PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2022

'B ++' Grade (CGPA 2.96)

Name of the Faculty : **Interdisciplinary Studies**

Syllabus & Name of the Course: **Four Years Integrated Course in B.Sc.B.Ed. Part-III**

With effect from : **June 2022**

PROGRAMME AND DURATION:

Integrated Programme of Teacher Education titled **'Bachelor of Science and Bachelor of Education' (B.Sc. B.Ed.)** degree programme. The programme will be of four-year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of a minimum of 16 weeks of instruction excluding examination.

This degree B.Sc. B.Ed. is thereby equivalent to B.Sc. and B.Ed. degrees of the University of P. A. H. Solapur University, Solapur and the UGC. On successful completion of the programme, students are eligible for admission to Master Degree Programmes in respective subjects in the P.A.H. Solapur University, Solapur and other Indian Universities.

THE GENERAL OBJECTIVES OF B. Sc. B.Ed. INTEGRATED COURSE ARE:

1. To develop among student-teachers the essential competencies of a teacher in order to develop an attitude towards becoming a committed and performance oriented teacher.
2. To equip the student-teachers through strong psycho-social foundation and with essential knowledge, skills and attitude so as to develop them as responsible teachers of the modern world.
3. To create awareness about national values enshrined in the Constitution of India, core elements, duties and responsibilities of a teacher and foster human rights, and the dignity of individuals.
4. To create awareness among student teachers about the socioeconomic and political scenario of the society in order to understand need of inclusion of all sections of the society and importance of unity in diversity.
5. To develop scientific temperament, critical thinking, sense of appreciation and decision making among student teachers.
6. To sensitize students about emerging issues related to environment, gender equality, and technology use, legal provisions on education, rights and duties enshrined in the constitution of India.
7. To promote student teachers about social cohesion, international understanding and protection of human rights and right of the child.
8. To use managerial and organizational skills among student teachers.
9. To become competent and committed Science and Mathematics teacher.

ATTENDANCE:

Each student has to attend a minimum of 75% of the classes conducted in each course. Failure to meet the minimum requirement renders disqualification from terminal examination and makes him/her ineligible for scholarship/ free ship. Such a student is deemed to have dropped the course and is not allowed to write the semester end examination of that course. He has to re-register for the course/s as and when they are offered by the institute.

MEDIUM OF INSTRUCTION:

The medium of instruction and examination is Marathi or English.

STANDARD OF PASSING

1) To pass the B.Sc. B.Ed. examination, a candidate must obtain at least 40% marks in each theory paper (separate passing for CA and UA). Such a candidate shall be declared passed the examination in Pass class & Second class.

2) Those obtaining C+ Grade in all Heads shall be declared passed the examination in Higher Second Class.

3) Those obtaining B Grade in all Heads shall be placed in the First Class.

4) Those obtaining A Grade in all Heads will be declared passed in First Class with Distinction.

5) B.SC. B.Ed. Class/Grade will be declared on the aggregate performance in the Semester I, II, III, IV, V, VI, VII and VIII.

Table: 100 Mark courses
10- Point scale for courses having passing criterion of 50%

Sr. No.	Range of Marks	Grade	Grade Point
1	80-100	O: Outstanding/Excellent	10
2	75-79	A+: Very Good	09
3	70-74	A: Good	08
4	65-69	B+: Above Average	07
5	60-64	B: Average	06
6	55-59	C+: Satisfactory	05
7	50-54	C: Pass	04
8	00-49	F: Fail	00

Table: 50 Mark Courses
10- Point scale for courses having passing criterion of 50%

Sr. No.	Range of Marks	Grade	Grade Point
1	43-50	O: Outstanding/Excellent	10
2	4.-42	A+: Very Good	09
3	37-39	A: Good	08
4	34-36	B+: Above Average	07
5	31-33	B: Average	06
6	28-30	C+: Satisfactory	05
7	25-27	C: Pass	04
8	00-24	F: Fail	00

NOTE:

1. A candidate failing in any subject of the eight semesters shall be required to appear for the examination in the next semester.
2. A candidate who has once passed in any of the theory Paper/Head and passing with 50% need not appear again for that theory Paper/Head.
3. While admitted to second or third or fourth year, ATKT (Allowed to keep Term) can be granted to those students, who have failed in below 50 % theory papers of conjugative semesters.
4. It is desired that, student will complete all his/her internal assessment work CA / EPC work/ Internship work within the academic year only. If a student fails to complete his/her internal assessment work/ EPC work/ Internship work he/she may have to get readmitted to the college/Department.

(B.Sc. B.Ed.) COURSE FROM 2022

F. Y. B.Sc. B.Ed. SEMESTER I

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Science Component	A 101 TH	English Compulsory	04	02	10	40	50
	A 102 **Select Any Four subjects TH**	Chemistry I	05	02	10	40	50
		Chemistry II		02	10	40	50
		Physics I	05	02	10	40	50
		Physics II		02	10	40	50
		Mathematics I	05	02	10	40	50
		Mathematics II		02	10	40	50
		Geology I	05	02	10	40	50
		Geology II		02	10	40	50
		Electronics I	05	02	10	40	50
		Electronics II		02	10	40	50
		Statistics I	05	02	10	40	50
		Statistics II		02	10	40	50
		Botany I	05	02	10	40	50
		Botany II		02	10	40	50
		Zoology I	05	02	10	40	50
		Zoology II		02	10	40	50
		Microbiology I	05	02	10	40	50
		Microbiology II		02	10	40	50
Education Component	E 01 TH	Contemporary India and Education	05	02	10	40	50
	E 02 TH	Understanding Disciplines and Subjects	05	02	10	40	50
Total of Semester I				**22**	**110**	**440**	**550**

F. Y. B.Sc. B.Ed. SEMESTER II

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Science Component Select Any Four subjects	A 201 TH	English Compulsory	04	02	10	40	50
	A 202 TH	Chemistry III Chemistry IV	05	02 02	10 10	40 40	50 50
	PR	Chemistry Practical	Per Batch 04	04	20	80	100
	TH	Physics III Physics IV	05	02 02	10 10	40 40	50 50
	PR	Physics Practical	Per Batch 04	04	20	80	100
	TH	Mathematics III Mathematics IV	05	02 02	10 10	40 40	50 50
	PR	Mathematics Practical	Per Batch 04	04	20	80	100
	TH	Geology III Geology IV	05	02 02	10 10	40 40	50 50
	PR	Geology Practical	Per Batch 04	04	20	80	100
	TH	Electronics III Electronics IV	05	02 02	10 10	40 40	50 50
	PR	Electronics Practical	Per Batch 04	04	20	80	100
	TH	Statistics III Statistics IV	05	02 02	10 10	40 40	50 50
	PR	Statistics Practical	Per Batch 04	04	20	80	100
	TH	Botany III Botany IV	05	02 02	10 10	40 40	50 50
	PR	Botany Practical	Per Batch 04	04	20	80	100
	TH	Zoology III Zoology IV	05	02 02	10 10	40 40	50 50
	PR	Zoology Practical	Per Batch 04	04	20	80	100
	TH	Microbiology III Microbiology IV	05	02 02	10 10	40 40	50 50
	PR	Microbiology Practical	Per Batch 04	04	20	80	100
Education Component	E 03 TH	Language across the curriculum	05	02	10	40	50
	E 04 TH	Knowledge and Curriculum Part– I	05	02	10	40	50
Total of Semester II				**38**	**190**	**760**	**950**
Total of First Year (Semester I & II)				**60**	**300**	**1200**	**1500**
Additional compulsory subject (Marks not included for class)							
	A 203 TH	Democracy, Election and good Governance	05	02	10	40	50

S. Y. B.Sc. B.Ed. SEMESTER III

Course Component	Course	Title	Periods	Credits	Internal Marks	External Marks	Total Marks
Science Component	B 101 **Select Any Three subjects** **TH**	Chemistry V Chemistry VI	05	02 02	10 10	40 40	50 50
		Physics V Physics VI	05	02 02	10 10	40 40	50 50
		Mathematics V Mathematics VI	05	02 02	10 10	40 40	50 50
		Geology V Geology VI	05	02 02	10 10	40 40	50 50
		Electronics V Electronics VI	05	02 02	10 10	40 40	50 50
		Statistics V Statistics VI	05	02 02	10 10	40 40	50 50
		Botany V Botany VI	05	02 02	10 10	40 40	50 50
		Zoology V Zoology VI	05	02 02	10 10	40 40	50 50
		Microbiology V Microbiology VI	05	02 02	10 10	40 40	50 50
Education Component	E 05 TH	Knowledge and Curriculum Part – II	05	02	10	40	50
	E 06 TH	Creating an Inclusive School	05	02	10	40	50
	PR 01	Enriching Teaching Skills	30	02	50	00	50
	PR 02	EPC: Drama and Art in Education	30	02	50	00	50
Total of Semester III				**20**	**180**	**320**	**500**

S. Y. B.Sc. B.Ed. SEMESTER IV

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Science Component **Select Any Three subjects**	B 201 TH	Chemistry VII Chemistry VIII	05	02 02	10 10	40 40	50 50
	PR	Chemistry Practical	Per Batch 04	04	20	80	100
	TH	Physics VII Physics VIII	05	02 02	10 10	40 40	50 50
	PR	Physics Practical	Per Batch 04	04	20	80	100
	TH	Mathematics VII Mathematics VIII	05	02 02	10 10	40 40	50 50
	PR	Mathematics Practical	Per Batch 04	04	20	80	100
	TH	Geology VII Geology VIII	05	02 02	10 10	40 40	50 50
	PR	Geology Practical	Per Batch 04	04	20	80	100
	TH	Electronics VII Electronics VIII	05	02 02	10 10	40 40	50 50
	PR	Electronics Practical	Per Batch 04	04	20	80	100
	TH	Statistics VII Statistics VIII	05	02 02	10 10	40 40	50 50
	PR	Statistics Practical	Per Batch 04	04	20	80	100
	TH	Botany VII Botany VIII	05	02 02	10 10	40 40	50 50
	PR	Botany Practical	Per Batch 04	04	20	80	100
	TH	Zoology VII Zoology VIII	05	02 02	10 10	40 40	50 50
	PR	Zoology Practical	Per Batch 04	04	20	80	100
	TH	Microbiology VII Microbiology VIII	05	02 02	10 10	40 40	50 50
	PR	Microbiology Practical	Per Batch 04	04	20	80	100
Education Component	E 07	Gender, School and Society	05	02	10	40	50
	E 08	Assessment for Learning	05	02	10	40	50
	PR 03	Action Research Project	30	02	50	00	50
	PR 04	School Experience and Internship (One Week)	30	02	50	00	50
Total of Semester IV				**32**	**240**	**560**	**800**
Total of Second Year (Semester III & IV)				**52**	**420**	**880**	**1300**

T. Y. B.Sc. B.Ed. SEMESTER V

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Science Component	C 101TH	English Compulsory	04	02	10	40	50
	C 102 Select Any One subjects TH	Chemistry IX	05	02	10	40	50
		Chemistry X	05	02	10	40	50
		Chemistry XI	05	02	10	40	50
		Chemistry XII	05	02	10	40	50
		Physics IX	05	02	10	40	50
		Physics X	05	02	10	40	50
		Physics XI	05	02	10	40	50
		Physics XII	05	02	10	40	50
		Mathematics IX	05	02	10	40	50
		Mathematics X	05	02	10	40	50
		Mathematics XI	05	02	10	40	50
		Mathematics XII	05	02	10	40	50
		Geology IX	05	02	10	40	50
		Geology X	05	02	10	40	50
		Geology XI	05	02	10	40	50
		Geology XII	05	02	10	40	50
		Electronics IX	05	02	10	40	50
		Electronics X	05	02	10	40	50
		Electronics XI	05	02	10	40	50
		Electronics XII	05	02	10	40	50
		Statistics IX	05	02	10	40	50
		Statistics X	05	02	10	40	50
		Statistics XI	05	02	10	40	50
		Statistics XII	05	02	10	40	50
		Botany IX	05	02	10	40	50
		Botany X	05	02	10	40	50
		Botany XI	05	02	10	40	50
		Botany XII	05	02	10	40	50
		Zoology IX	05	02	10	40	50
		Zoology X	05	02	10	40	50
		Zoology XI	05	02	10	40	50
		Zoology XII	05	02	10	40	50
		Microbiology IX	05	02	10	40	50
		Microbiology X	05	02	10	40	50
		Microbiology XI	05	02	10	40	50
		Microbiology XII	05	02	10	40	50
Education Component	E 09	Environmental Education	05	02	10	40	50
	E 10 Select Any One TH	Pedagogy of School Subject: **Physical Science, Chemical Science**	05	02	10	40	50
	E 11 Select Any One TH	Pedagogy of School Subject: **Biological Science, Mathematical Science**	05	02	10	40	50
	PR 04	Lesson Planning Workshop	30	01	25	00	25
	PR 05	Workshop on Teaching Aids	30	01	25	00	25
	PR 06	Practice Teaching and Internship (Three Week)	30	04	100	00	100
	SOC	*** Skill Oriented Course: Any one of the following** * Stress Management * The Art of Public Speaking * Psychological Testing and Assessment * Technology Embedded Teaching	60	04	100	00	100
Total of Semester V				**26**	**330**	**320**	**650**

T. Y. B.Sc. B.Ed. SEMESTER VI

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Science Component **Select Any One subjects**	C 201 TH	English Compulsory	04	02	10	40	50
	C 202 TH	Chemistry XIII	05	02	10	40	50
		Chemistry XIV	05	02	10	40	50
		Chemistry XV	05	02	10	40	50
		Chemistry XVI	05	02	10	40	50
	PR	Chemistry Practical	Per Batch 04	08	40	160	200
	TH	Physics XIII	05	02	10	40	50
		Physics XIV	05	02	10	40	50
		Physics XV	05	02	10	40	50
		Physics XVI	05	02	10	40	50
	PR	Physics Practical	Per Batch 04	08	40	160	200
	TH	Mathematics XIII	05	02	10	40	50
		Mathematics XIV	05	02	10	40	50
		Mathematics XV	05	02	10	40	50
		Mathematics XVI	05	02	10	40	50
	PR	Mathematics Practical	Per Batch 04	08	40	160	200
	TH	Geology XIII	05	02	10	40	50
		Geology XIV	05	02	10	40	50
		Geology XV	05	02	10	40	50
		Geology XVI	05	02	10	40	50
	PR	Geology Practical	Per Batch 04	08	40	160	200
	TH	Electronics XIII	05	02	10	40	50
		Electronics XIV	05	02	10	40	50
		Electronics XV	05	02	10	40	50
		Electronics XVI	05	02	10	40	50
	PR	Electronics Practical	Per Batch 04	08	40	160	200
	TH	Statistics XIII	05	02	10	40	50
		Statistics XIV	05	02	10	40	50
		Statistics XV	05	02	10	40	50
		Statistics XVI	05	02	10	40	50
	PR	Statistics Practical	Per Batch 04	08	40	160	200
	TH	Botany XIII	05	02	10	40	50
		Botany XIV	05	02	10	40	50
		Botany XV	05	02	10	40	50
		Botany XVI	05	02	10	40	50
	PR	Botany Practical	Per Batch 04	08	40	160	200
	TH	Zoology XIII	05	02	10	40	50
		Zoology XIV	05	02	10	40	50
		Zoology XV	05	02	10	40	50
		Zoology XVI	05	02	10	40	50
	PR	Zoology Practical	Per Batch 04	08	40	160	200
	TH	Microbiology XIII	05	02	10	40	50
		Microbiology XIV	05	02	10	40	50
		Microbiology XV	05	02	10	40	50
		Microbiology XVI	05	02	10	40	50
	P	Microbiology Practical	Per Batch 04	08	40	160	200
Education Component	E 12 TH	School Guidance and Counseling	05	02	10	40	50
	E 13 Select Any one TH	Pedagogy of School Subject: **Physical Science, Chemical Science**	05	02	10	40	50
	E 14 Select Any one TH	Pedagogy of School Subject: **Biological Science, Mathematical Science**	05	02	10	40	50
	PR 07	EPC: Critical Understanding of ICT	30	02	50	00	50
Total of Semester VI				**26**	**170**	**480**	**650**
Total of Third Year (Semester V & VI)				**52**	**500**	**800**	**1300**

Final Year B. Sc. B. Ed. SEMESTER VII

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Education Component	E 15 TH	Learning and Teaching	05	02	10	40	50
	E 16 Any One TH	Educational Management	05	02	10	40	50
		Educational Technology					
	PR 08	EPC: Reading and Reflecting on Text	30	02	50	00	50
	PR 09	CCM Workshop	30	01	25	00	25
	PR 10	Evaluation Workshop	30	01	25	00	25
	PR 11	Physical and Health Education	30	02	50	00	50
	PR 12	School Internship (Six Week)	30	08	200	00	200
	PR 13	Social Service	30	02	50	00	50
	PR 14	Educational Tour	--	02	50	00	50
Total of Semester VII			**--**	**22**	**470**	**80**	**550**

Final Year B. Sc. B.Ed. SEMESTER VIII

Course Component	Course	Title	Periods per week	Credits	Internal Marks	External Marks	Total Marks
Education Component	E 17 TH	Childhood and Growing Up	05	02	10	40	50
	E 18 TH Any One	Value Education	05	02	10	40	50
		Peace Education					
	PR 15	EPC: Understanding the Self	30	02	50	00	50
	PR 16	Workshop on Constructivism	30	02	50	00	50
	PR 17	Models of Teaching Workshop	30	02	50	00	50
	PR 18	Visit to Innovative Organization	30	02	50	00	50
	PR 19	School Internship (One Week)	30	02	50	00	50
	PR 20	Lesson Examination	30	04	00	100	100
	PR 21	Creativity and Personality Development	30	02	50	00	50
	PR 22	Viva Voce	--	02	00	50	50
Total of Semester VIII				**22**	**320**	**230**	**550**
Total of Final Year (Semester VII & VIII)				**44**	**790**	**310**	**1100**

Year wise Mark Distribution Chart

Sr. No.	Year	Semester	Component Area	College Assessment Marks	University Assessment Marks	Practical Marks		Total Marks	Year wise Total Marks
						CA	UA		
01	First	I	Science	90	360	--	--	450	1500
			Education	20	80	--	--	100	
		II	Science	90	360	80	320	850	
			Education	20	80	--	--	100	
02	Second	III	Science	60	240	--	--	300	1300
			Education	20	80	100	--	200	
		IV	Science	60	240	60	240	600	
			Education	20	80	100	--	200	
03	Third	V	Science	50	200	--	--	250	1300
			Education	130	120	150	--	400	
		VI	Science	50	200	40	160	450	
			Education	30	120	50	--	200	
04	Fourth	VII	Science	--	--	--	--	--	1100
			Education	20	80	450	--	550	
		VII	Science	--	--	--	--	--	
			Education	20	80	300	150	550	
Total Marks			**Science**	**400**	**1600**	**180**	**720**	**2900**	--
Total Marks			**Education**	**280**	**720**	**1150**	**150**	**2300**	--
Total Marks				**680**	**2320**	**1330**	**870**	**5200**	**5200**

- **Credit Ratio** **:** 01 Credit = 25 Marks
- **Theory Papers** **:** 01 week = 05 Periods
- **Practical Work** **:** 01 week = 04 Periods per batch

(Per batch minimum 12 and maximum 20 students)

- **Total Theory Papers (Science)** **:** 40 = 2000 Marks
- **Total Theory Papers (Education)** **:** 18 = 900 Marks
- **Total Practical work** **:** 31 = 2200 Marks
- **Skill Oriented Course** : 04 = 100 Marks

Sr. No.	Component Area	Total Marks	Total Credits
01	Science	2900	116
02	Education	2300	92
	Total	**5200**	**208**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: English (Comp.)

Name of the Course: B. A./B. Sc./ B.C.A. Part- III

(Syllabus to be implemented from w.e.f. June 2021)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part – III

Name of the Course: Compulsory English

Name of the Text: *Literary Mindscapes* (I & II)

Semester- V & VI

With effect from June-2021-22, 2022-23 & 2023-24

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: BA/BSC Part III**

Name of the Paper**: Compulsory English**

Literary Mindscapes (I & II)

Semester: V & VI

Preamble:

Significance of English Language Skills in the days of technology is the need of the hour. Strengthening the basic language skills of English language acquired in the previous years of under graduation is essential. Oral and written communication skills along with the soft skills are required in this global scenario. The aspirants for jobs in private, public sectors, and PG Courses have to clear English proficiency test. This course will be instrumental in preparing the learners in these areas.

Objectives of the Course:

- Strengthening comprehension skills
- Developing appreciation abilities for Literature
- Strengthening oral & written communication skills
- Galvanizing soft skills

Course Outcome:

By the end of the course the students will be able to

- Use oral and written English effectively
- Appreciate literary language
- Use English language in creative writing
- Apply English language skills in clearing competitive examinations

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Name of the course**: BA/BSC Part III**

Name of the Paper**: Compulsory English**

Literary Mindscapes – I

Semester: V

CREDITS: 04 60 Lectures

Unit No: I - Prose

1) The Gift of the Magi: O' Henry
2) The Homecoming: Rabindranath Tagore

Unit No: II - Poetry

1) **The Solitary Reaper** William Wordsworth
2) The Queen's Rival Sarojini Naidu
3) The Village School Master Oliver Goldsmith
4) The Road not Taken Robert Frost

Unit No: III - Grammar & Vocabulary

1) Active & Passive Voice
2) Phrasal Verbs

Unit No: IV - 21st Century Skills
1) 21st Century Skills
2) Types of 21st Century Skills
3) Learning Skills (The 4 Cs)

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Name of the course**: BA/BSC Part - III**

Name of the Paper**: Compulsory English**

Literary Mindscapes – II

Semester: VI

CREDITS: 04 60 LECTURES

Unit No: I - Prose

1) Growing Up	Joyce Cary
2) God Sees the Truth, but Waits	Leo Tolstoy

Unit No: II - Poetry

1) Sita	Toru Dutt
2) My Last Duchess	Robert Browning
3) Ode to Beauty	John Keats
4) Life	Charlotte Bronte

Unit No: III - Grammar & Vocabulary

1) Adverbials
2) Direct and Indirect speech

Unit No: IV - Communication Skill

1) Literacy Skills (IMT)
2) Life Skills (FLIPS)
3) Other Skills

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Name of the Course: **B. A. (English) Part–III**
Name of the Paper: **Compulsory English**
Semester**: V & VI**
(2021-2022, 2022-2023, 2023-2024)
(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

Semester	**Paper No.**	**Title of Paper**	**No. of Lectures**	**College Assessments (Marks)**	**University Assessments (Marks)**	**Total Marks**	**Credits**
V & VI	-	Compulsory English	60	10	40	50	04

Question Paper Pattern

Name of the Course: BA/BSC Part III
Name of the Paper**: Compulsory English**
SEM- V & VI

Q. **1 Rewrite the following sentences by choosing the correct alternative.** 08 Marks
(Poetry, Prose & Grammar)

Q. 2 Write answers in short (any four out of six) 12 Marks
(Prose & Poetry)

Q. 3 Broad Question (any one) 10 Marks
(Communication skills)

Q. 4 Broad Question 10 Marks
(Communication skills)

Equivalent subject for old syllabus (Compulsory Syllabus)

Sr. No	Name of the Old Papers	Name of the New Papers
1	Compulsory English	Compulsory English

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part – III

Name of the Course: Introduction to Literary Criticism

Paper No. – VII & XII

Semester – V & VI

With effect from June-2021-22, 2022-23 & 2023-24

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B. A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism**

Semester – V & VI

Preamble:

It is a prime concern to inculcate the crucial skill of critical thinking among the students to lead them to a more balanced life. The ability to think critically and from multiple perspectives is very essential to make good evaluation and take the best decisions to lead a successful and satisfied life. The ability is quite needed for making the responsible good citizens. This paper aims at nourishing among the students the understanding of critical thinking: processes, terms, concepts, views, perspectives, approaches, theories, and practices. Keeping in view these basics, the paper includes the general understanding of the concept of criticism: meaning, nature, function, objectives, types, introductory history, and trends. So also, there is the inclusion of theories representing different eras as well as different perspectives.

Objectives:

- To introduce the students to the basics of literary criticism.
- To give the students an overview of the critical practices from traditional criticism
- To acquaint the students with types of Literary Criticism
- To develop in them a critical perspective and ability to relate and compare various critical approaches.

Course Outcomes:

By the end of the course the students will be able to:

- Understand the basics of literary criticism
- Trace the development of critical practices from traditional criticism
- Read and understand the representative theories/essays.
- Know the different critical terms/concepts/trends/movements/schools of Literary Criticism
- Look at a literary piece from different perspectives and relate them.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-VII)

Semester – V

CREDITS: 04 60 LECTURES

Unit 1. Literary Criticism: Basics (Credit: 01) Lectures (15)

Literary Criticism: Definitions/Meaning, Nature, Function, Qualifications of a good literary critic

Unit 2. Classical Criticism (Credit: 01) Lectures (15)

Aristotle: Theory of Imitation

Unit 3. Neoclassical Literary Criticism (Credit: 01) Lectures (15)

Samuel Johnson's 'Preface to Shakespeare'

Unit 4. Types of Criticism (Introductory) (Credit: 01) Lectures (15)

Aesthetic Criticism, Evaluative Criticism, ,Comparative Criticism, Historical Criticism, Descriptive Criticism

References:

1. Abrams, M.H., Geoffery Galt Harpham, *Dictionary of Literary Terms and Literary Theory*, Cengage Learning India Private Limited. 2015.
2. Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory,* Manchester University Press, 2002
3. Brooks, Cleanth and Wimsatt, *A Short History of Literary Criticism*, Univ of Chicago Pr. 1983.
4. Butcher, S. H.(Trans.) *The Poetics of Aristotle*. Macmilan. 1902
5. Cuddon, J. A. *Penguin Dictionary of Literary Terms and Literary* Theory.Penguin Books. 1999
6. Daiches, David. *Critical Approaches To Literature.* Orient Longman Limited, 1984
7. Fowler, Roger and Peter Childs. *The RoutledgeDictionary of Literary Terms.* Taylor and Francis. 2005
8. Guern, Wilfred L. *A Handbook of Critical Approaches to Literature*. Oxford University Press,1999.
9. Hudson, W.H. *An Introduction to the Study of Literature.* George G. Harrap and Co. Press.London.
10. Leech, G. N. *A Linguistic Guide to English Poetry*. Longman. 1969
11. Thorat, Ashok. *Kumar Iyer and et al. A Spectrum oif Literary Criticism*. Frank Bros. and Co. Ltd., 2001.
12. Wellek, Rene. and Austen Warren. *Theory of Literature*. Penguine Books Publicatin, 198

Question Paper Pattern

Name of the Course**: B. A. Part III**
Name of the Paper: **Introduction to Literary Criticism**
SEM- V

1. Rewrite the following sentences by choosing the correct alternative from given below. 08 Marks

(Unit 2 Aristotle: Theory of Imitation/ Unit 3 Samuel Johnson's 'Preface to Shakespeare')

2. Answer any Four of the following questions (Any Four out of Six) 12 Marks
(Unit 4. Types of Criticism)

3. Answer the following question. (One out of Two) 10 Marks
(Unit 2 Aristotle: Theory of Imitation/ Unit 3 Samuel Johnson's 'Preface to Shakespeare')

4. Answer the following Question (Only One) 10 Marks
(Unit 1. Literary Criticism: Basics)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-XII)

Semester - VI

Preamble:

This paper aims at creating the awareness of the critical creed, multiple perspectives, theoretical bases and actual practice of relating theories, approaches, and perspectives to a literary piece. Further, the paper is an attempt to integrate theory with practice making the students able to think critically. With the application of theoretical knowledge in like-like situations, the students are expected to lead more balanced life. The introduction of wide range material is with the end to bridge the gap between lab and land and develop the practical knowledge and skill of the students. The inclusion of approaches, representative theories and practical criticism would enhance the capabilities of the students. The practical criticism included in the syllabus is with the aim to make students more intensive and practice-oriented.

Objectives:

1. To introduce different approaches to the students.
2. To make the students aware of theoretical diversity.
3. To enable the students to understand different literary devices.

Course Outcomes:

By the end of the course the students will be able:

1. To identify the features of different critical approaches.
2. To understand an essay from romantic criticism.
3. To understand an essay from 20^{th} century literary criticism
4. To understand literary devices.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-XII)

Semester - VI

CREDITS: 04 60 LECTURES

Unit 1. Critical Approaches to Literature (Credit: 01) Lectures (15)

I. Biographical Approach to Literature.

II. Psychological Approach to Literature.

III. Sociological Approach to Literature

Unit 2. Romantic Criticism (Credit: 01)Lectures (15)

William Wordsworth's 'Preface to Lyrical Ballads' (1802)

Unit 3. Twentieth Century Criticism (Credit: 01) Lectures (15)

T. S. Eliot's 'The Function of Criticism'

Unit 4. Literary Devices/Terms (Credit: 01) Lectures (15)

Theme, Tone, Mood, Imagery, Symbols, Alliteration, Onomatopoeia, Repetition, Rhyme, Antithesis, Hyperbole, Pun, Metonymy, Climax, Anticlimax, Conceit.

References:

1. Barry, Peter Beginning Theory: *An Introduction to Literary and Cultural Theory*, Manchester University Press, 2002
2. Brooks, Cleanth and Robert Penn Warren. *Understanding Poetry*. Henry Holt 1938. rpt 1950.
3. Daiches, David. *Critical Approaches To Literature.* Orient Longman Limited, 1984
4. Richards, I. A. *Practical Criticism*. London, 1929
5. Eliot, T S. *Selected Essays*. Faber and Faber.1932
6. Eliot, T.S. *Selected Essays* 1917-1932, Harcourt,Brace and Company. 1932
7. Eliot, T. S. *Selected Essays*. Faber. 1999.
8. Evans, Robert. *Critical Approaches to Literature: Moral*. Salem Press. 2017.
9. Harpham, Geoffrey and Abrams M.H. *A Glossary of Literary Terms*. Cengage Learning, 2015.
10. Leech, G. N. *A Linguistic Guide to English Poetry*. Longman. 1969
11. Lennard, John. *The Poetry Handbook: A Guide to Reading Poetry for Pleasure and Practical Criticism*, Oxford Publication. 1996
12. Richards, I. A. *Practical Criticism*. London, 1929
13. Seturaman, V.S. and C.T.Indra, T. Sriraman, *Practical Criticism*, Macmillan Publishers India Limited, 1990.
14. Tyson, Lois. ENGL A337 *Critical Approaches to Literature*. Taylor & Francis. 2018.
15. Warren, Austin, and Wellek, René. *Theory of Literature*. Dalkey Archive Press.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **Introduction to Literary Criticism**

Semester**: V & VI**

(2021-2022, 2022-2023, 2023-2024)

(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

Semester	**Paper No.**	**Title of Paper**	**No. of Lectures**	**College Assessments (Marks)**	**University Assessments (Marks)**	**Total Marks**	**Credits**
V & VI	VII & XII	**Introduction to Literary Criticism**	60	10	40	50	04

Question Paper Pattern

Name of the Course**: B. A. Part III**

Name of the Paper: **Introduction to Literary Criticism (Paper-XII)**

SEM- VI

Q. 1. Rewrite the following sentences by choosing the correct alternative from given below.08 Marks

(Unit 2.William Wordsworth's 'Preface to Lyrical Ballads' (1802) and Unit 3. T. S. Eliot's 'The Function of Criticism')

Q. 2. Answer any Four of the following questions (any four out of Six) 12 Marks

Unit 4: Literary Devices/Terms

Q. 3. Answer the following question. (One out of Two) 10 Marks

A) Unit 2.William Wordsworth's 'Preface to Lyrical Ballads'

Or

B) Unit 3. T. S. Eliot's 'The Function of Criticism')

Q. 4. Answer the following Question (Only One)10 Marks

(Unit 1. Critical Approaches to Literature)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part – III

Name of the Paper: British Literature

Paper No. – VIII & XIII

Semester – V & VI

With effect from June-2021-22, 2022-23 & 2023-24

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**
Name of the Paper: **British Literature**
Semester V & VI

Preamble:

British literature is widely read and interpreted worldwide. It is necessary for the students to be introduced to different literary forms practiced by the writers in the British literary tradition.

Objectives:

1. To acquaint the students with the major genres of British Literature.
2. To introduce various movements and major contribution to British literature.
3. To enhance literary, linguistic and aesthetic competence of the students.

Course Outcomes:

By the end of the course the students will:

- Gain knowledge about stylistic strategies and diction of British literature.
- Be able to explore the creativity and the human experiences in fiction, poetry and drama.
- Be able to cultivate aesthetic and ethical values in life through literary texts.
- Gain knowledge of major trends and traditions of British literature.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **British Literature (Paper-VIII)**

Semester V

CREDITS: 04 60 LECTURES

Survey Topics: Credit 01 Lectures 15

1. Characteristics of Elizabethan Stage

2. Romance and Fantasy in English Novels

Poems: Credit 01 Lectures 15

1. Edmund Spenser**:** ***Ice and Fire***
2. John Donne**:** ***Lovers' Infiniteness***
3. William Shakespeare**:** ***True Love***
4. John Milton**:** ***When I Consider How my Light is Spent***
5. George Herbert**:** ***The Flower***

Drama: Credit 01 Lectures 15

1. William Shakespeare: ***Antony and Cleopatra***

Novel: Credit 01 Lectures 15

1. Thomas Hardy: ***Two on a Tower***

References:

1. Shakespeare, William, *Antony and Cleopatra*, Rupa & Co 2004.
2. Hardy, Thomas, *Two on a Tower*, Everyman India, 2010.
3. David Scott Kastan, ed. *The Oxford Encyclopedia of British Literature*, Oxford University Press, 2003.
4. Ford Boris, *The Pelican Guide to English Literature*, Penguin Books, 1955.
5. Green, David (Ed.), *The Winged Word* MacMillan Publishers India Pvt Ltd. 2016.
6. Herbert J. C. Grierson *A Critical History of English Poetry*, London, Hogarth Press, 1946.
7. Kettle, Arnold, *An Introduction of Novel*, Universal Book Stall, Vol 1 & 2.
8. Mundra J.N., and Mundra S.C. (1998), *A History of English Literature*, Vol. I,II, III.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper: **British Literature (Paper-XIII)**

Semester: VI

CREDITS: 04 60 LECTURES

Survey Topics: Credit 01 15 Lectures

1. Victorian Poetry

2. Victorian Women Writers

Poems: Credit 01 15 Lectures

1. Robert Browning**:** ***Meeting at Night***

2. Tennyson: ***Come into the Garden, Maud***

3. Matthew Arnold**:** ***Shakespeare***

4. C.G. Rossetti: ***A Christmas Carol***

5. G.M. Hopkins**:** ***Spring***

Drama: Credit 01 15 Lectures

1. John Osborne: ***Look Back in Anger***

Novel: Credit 01 15 Lectures

1. Charlotte Bronte: ***The Professor***

References:

1. Osborne, John. *Look Back in Anger,* Pearson Education. 2011.
2. Bronte, Charlotte. *The Professor* Wordsworth Editions Ltd, 2009.
3. David Scott Kastan, ed. *The Oxford Encyclopedia of British Literature*. Oxford University Press, 2003.
4. Ford Boris. *The Pelican Guide to English Literature*. Penguin Books, 1955.
5. Green, David (Ed.), *The Winged Word*. MacMillan Publishers India Pvt Ltd. 2016.
6. Herbert J. C. Grierson. *A Critical History of English Poetry*. London, Hogarth Press, 1946.
7. Kettle, Arnold. *An Introduction of Novel*. Universal Book Stall, Vol I & II.
8. Mundra J.N., and Mundra S.C. (1998). *A History of English Literature,* Vol. I,II, III.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course**: B.A (English) Part–III**

Name of the Paper**: British Literature**

Semester V & VI

(2021-2022, 2022-2023 & 2023-2024)

(CBCS Semester Pattern Syllabus *w.e.f.* June, 2021)

Semester	**Paper No.**	**Title of Paper**	**No. of Lectures**	**College Assessment**	**University Assessment**	**Total Marks**	**Credits**
V	VIII & XIII	British Literature	60	10	40	50	04

Question Paper Pattern

Name of the Course: B. A. Part III

Name of the Paper**: British Literature**

SEM- V & VI

Que -1- Multiple Choice Questions. (8 Marks)
(Poetry, Drama & Novel)

Que- 2- Short Answer Type Question. (12 Marks)
(2 Survey Topics & 4 Poetry)

Que- 3- Broad Question with an internal option. (A or B).
(Drama) (10 Marks)

Que- 4- Broad Question. (10 Marks)
(Novel)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part - III

Name of the Paper: Indian English Literature

Paper No. – IX & XIV

Semester: V & VI

With effect from June-2021-22, 2022-23 & 2023-24

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Name of the Course**: B. A. (English) Part- III**
Name of the Paper: **Indian English Literature**
Semester: V & VI

Preamble:-

In continuation with the study of early 20th century representative Indian English writers/writings covering major literary genres in B.A.Part-2, students are further to be acquainted with the development of Indian English Literature in late 20th century with focus on selected authors and texts .

Objectives of the course:-

- To introduce to the students the socio-cultural and intellectual background of the post-independence Indian English Literature.
- To acquaint undergraduates with different literary genres as practised by representative Indian English writers in early post-independence period.
- To help students to understand, interpret variety of themes and styles as reflected in the prescribed texts.

Course Outcomes:-

By the end of the course, students will –

• Understand gradual development of Indian English Literature in the latter half of the 20th century.
• Get acquainted with important themes & issues through study of texts prescribed.
• Get acquainted with Indian ethos as revealed through prescribed texts.
• Be able to interpret and analyse on their own & further nurture interest in the study of Indian literatures, especially Indian English Literature.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the course**: B.A. Part III**

Name of the Paper**: Indian English Literature (Paper-IX)**

Semester: V

CREDITS: 04 60 LECTURES

(I) Survey Topics- (Credit-01) (Lectures-15)

1) Salient Features of Modern Indian English Poetry. (With reference to the poems prescribed).

2) Salient Features of Modern Indian English Drama. (With reference to the translated Indian plays in English).

(II) Poems Prescribed- (Credit-01) (Lectures-15)

1) **Nissim Ezekiel**- Poet, Lover, Birdwatcher.

2) **Arun Kolatkar**- Between Jejuri and Railway Station.

3) **Shiv K. Kumar**- Letter from New York.

4) **Jayant Mahapatra**- Dawn at Puri.

5) **A. K. Mehrotra**- Letter to a Friend.

(III) Drama-(Credit-01) (Lectures-15)

1. The Dread Departure by Satish Alekar.

(Trans.by Gauri Deshpande) (Collected Plays of Satish Alekar) (OUP).

(IV) Fiction- (Credit-01) (Lectures-15)

1. The Foreigner - Arun Joshi. (Orient Paperbacks-2010)

List of Reference Books-

1) K.R.Srinivas Iyengar-*Indian Writing in English*.(Sterling Pub.)

2) M.K.Naik-*A History of Indian English Literature*.(Sahitya Akademi New Delhi-1982)

3) Bruce King: *Three Indian Poets: Nissim Ezekiel, A.K.Ramanujan, Dom Moraes* (OUP-1991)

4) M.K.Naik-*Indian English Poetry: From Beginning to 2000.*

5) Meenakshi Mukherjee- *The Twice Born Fiction.* (Pencraft, New Delhi)

6) N.Bharucha & Vilas Sarang (edi)- *Indian English Fiction-1980-90- An Assessment.*

7) M.K.Bhatnagar (edi)- *The Novels of Arun Joshi-A Critical Study.* (Atlantic -January,2014)

8) Siddhartha Sharma- *Arun Joshi's Novels:A Critical Study*.(Atlantic Pub.)

9) A N.Dwivedi- *Studies in Contemporary English Drama.*

10) Kaustav Chakraborty- *Indian Drama in English*.

11) Natesan Sharada Iyer- *Musings on Indian Writing:Drama*. (Sarup & Sons, 2007).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Course Name**: B. A. (English) - Part-III**

Paper Name**: Indian English Literature** (Paper No. XIV)

Semester-VI

CREDITS: 04 60 LECTURES

(I) General/Survey Topics- (Credit-01) (Lectures-15)

1**) Salient features of post-modern Indian English Poetry.** (With spl. reference to the poems prescribed).

2) **Salient features of post-modern Indian English Novel.** (With spl. reference to the Diasporic Indian English Novel).

(II) Poems Prescribed- (Credit-01) (Lectures-15).

1) **A. K. Ramanujan**- Looking for a Cousin on a Swing.

2) **Dilip Chitre**- Felling of Bunyan Tree

3) **Eunice De Souza-** Feeding the Poor at Christmas.

4) **Manohar Shetty**- Animal Planet.

5) **Mamta Kalia**- Tribute to Papa.

(III)Drama- (Credit-01) (Lectures-15).

1**. Nagamandala**- Girish Karnad. Updated Students' Version) (Oxford University Press-1999).

(IV)Fiction- (Credit-01) (Lectures-15)

1. The Namesake - Jhumpa Lahiri. (Mariner Books-Reprint-2004)

List of Reference Books-

1) A.K.Mehrotra (Edi), *Ten Twentieth Century Indian English Poets.* (Oxford University Press-2001).

2) Menka, Shivdasani (Edi). *Anthology of Contemporary Indian Poetry* - (Big Bridge Press -2013).

3) Bruce, King. *Three Indian Poets Nissim Ezekiel, A.K.Ramanujan ,Dom Moraes.(*OUP-1991).

4) Kaustav, Chakraborty. *Indian Drama in English.*

5) Natesan Sharada Iyer, *Musings on Indian Writing: Drama*.(Sarup & Sons,2007)

6) Dr.S.S.Upase. *Power in Karnad's Plays.*

7) Nandkumar. *Indian English Drama : Study in Myths.*

8) N.Bharucha & Vilas Sarang (Edi). *Indian English Fiction 1980-90- An Assessment*.

9) Viney Kirpal (Edi). *The Post-modern Indian English Novel-Interrogating the 1980s & 1990s.*(Allied Publication -1996).

10) Nizara Hazarika, Johnson, Day (Edi.). *Contemporary Indian Women Writers in English: Critical Perspectives.* (Pencraft -2015)

11)Angshuman Kar (Edi.). *The Contemporary Indian Diaspora: Literary & Cultural Representation* (Rawat Pub. 2015).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **Indian English Literature**

Semester**: V & VI**

(2021-2022, 2022-2023 & 2023-2024)

(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

Semester	**Paper No.**	**Title of Paper**	**No. of Lectures**	**College Assessment (Marks)**	**University Assessment (Marks)**	**Total Marks**	**Credits**
V & VI	IX&XIV	**Indian English Literature**	60	10	40	50	04

Question Paper Pattern

Name of the Course: B. A. Part III

Name of the Paper**: Indian English Literature**

SEM- V & VI

Que-1- Multiple Choice Questions. **(8 Marks)**
(Poetry, Drama & Fiction)

Que-2- Short Answer Type Question. (12 Marks)
(Survey Topics & Poetry)

Que-3- Broad Question (A or B). (10 Marks)
(Drama)

Que-4- Broad Question. **(10 Marks)**
(Novel)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part - III

Name of the Paper: Literatures in English

Paper No. – X & XV

Semester: V & VI

With effect from June-2021-22, 2022-23 & 2023-24

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III (Semester V)**

Name of the Paper: **Literatures in English**

Semester: V & VI

Preamble:

Many outstanding literary figures from different part of the world have been contributing and enriching literature. As English is the World Language, it is essential to introduce World Literature to B.A. III year students so as to get acquitted with these literary exponents and take an opportunity to study cultures, society, language and tradition depicted by them in their works.

Objectives

• To develop a clear understanding of the key concepts of world literature

• To expose students to alternative literature produced in the world

• To provide an exposure to various writers from the entire world.

• To familiarize students with the different literary tradition of the world

• To help students understand and respond to literary texts of different time and period.

Course Outcome:

By the end the course, the students will:

• Understand Literature from the world around.

• Understand the salient features of postcolonial fiction and absurd theatre.

• Be able to respond critically to world literatures in English.

• Get acquainted with different cultures across the world through literature.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III (Semester V)**

Name of the Paper: **Literatures in English (Paper-X)**

Semester: V

CREDITS: 04 60 LECTURES

I) General Topics: (Credit: 01) Lectures (15)

1. Characteristic Features of the Russian Literature with reference to the Novel prescribed

2. Characteristic Features of the 20th Century Dramas with reference to the work prescribed.

II) Novel (Credit: 01) Lectures (15)

Leo Tolstoy**:** ***War and Peace*** (Fingerprint Publishing, 2015)

III) Drama (Credit: 01) Lectures (15)

Tennessee Williams**:** ***The Streetcar Named Desire*** (Delhi Open Books, 2019)

IV) Poems: (Credit: 01) Lectures (15)

1. Pablo Neruda: ***If You Forget Me.***
2. Amrita Pritam: ***The Will***
3. Louise Gluck: ***The Wild Iris***
4. Max Ehrmann: ***Desiderata***
5. Czeslaw Milosz: ***Account***
6. Edgar Allen Poe: ***A Dream within a Dream***
7. Li Po: ***Drinking Alone in the Moonlight***

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Literatures in English (Paper-XV)**

Semester: VI

CREDITS: 04 60 LECTURES

I) Survey Topics: (Credit: 01) Lectures (15)

1. Characteristic Features of Afro-American drama

2. A Psychological Thriller

II) Novel: (Credit: 01) Lectures (15)

Paula Hawkins: ***The Girl on the Train*** (Random House Publishing, 2015)

III) Drama: (Credit: 01) Lectures (15)

Lorraine Hansberry: **A Raisin in the Sun.** (Vintage: Reprint, Reissue Edition,2004)

IV) Short Story: **(**Credit: 01) Lectures (15)

1. William Somerset Maugham: ***The Luncheon***

2. Guy de Maupassant: ***The Necklace***

3. Sudha Murthy: ***How I Taught My Grandmother to Read***

4. Franz Kafka: ***Wedding Preparation in the Country***

5. Maxim Gorky: ***Twenty-Six Men and a Girl***

List of References:

1. Andrews, W., F. Foster and T. Harris (eds).*The Oxford Companion to African American Literature*. Oxford, 1997.
2. Gilyard, K., and A. Wardi. *African American Literature*. Penguin, 2004.
3. Peterson, Carla (1995). *Doers of the Word: African-American Women Speakers and Writers in the North (1830–1880)*. New York: Oxford University Press.
4. Bennett, Michael Y. *The Cambridge Introduction to Theatre and Literature of the Absurd.* Cambridge: Cambridge University Press, 2015.
5. Esslin, Martin. Essay: "The Theatre of the Absurd". *The Tulane Drama Review*, Vol. 4, No. 4 (May, 1960), Publisher: MIT Press.
6. Terras, Victor (1985). *Handbook of Russian Literature*. New Haven, CT: Yale University Press
7. Bhabha, Homi K. (1994): *The Location of Culture.* Routledge, London and New York. Print.
8. Stone, Jonathan (2013). *Historical Dictionary of Russian Literature*. Rowman & Littlefield
9. Davies, Carole Boyce, and Anne Adams Graves. eds. *Ngambika: Studies of Women in African Literature*. Trenton: African World P, 1986.
10. Fanon, Frantz. *The Wretched of the Earth.* Trans. Constance Farrington. Middlesex: Penguin, 1967.
11. Gilbert, Helen (2001): *Introduction to Pantomime by Derek Walcott in): Postcolonial Anthology: An Anthology*. Routledge Chapman & Hall, London, 128-131. Print
12. Nayar, Pramod K. (2008): *Postcolonial Literature: An Introduction*. Pearson
    a. Longman, New Delhi, India. Print.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper**: Literatures in English**

Semester: V & VI

(2021-2022, 2022-2023 & 2023-2024)

(CBCS Semester Pattern Syllabus *w.e.f*. June, 2021)

Semester	Paper No	Title of the Paper	No. of Lectures (Theory)	College Assessment (Marks)	University Assessment (Marks)	Total Marks	Credits
V & VI	X & XV	Literatures in English	60	10	40	50	100

Question Paper Pattern

Name of the Course: B. A. Part III

Name of the Paper**: Literatures in English**

SEM- V & VI

Que.1 Rewrite the following sentences by choosing the correct alternative. 08 Marks

(Novel, Drama & Poetry)

Que. 2 Write the answers in short. (Any Four out Six) 12 Marks

(Survey Topics, Poems & Short Stories)

Que.3 Broad question (any one) 10 Marks

(Drama)

Que. 4 Broad question. 10 Marks

(Novel)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part - III

Name of the Paper: Introduction to the Structure and Function of Modern English

Paper No. – XI & XVI

Semester: V & VI

With effect from June-2021-22, 2022-23 & 2023-24

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course**: B. A. (English) Part-III**

Name of the Paper**: Introduction to the Structure and Function of Modern English (Paper-XI)**

Semester: V

Preamble:

The paper, as its name suggests, introduces the students to various structures of modern English and their functions. It familiarizes them with the inter-relations of the units in a structure. It aims to help them frame and analyse structures and use appropriate words and expressions to convey various meanings.

Objectives:

- To acquaint the students with the classification of words
- To acquaint them with the structures and functions of phrases, and enable them to analyse phrases
- To acquaint them with the elements of clause
- To acquaint them with the active and passive clause patterns
- To introduce them to a few communicative concepts

Course Outcomes:

By the end of the course, the students will be able to:

- Identify the class of words
- Know the structure and function(s) of phrases and analyse them
- Identify clause elements
- Construct sentences using basic clause patterns
- Use appropriate words and expressions to communicate the prescribed concepts

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

(Paper-XI)

Semester: V

CREDITS: 04 60 LECTURES

Teaching Components:

1. Unit No: 1: Words **(Credit: 01)** **(Lectures: 15)**

1.1 Open and closed word classes

1.2 Analysis of open and closed word classes

2. Unit No. 2: Phrases **(Credit: 01)** **(Lectures: 15)**

2.1 Main Phrase and Subordinate Phrase

2.2 Classes of Phrase: NP, PP, GP, AjP, AvP and VP.

2.3 Analysis of Phrases

3. Unit No. 3 Clauses **(Credit: 01)** **(Lectures: 15)**

3.1 Elements of Clause

3.2 Classification of Clauses—Subordinate and Main Clauses

3.3 Subordinate Clause and its types

3.4 Finite (Tensed), Non-finite Tenseless and Verbless Subordinate Clauses

3.5 Types of Main Clause: Declarative Clause, Interrogative Clause, and Imperative Clauses

3.6 Active and passive Clauses

3.7 Basic Clause Patterns

4. Unit No. 4: Communicative Concepts **(Credit: 01)** **(Lectures: 15)**

4.1 Statements, Questions and Responses

4.2 Denial and Affirmation

4.3 Agreement and Disagreement

4.4 Degrees of Likelihood

Books Recommended:

1. Leech, Geoffrey, Margaret Deuchar and Robert Hoogenraad. *English Grammar for Today*. London: Palgrave, 1982.
2. Quirk, Randolph and Sidney Greenbaum. *A University Grammar of English*. Hong Kong: Longman, 1993.
3. Greenbaum, Sidney and Randolph Quirk. *A Student's Grammar of the English Language*. New Delhi: Pearson Education, 2009.
4. Greenbaum, Sidney. *Oxford English Grammar*. New Delhi: OUP, 2009.
5. Leech, Geoffrey, and Jan Svartvik. *A Communicative Grammar of English*. Delhi: Longman, 2002.

Question Paper Pattern

Name of the Course**: B. A. Part III**

Name of the Paper**: Introduction to the Structure and Function of Modern English**

Semester: V (Paper No. XI)

Time: Marks: 40

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks

Q.1. Choose the correct alternative. 10 Marks

(Ten multiple type questions will be set on all the topics)

Q.2. Answer any five of the following in brief. 10 Marks

(Six questions will be set on the topic *Words*)

Q.3. A) Answer any two of the following questions in brief. 06 Marks

(Three questions will be set on the topic *Communicative Concepts*)

Q.3.B) Answer any two of the following in brief. 04 Marks

(Three questions will be set on the topic *Phrases*)

Q. 4. Answer *any one* of the following questions. 10 Marks

(Two broad answer type questions will be set on the topic *Clauses*)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

(Paper-XVI)

Semester: VI

(Credits: 04) (Total lectures: 60)

Preamble:

The paper, as its name suggests, introduces the students to various structures of modern English and their functions. It familiarizes them with the inter-relations of the units in a structure. Moreover, it makes them realize how language varies according to the medium in which it is put, the relationship or the relative distance between the addresser and the addressee(s), and the function it fulfils in communication. It aims to help them use correct structures, and use appropriate words and expressions to convey various meanings.

Objectives:

- To acquaint the students with the classification of sentence
- To acquaint them with the processes of subordination and coordination
- To acquaint them with the structures and functions of subordinate clauses
- To introduce them to the basic and derived structures
- To introduce them to discourse analysis with reference to mode, tenor and domain
- To introduce them to a few more communicative concepts other than the ones prescribed in the preceding semester

Course Outcomes:

By the end of the course the students will be able to:

- Identify the simple and complex sentences
- Know the difference between subordination and coordination
- Derive structures from the basic ones
- Analyse a discourse with reference to its mode, tenor and domain
- Use appropriate words and expressions to communicate.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

(Paper-XVI)

Semester: VI

CREDITS: 04 60 LECTURES

Teaching Components:

Unit No.1: Subordination and Coordination **(Credit: 01) (Lectures: 15)**

1.1 Kinds of Sentences: Simple and Complex
1.2 Subordinate Clauses (SCls)
1.2.1 Structure of Subordinate Clauses
1.2.2 Functions of Subordinate Clauses
1.3 Classification of Subordinate Clauses: Finite (Tensed) and Non-finite (Tenseless)
1.4 Kinds of Subordinate Clauses: Noun Clauses, Adverbial Clauses, Relative Clauses, Comparative Clauses, and Prepositional Clauses
1.5 Subordination: Direct and Indirect
1.6 Coordination

Unit No. 2: Basic and Derived Structures **(Credit: 01) (Lectures: 15)**

2.1 Basic and Derived Structures
2.2 'Missing' Elements
2.3 Split Constituents
2.4 Double Analysis
2.5 Style and Structure-changing Rules

Unit No. 3: Discourse Analysis **(Credit: 01) (Lectures: 15)**

3.1 Dimensions of Discourse: Mode, Tenor, and Domain
3.2 Mode: Speech and Writing
3.2.1 Speech and Writing: Which Comes First?
3.2.2 Functions of Writing and Speech
3.2.3 The Form of Speech and Writing
3.2.4 Linguistic Characteristics of Speech and Writing
3.2.5 An analysis of Spoken and Written Discourse
3.3 Tenor
3.3.1 Tenor and Discourse
3.4 Domain
3.4.1 Domain and Discourse

Unit No. 4: Communicative Concepts **(Credit: 01) (Lectures: 15)**

4.1 Describing Emotions
4.2 Friendly Communications
4.3 Permission and Obligation
4.4 Influencing People

Books Recommended:

1. Leech, Geoffrey, Margaret Deuchar and Robert Hoogenraad. *English Grammar for Today*. London: Palgrave, 1982.
2. Quirk, Randolph and Sidney Greenbaum. *A University Grammar of English*. Hong Kong: Longman, 1993.
3. Greenbaum, Sidney and Randolph Quirk. *A Student's Grammar of the English Language*. New Delhi: Pearson Education, 2009.
4. Greenbaum, Sidney. *Oxford English Grammar*. New Delhi: OUP, 2009.
5. Leech, Geoffrey, and Jan Svartvik. *A Communicative Grammar of English*. Delhi: Longman, 2002.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper**: Introduction to the Structure and Function of Modern English**

Semester V & VI

(2021-2022, 2022-2023 & 2023-2024)

(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

Sem.	P-No	Title of the Paper	No. of Lectures	C A Marks	UA marks	Total marks	Credits
VI	XI & XVI	Introduction to the Structure and Function of Modern English	60	10	40	50	04

C A: College Assessment
U A: University Assessment

Question Paper Pattern

Name of the Course**: B. A. Part III**

Paper No. XVI: Introduction to the Structure and Function of Modern English

Semester: VI

Time: Marks: 40

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks

Q.1. Choose the correct alternative. 10 Marks

(Ten multiple type questions will be set on all the topics)

Q.2. Answer any five of the following in brief. 10 Marks

(Six questions will be set on the topic *Basic and Derived Structures)*)

Q.3. A) Answer any two of the following questions in brief. 06 Marks

(Three questions will be set on the topic *Communicative Concepts*)

Q.3. B) Give form and function labels to any two of the underlined clauses in the given sentences. 04 Marks

(Three questions will be set on the topic *Subordination and Coordination*)

Q.4. Analyse any one of the given discourses with reference to its mode, tenor and domain supporting with at least two examples of each from it. 10 Marks

(Two examples of discourse – one written and the other spoken based on the topic *Discourse Analysis* will be given.)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Humanities

Name of the Course: B. A. (English) Part - III

Name of the Paper: Content Writing and Editing in English Language

(Skill Development Course)

With effect from June-2021-22, 2022-23 & 2023-24

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language**

(Skill Development Course)

Preamble:

In this course, the students will study how to write and edit content in English. The course will examine different types of content writing. Consistent, engaging, and high-quality **content** impacts the audience more than any other technique. **Content writing** allows your brand to create cohesive pieces of information. Consistency, especially in brand messaging, is one of the significant factors to determine the growth and success of your business. An editor will find himself planning, coordinating and editing material for publication at newspaper, magazine, publishing house or other organization This course offers writing and editing skills to train "aspiring-content writers and editors.

Objectives of the Course:

1. The course aims to inculcate content writing and content editing skills among the students.
2. This course can also be beneficial to the existing content writers in honing their skills.

Course Outcome:

1. Content writing is considered a highly skilled area and presents opportunity for a full time/part time career.
2. Students will be able to write and edit content.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language (Skill Development Course)**

[Credits:04 Theory-(45), Practical-(15)]

Total Theory Lectures-(45) **Total Credits – (04)**

Unit No: 1 Introduction to Content Writing and Editing **(**Credit: 01) **(15)**

Unit No: 2 Structuring and Writing Quality Content (Credit: 01) **(15)**

Unit No: 3 Copy Writing, Sales, Advertising and Promotion. (Credit: 01) **(15)**

Unit No: 4 Digital Content Writing (Credit: 01) **(15)**

Course Structure:

Semester	Paper No.	Title of Paper	No. of Lectures	College Assessments (Marks)	University Assessments (Marks)	Total Marks	Credits
		CONTENT WRITING AND EDITING IN ENGLISH	60	20	80	100	04

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language**

(Skill Development Course)

Unit: I Introduction to Content Writing and Editing

- Origin and need of content writing
- Career in content writing
- Types of content writings
- The Concept of Content Marketing
- Difference between Academic and Content Writing.

Unit: II Structuring and Writing Quality Content

- Brainstorming and Collection of Material
- Proof Reading Techniques
- How to Structure a Book and ensure Content Quality?
- Documentation and Formatting

Unit: III Copy Writing, Sales, Advertising and Promotion.

- Writing Newsletters, Product Descriptions and Press Releases
- Importance of Page Layout and Text Outline
- Effective Writing Techniques
- Writing Articles
- Mistakes to Avoid

Unit: **IV** – **Digital Content Writing**

- Video scripts
- Email newsletters
- Keynote speeches
- Social media posts
- Podcast titles
- Web page copy
- YouTube video descriptions
- Blog

List of References:

1. A. Z. Gill, Content Writing: A helpful Guide,

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Chemistry

Name of the Course: B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

PAH Solapur University, Solapur

Faculty of Science and technology -New Choice Based Credit System (CBCS)- (w.e.f.2021-22)

Draft Structure for B. Sc-III Chemistry

Subject / Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)	**English (Business English)**		Paper- III	4.0	--	--	100	80	20	4.0
Discipline Specific Elective (DSE) (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.)	**DSE-1A-Physical Chemistry**		Paper- IX	3	--	--	100	80	20	4.0
	DSE- 2 A-Inorganic Chemistry		Paper -X	3	--	--	100	80	20	4.0
	DSE- 3 A-Organic Chemistry		Paper- XI	3	--	--	100	80	20	4.0
	ANY ONE from DSE-4A(I) & 4A(II)		Paper- XII	3	--	--	100	80	20	4.0
	DSE-4 A(I)-Analytical and Industrial Physical Chemistry									
	DSE-4 A(II)-Methodology and materials of industrial importance									
	(Add-on-self learning)- MOOC/SWAYAM COURSE/INTERNSHIP/INDUSTRAIL TRAINING/ Courses offered* by College			--	--	--	--	--	--	4.0
Grand Total				**16**	**-**	**--**	**500**	**400**	**100**	**24**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)	**English (Business English)**		Paper IV	4.0	--	--	100	80	20	4.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.	**DSE- 1B-Physical Chemistry**		Paper - XIII	3.0	-	--	100	80	20	4.0
	DSE- 2B-Inorganic Chemistry		Paper- XIV	3.0	--	--	100	80	20	4.0
	DSE- 3B-Organic Chemistry		Paper- XV	3.0	--	--	100	80	20	4.0
	ANY ONE from DSE-4B(I) & 4B(II)		Paper- XVI	3.0	--	--	100	80	20	4.0
	DSE 4B(I)- Analytical and Industrial Organic Chemistry									
	DSE 4B(II)-Applied Organic Chemistry									
	SEC-									
Total (Theory)				**16**	**-**	**--**	**500**	**400**	**100**	**20**
DSE - Practical (Annual Exam)	**DSE- 1 A&B**		Practical- IX & XIII	--	--	5	100	80	20	4.0
	DSE -2 A&B		Practical- X&XIV	--	--	5	100	80	20	4.0
	DSE- 3 A&B		Practical- XI&XV			5	100	80	20	4.0
	DSE- 4 A& B		Practical- XII & XVI			5	100	80	20	4.0
Total (Practicals)						**20**	**400**	**320**	**80**	**16**
Grand Total				**32**		**20**	**1400**	**1120**	**280**	**60**

* Add on College course List should be submitted to the University for Information

General Structure

Theory Examination:

- Structure of B.Sc. course under faculty of science has total 06 semesters for 3years.
- B.Sc.-III comprises of total two semesters (Sem-V andSem-VI).
  Each semester will have Five theory papers (one compulsory English and four Chemistry papers) of 80 marks each (University external examination) and 20 marks for each paper (Internal examination)
  The duration of each University theory paper examination will be of 2 hr. and 30 min.
  Each theory paper has 20 marks for internal examination. There will be 10 marks unit test and 10 marks home assignment
- At the end of academic year i.e. semester - VI the practical examination will be conducted. The weightageofpracticalisof280marksforUniversityexternalpracticalexaminationand 120 i.e (30*4) marks for internal practicalexamination.

There will be Four theory papers in chemistry of 80 marks for each semester. Their titles and marks distribution are as under (Excluding English).

B Sc –III Sem-V

DSE-1A-Physical Chemistry
DSE- 2 A-Inorganic Chemistry
DSE- 3 A-Organic Chemistry
DSE 4 A(I)- Analytical and Industrial Physical Chemistry **OR** DSE-4 A(II)- Methodology and materials of industrial importance

B Sc- III Sem-VI

DSE- 1B-Physical Chemistry
DSE- 2 B-Inorganic Chemistry
DSE- 3 B-Organic Chemistry
DSE 4B(I)- Analytical and Industrial Organic Chemistry **OR**DSE-4B(II) Applied Organic Chemistry

Practical Course

Practical Examination will be held at the end of the year.

A) Distribution of marks :

- **Continuous Internal Assessment forchemistry**:

1) Practical paper has 20*4=80 marks for internalexamination.
2) Practical paper has 320 marks for external university practicalexamination.
   There will be three practicals, one from each Physical, Inorganic and Organic practical work.
3) The mark distribution of 320 marks for external university practical examination is as follows.

Q. 1 Physical Chemistryexperiment : 105 marks
Q. 2 InorganicChemistryexperiment : 110marks
Q. 3 OrganicChemistryexperiment : 105 marks

Total marks: 320 marks

Duration of practical examination is three days, six and half hours per day
All answer sheets should be collected at the end of examination.

Practical Marks Distribution

- **Physical Chemistry experiment: 105 marks**

a) **Instrumental 40**
b) **Non-instrumental** 45
c) **Journal 10**
d) **Oral : 10**

- **Inorganic Chemistry experiment: 110marks**

a) **Gravimetric analysis : 40**
b) **Volumetric analysis 30**
c) **Preparation 20**
d) **Journal 10**
e) **Oral 10**

- **Organic Chemistry experiment: 105 marks**

a) **Organic Mixture Separation and analysis: 40**

b) **Volumetric analysis : 35**

OR

b) **Preparation 35**
c) **Derivative 10**
d) **Journal 10**
e) **Oral 10**

Theory

N. B.

i.)Figuresshowninbracketindicatesthetotalnumberofcontacthoursrequiredforthe respectivetopics

ii) The question paper should cover the entire syllabus. Marks allotted should be in proportion to the number of contact hours allotted to respectivetopics.

iii) All topics should be dealt with S.Iunits.

iv) Use of scientific calculator isallowed.

v) Industrial tour isprescribed.

vi) Values required for spectral problems should be provided in the questionpaper.

SEMESTER –V

PAPER-IX:DSE-1A

PHYSICAL CHEMISTRY

Total Credits:4
Contact hrs: 60

1. Introduction to Quantum Mechanics **[10]**

1.1 Introduction
1.2 Failures of classical mechanics, origin of quantum mechanics
1.3 Black body radiation, Stefan-Boltzmann law
1.4 Planck's quantum theory of black body radiation distribution
1.5 Photoelectric effect, explanation on the basis of quantum theory
1.6 Compton effect
1.7 De-Broglie hypothesis
1.8 Heisenberg's uncertainty principle (statement explanation)
1.9 Schrodinger wave equation- (Derivation not expected)
1.10 Physical significance of wave function ψ and ψ^2

2. Phase Equilibria. **[10]**

2.1 Introduction
2.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in theequation.
2.3 Phase diagram, true and metastableequilibria.
2.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism.
2.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisationof lead (ii) Formation of compound with congruent melting point ($FeCl_3$ - H_2O)

3. Electromotive force. **[25]**

(Convention : Reduction potentials to be used)

3.1 Introduction
3.2Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms ofactivities.
3.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emfequationfor,
i) Metal - metal ion electrode. ii) Amalgamelectrode.
iii) Metal - insoluble salt electrode. iv) Gas -electrode.
v) Oxidation - Reductionelectrode.
3.4 i) Reversible and Irreversiblecells.
ii) Chemical cells withouttransference.
iii) Concentrationcells
a. Electrode concentrationcell
I) Reversible tocation
II) Reversible toanion
b. Electrolyte concentration cells withouttransference
3.5 Equilibrium constant from cell emf, determination of the thermodynamic parameters such as ΔG, ΔH andΔS.
3.6 Applications of emf measurements:
i) Determination of pH of solution using Hydrogenelectrode.
ii) Solubility and solubility product of sparingly soluble salts (based on concentrationcell).
3.7 Numericalproblems.

4. Photochemistry. **[15]**

4.1 Introduction

4.2 Difference between thermal and photochemicalprocesses.

4.3 Laws of photochemistry :Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark – Einsteinlaw.

4.4 Quantum yield, Reasons for high quantum yield (e.g. H_2 - Cl_2) and low quantum yield. (e.g. Decomposition of HI andHBr).

4.5 Photosensitized reactions - Dissociation of H_2,Photosynthesis.

4.6 Photodimerisationofanthracene.

4.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence andphosphorescence.

4.8 Chemiluminescence.

4.9 Numericalproblems.

Reference Books:

1. Physical Chemistry by G. M. Barrow, International student Edition, Mc GrawHill.
2. University General Chemistry by C.N.R. Rao,Macmillan.
3. Physical Chemistry by, R. A. Alberty, Wiley EasternLtd.
4. The Elements of Physical Chemistry by P. W. Atkins,Oxford.
5. Principles of Physical Chemistry by S. H. Maron, C. H. Prutton, 4thEdition.
6. Fundamentals of Photochemistry by K.K.Rohatgi-Mukerjee.
7. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
8. Text Book of Physical Chemistry by S. Glasstone, Macmillan IndiaLtd.
9. Elements of Physical Chemistry by D. Lewis and S. Glassture(Macmillan).
10. Principles of Physical Chemistry by Maron and Lando(Amerind).
11. An Introduction to Electrochemistry by S.Glasstone.
12. Physical Chemistry by W. J.Moore.
13. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).
14. Quantum Chemistry: R. K. Prasad
15. Quantum Chemistry: D. A. MacQuerrey

PAPER –X:DSE-2A
INORGANIC CHEMISTRY

Total Credits: 04
Contact hrs: 60

1. Metal Ligand Bonding in TransitionMetalComplexes : [18]

A) **Crystal Field Theory(CFT).**

1.A.1) Introduction - What is CFT?

1.A.2) Basic concept ofCFT.

1.A.3) Formation of complexes with Crystal field splitting of 'd'orbitals

i. Shapes of d orbitals and their electron densityregion

ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): [CoF6] $^{3-}$, $[Co(NH_3)_6]^{3+}$.

iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g.$[CoCl_4]^{2-}$

iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co\ (CN)_4]^{2-}$

1.A.4. Jahn–Tellardistortion.

1.A.5. Factors affecting the Crystal - fieldsplitting.

1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only.

1.A.7. Applications and limitations ofCFT.

B) Molecular Orbital Theory(MOT).

1.B.1. Introduction.

1.B.2. Basicconcept

1.B.3. Symmetry classes of atomicorbitals

1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedralcomplex.

1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$, $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$,$[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$

1.B.6. Applications and limitations ofMOT.

1.B.7. Comparison between CFT andMOT.

2. NuclearChemistry: [14]

2.1. Nuclear reaction and energetics of nuclearreactions.

2.2. Classification of nuclear reactions and Types of nuclearreactions:

i) Artificialtransmutation.

ii) Artificialradioactivity.

iii) Projectile capturereaction.

iv) Projectile capture - particle emissionreaction.

v) Nuclearfission.

vi) Nuclearfusion.

2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb.

2.4. Applications of radioisotopes astracers.

i) Chemical investigation -Esterification.

ii) Structural determination - Phosphoruspentachloride.

iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood.

iv) Age determination - Dating by ^{14}C.

3. BioinorganicChemistry: [10]

3.1. Essential and trace elements in biologicalprocess.

i) Essential elements a) Macro / major elements b) Micro/trace/minor elements

ii) Non-essentialelements

3.2. Metalloporphyrins with special reference to haemoglobin andmyoglobin.

i) Structure of Haemoglobin(Hb)

ii) Structure of Myoglobin(Mb)

iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs totissues

iv) Function of Haemoglobin as Carry back CO_2tolungs

v) Co-operativity

vi) Oxygen binding curve

vii) Difference between Haemoglobin (Hb) and Myoglobin(Mb)

3.3. Role of alkali and alkaline earth metal ions with special reference to Na^+ , K^+ and$Ca^{2+.}$

i) Role of Na^+andK^+

ii) Role of Ca^{2+}.

4. Catalysis [10]

4.1. Introduction

4.2. Classification of catalytic reactions : Homogeneous &Heterogeneous

4.3. Types of catalysis

4.4. Characteristics of catalyticreactions

4.5. Mechanism of catalysis:

i) Intermediate compoundtheory

ii) Adsorptiontheory.

4.6. Industrial Applications ofCatalysis.

5. Fertilizers [08]

5.1. Nutrient Functions in plant growth:

Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency.

5.2. Definition and qualities of an idealfertilizers:

5.3. Classification or types offertilizers:

5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammoniumphosphate.

5.5. Mixed fertilizers, Compound or complexfertilizers.

5.6. Pollution caused byfertilizers:

Reference Books:

1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D.Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H.LangFord,Oxford University Press, 2ndEdition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper andRow.
4. Basic Inorganic Chemistry : Cotton andWilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton andWilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wileypublication.
7. Fundamental concepts of Inorganic Chemistry by E. S.Gilreath.
8. Structural principles in inorganic compounds. W. E.Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S.Manku.
11. Theoretical Inorganic Chemistry by Day andSelbine.
12. Co-ordination compounds S F AKettle.
13. Modern Aspects of Inorganic Chemistry. E.Sharpe.
14. New guide to Modern Valence Theory by G. I.Brown.
15. Essentials of Nuclear Chemistry by H. J.Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. NewDelhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman -Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. PitampurDelhi.
19. Text book of Inorganic Chemistry by K. N. UpadhyayaVikas Publishing House – NewDelhi.
20. Progress in inorganic polymer by LaportandLeigh.
21. Co-ordination compounds by BaseloandPearson.
22. Advancedinorganicchemistry,Vol.IandIISatyaprakash,G.D.Tuli,S.K.Basuand Madan (SChand)
23. Selected Topics in inorganic chemistry by W U Malic, G. D. Tuli, R. D. Madan. (S.Chand)
24. Industial chemistry part I and II by A. K.De
25. Industrial Chemistry, By – B K Sharma, Goel Publishing House 16th Edition: Topic No 26, Page No. 762 to 808

Paper – XI: DSE-3A
Organic Chemistry

Total Credits: 4
Contact hrs: 60

1 SpectroscopicMethods. **30**

[10]

1.1. Infrared Spectroscopy

1.1.1 Introduction.
1.1.2 Principle of IRspectroscopy.
1.1.3 Double beam IR spectrophotometer- Schematicdiagram.
1.1.4 Fundamental modes ofvibrations.
1.1.5 Types ofvibrations.
1.1.6 Hooke'slaw.
1.1.7 Factors affecting values of vibrationalfrequencies.
1.1.8 Conditions for absorption of radiation and selectionrule.
1.1.9 Fundamental group regions of IRspectrum.
1.1.10 Functional group region, Finger print region, Aromaticregion.
1.1.11 Characteristic absorption of various functionalgroups.
1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups, spectral problems based onIR.

1.2 NMRSpectroscopy **[12]**

1.2.1 Introduction.
1.2.2. Proton magnetic resonance (^{1}H) spectroscopy (PMR).
1.2.3 Principles of PMRspectroscopy.
1.2.4 Magnetic and non-magneticnuclei.
1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance.
1.2.6 NMR - Instrument. Schematic diagram.
1.2.7. Shielding and deshieldingeffect.
1.2.8. Chemical shift, measurement of chemical shift by delta scale and tauscale.
1.2.9. TMS as reference. Advantages ofTMS.
1.2.10. Peak area(integration).
1.2.11. Spin - spin splitting (n + 1rule).
1.2.12. Definition of coupling constant (J value) of first ordercoupling.
1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone, benzaldehyde, propanoic acid and benzoicacid.
1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to begiven).

1.3 Mass spectroscopy **[08]**

1.3.1 Introduction.
1.3.2 Theory of massspectroscopy
1.3.3 Mass spectrometer - schematicdiagram
1.3.4 Formation of ions byionization
1.3.5 Types of ions withexamples.
1.3.6. Applications of massspectroscopy.
i) Determination of molecularweight.
ii) Determination of molecularformula.

2. Stereochemistry **[10]**

2.1 Introduction.
2.2 Baeyer's straintheory.
2.3 Theory of strainlessrings.
2.4 Conformation and stability of cyclohexane and monosubstitutedcyclohexanes– methylcyclohexane.
2.5 Locking of conformation in t-butylcyclohexane.
2.6 Stereoselective and stereospecific reactions:
i) Stereochemistry of addition of halogens to alkenes:syn and anti-addition. Example - Addition of bromine to 2-butene. (mechanism notexpected)
ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol (Example of SN^2reaction)

3. Name reactions **[10]**

Mechanism and applications of following reactions:
3.1 Stobbecondensation.
3.2 Oppenaueroxidation.
3.3 MeerweinPonndorfVerleyreduction.
3.4 Reformatskyreaction.
3.5 Wagner –MeerweinRearrangement.
3.6 Hofmann rearrangement reaction.
3.7 Wittigreaction.
3.8 Relatedproblems.

4. Organic synthesisviaEnolates **[10]**

4.1 Introduction - Reactive methylenegroup.
4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocycliccompound.
4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic acid, α- β- unsaturated acid, α-amino acid and heterocycliccompound.

Reference Books:

1) Organic Chemistry: D. J. Cram and G. S. Hammond, McGraw Hill book Company, New York.
2) Organic Chemistry: I. L. Finar, The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry: Peter Sykes, Longman Green and Co. Ltd. London 6thEdition.
4) Organic Chemistry: R. T. Morrison and R. N. Boyd, Prentice Hall of India Private Limited, New Delhi. 6thEdition.
5) Text book of organic Chemistry: L. N. Ferguson, N. D. Van Nostrand Company Indian Edition, Affiliated East west press private Ltd. NewDelhi.
6) Organic Chemistry Vol. I, II and III: S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Eastern, Limited, NewDelhi.
7) A text book of organic Chemistry: K. S. Tewari, S. N. Mehrotra, N.K. VishnoiVikas Publishing House Private Ltd. NewDelhi.
8) A text book of Organic Chemistry: ArunBahl and B. S. Bahl , S.Chand and Company Ltd. 6thEdition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism: Raj K. Bansal, Wiley Easter Ltd., NewDelhi.
10) Reaction Mechanism and Reagents in Organic Chemistry: G. R. Chatwal, Himalaya Publishing House, NewDelhi.
11) Stereochemistry conformation and mechanism: P. S. Kalsi, New Age International Publishers, 4th Edition.
12) Organic Chemistry Volume I and II: I. L. Finar ELBS with Longman 6thEdition.
13) Organic Chemistry Volume I and II : William Kemp, ELBS withMc. Million 3rdEdition.
14) Advanced Organic Chemistry: Jerry March, Wiley EasternLtd.
15) Spectroscopy of Organic compounds: P. S.Kalsi.

16) Modern Methods of Organic Synthesis, W Carruthers, IaonColdhalm, Cambridge UniversityPress
17) Organic Chemistry: Fieser andFieser.
18) Principles of Organic Chemistry: English andCassidy.
19) Elementary Organic Absorption Spectroscopy: Y. R.Sharma.
20) Spectroscopy: V. M.Parikh.
21) Stereochemistry of Carbon Chemistry: Eliel.
22) Principles of Organic Chemistry: M. K.Jain.
23) Organic Chemistry by Clayden, Greeves, Warren and WothersOxford press.
24) Organic Chemistry: A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical ScienceSeries.
25) Reactions, Rearrangements and reagents: S.N.Sanyl, BharatiBhawan publishers and DistributorsPatna.

PAPER-XII : DSE-4A(I)
ANALYTICAL AND INDUSTRIAL PHYSICAL CHEMISTRY

Total Credits: 4
Contact hrs: 60

1. Colorimetry. **[10]**

1.1 Introduction

1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer'slaw.

1.3Classification of methods of color measurement or comparison, Photoelectric photometer method - single cell photo-electriccolorimeter.

2. Potentiometry **[12]**

2.1 Introduction.

2.2 Detail study of calomel, quinhydrone and glass electrodes and their use in determination of pH.

2.3 Basic circuit diagram of direct readingpotentiometer

2.4 Potentiometric titrations : Classical and analytical methods for locating endpoints,

i) Acid - Basetitrations.

ii) Redox - titrations.

iii) Precipitationtitrations.

2.5 Advantages of potentiometrictitrations.

3 Electroplating **[14]**

3.1 Introduction.

3.2 Electrolysis, Faraday's laws, Cathode currentefficiency.

3.3 Basic principles of electroplating, cleaning ofarticles.

3.4 Electroplating of Nickel andChromium.

3.5 Anodising.

4 Flame photometry **[12]**

4.1 Generalprinciples.

4.2 Instrumentation : Block diagram,
Burners: Total consumption burner, premix or laminar-flow burner and Lundergraph burner,
Mirrors,
Slits,
Monochromators,
Filters
Detectors.

4.3 Applications in qualitative and quantitativeanalysis.

4.4 Limitations of flamephotometry.

5. Conductometry: **[12]**

5.1 Basic circuit of D.C. Wheatstone bridge, Measurement of conductance by Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molarconductance.

5.2 Conductometric acid-basetitrations

i. Strong acid against strongbase
ii. Strong acid against weak base
iii. Weak acid against strongbase.
iv. Weak acid against weakbase.

5.3 Advantages of conductometrictitrations

Reference Books :

1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rdEdition).
2. Instrumental methods of Chemical analysis by Willard, Merit andDean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (HimalayaPublication).
4. Principles of electroplating and eletroforming by Blum andHogaboom, Mac Graw - Hill Book Co. 3rdEdn.
5. Vogel's text book of Quantitative Inorganic Analysis by Basssett and Denny etc. ELBS and Longman 4thEdition.
6. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
7. Text Book of Physical Chemistry by S. Glasstone, McMillan IndiaLtd.
8. Elements of Physical Chemistry by D. Lewis and S. Glasstone(McMillan).
9. Principles of Physical Chemistry by Maron and Lando(Amerind).
10. An Introduction to Electrochemistry by S.Glasstone.
11. Physical Chemistry by W. J.Moore.
12. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).

PAPER-XII : DSE-4A(II)
METHODOLOGY AND MATERIALS OF INDUSTRIAL IMPORTANCE

Total Credits: 4
Contact hrs: 60

1. DataAnalysis (15 Lectures)

1.1 The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design ofexperiments.
1.2 Analysis and Presentation of Data: Descriptive statistics. Choosing and using statisticaltests.
1.3 Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curvefitting, fitting of linear equations, simple linear cases, weighted linear case, analysis ofresiduals,
1.4 General polynomial fitting, linearizing transformations, exponential function fit, 'r' and its abuse.
1.5 Basic aspects of multiple linear regressionanalysis.

2. Chemical Safety and Ethical Handlingof Chemicals: (15 Lectures)

2.1 Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratoryventilation.
2.2 Safe storage and use of hazardouschemicals,
2.3 Procedure for working with substances that pose hazards, flammable or explosivehazards,
2.4 Procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratorychemicals,
2.5 Procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewersystem.
2.6 Incineration and transportation of hazardouschemicals.

3. Nanomaterials: (15 Lectures)

3.1 Overview of nanostructures and nanomaterials:classification.
3.2 Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensionalcontrol.
3.3 Carbon nanotubes and inorganicnanowires.
3.4 Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisicalnanomaterials,
3.5 Bionanocomposites.

4. Compositematerials: (15 Lectures)

4.1 Introduction,limitationsofconventionalengineeringmaterials,roleofmatrixincomposites,
4.2 Classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforcedcomposites.
4.3 Environmental effects oncomposites.
4.4 Applications ofcomposites.

Reference Books

1) Practical skills in chemistry, Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) 2nd Ed. Prentice-Hall, Harlow.
2) Data analysis for chemistry, Hibbert, D. B. & Gooding, J. J. (2006) Oxford University Press.
3) Errors of observation and their treatment, Topping, J. (1984).Fourth Ed., Chapman Hall, London.
4) Quantitative chemical analysis, Harris, D. C. 6th Ed., Freeman (2007) Chapters 3-5.
5) How to use Excel in analytical chemistry and in general scientific data Analysis, Levie, R. de, Cambridge Univ. Press (2001) 487 pages.
6) Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
7) Inorganic Solids: An introduction to concepts in solid-state structural Chemistry, Adam, D.M. John Wiley & Sons, 1974.
8) Introduction to Nanotechnology, Poole, C.P. & Owens, F.J. John Wiley & Sons, 2003.

SEMESTER-VI

PAPER-XIII:DSE-IB

PHYSICALCHEMISTRY

Total Credits: 4
Contact hrs:60

1. Spectroscopy. **[15]**

1.1 Introduction
1.2 Electromagnetic radiation.
1.3 Electromagnetic spectrum, Energy leveldiagram.
1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzmann distribution), determination of bond length; isotope effect. Interaction of radiation with rotatingmolecule.
1.5 Vibrational spectra of diatomic molecules: Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant,zero point energy. The Anharmonic oscillator, overtones and hot band. Interaction of radiation with vibrating molecules.
1.6 Raman spectroscopy: Introduction, Rayleigh scattering. Raman Scattering, classicaltheory of Raman effect and quantum theories of Raman effect. Polarization of light and the Raman effect. Mutual exclusion principle.
1.7 Numerical problems.

2. Solutions. **[15]**

2.1 Introduction
2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids.
2.3 Vapour pressure and boiling point diagrams of miscibleliquids.
Type I : Systems with intermediate total vapour pressure.
(i.e. System in which B.P. increases regularly - Zeotropic)
Type II : Systems with a maximum in the total vapour pressure.
(i.e. System with a B.P. minimum - Azeotropic)
Type III :Systems with a minimum in the total vapour pressure.
(i.e. System with a B.P. Maximum - Azeotropic)
Distillation of miscible liquid pairs.
2.4 Solubility of partially miscible liquids.
(i) Maximum solution temperature type : Phenol - watersystem.
(ii) Minimum solution temperature type :Triethyl amine - watersystem.
(iii) Maximum and minimum solution temperature type : Nicotine - watersystem.

3. Thermodynamics. **[15]**

3.1 Introduction
3.2 Free energy : Gibbs function (G) and Helmholtz function (A), Criteria for thermodynamic equilibrium andspontaneity.
3.3 Relation between G and H : Gibbs Helmholtzequation.
3.4 Phase equilibria :Clapeyron – Clausius equation.
3.5 Thermodynamic derivation of law of mass action, van't Hoff isotherm and isochore.
3.6 Fugacity and activityconcepts.
3.7 Numericalproblems.

4. Chemical Kinetics **[15]**

4.1 Introduction, simultaneous reactions such as opposing reactions, side reactions, consecutive reactions and chain reactions. [Derivations of rate Equations for these reactions are notexpected.]

4.2 Effect of temperature on the rate ofreaction.
1. Temperaturecoefficient
2. Arrheniusequation
3. Energy ofactivation

4.3 Theories of reaction rate:
1. Collision theoryand
2. Transition statetheory

4.4 Third order reaction with equal concentration of all reactants, their characteristics and examples
4.5 Numericalproblems.

Reference Books :

1. Principles of Physical Chemistry by Maron and Pruton 4th edition.
2. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
3. Text Book of Physical Chemistry by S. Glasstone, McMillan IndiaLtd.
4. Elements of Physical Chemistry by D. Lewis and S. Glasstone(McMillan).
5. Principles of Physical Chemistry by Maron and Lando(Amerind).
6. Thermodynamics for chemists by SGlasstone.
7. Physical Chemistry by W. J.Moore.
8. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).
9. Basic Chemical Thermodynamics by V V Rao(McMillan)
10. An introduction to chemical thermodynamics by R. R. Mishra and R. P.Rastogi.
11. Fundamentals of molecular spectroscopy by C. N. Banwell and McCash- Tata McGrawHill

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PAPER-XIV: DSE-2B
INORGANIC CHEMISTRY

Total Credits:04
Contact hrs:60

1) Study ofF-blockElements [15]

1.1 Lanthanides:-

I) Introduction
II) Electronicconfiguration
III) Occurrence
IV) Separation ofLanthanides
i) Bulk separationmethods
ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail)

1.2 Actinides:-

I) Introduction
II) Electronicconfiguration
III) General Methods of preparation–
a. Neutron-capture followed byβ-decay
b. Accelerated projectile bombardmentmethod
c. Heavy-ion bombardment method

2) MetalsandSemiconductors. [13]

2.1 Introduction.
2.2 Properties of metallicsolids.
2.3 Theories of bonding inmetal.
a) Free electrontheory.
b) Molecular orbital theory (Bandtheory).
2.4 Classification of solids as conductor, insulators and semiconductors on the basis of bandtheory.
2.5 Semiconductors:
a) Types of semiconductors - intrinsic and extrinsicsemiconductors.
b) Applications ofsemiconductors.
2.6 Superconductors:
a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_7$-x
b) Applications ofsuperconductors.

3) StructuralChemistry. [12]

3.1 Structural study of followingcompounds.
i) Diborane.
ii) Borazine.
iii) Xenon compounds → XeF_2, XeF_6, XeO_4 (w.r.t. VBTonly.)
3.2 Structural study of Oxides of Sulphur and Phosphorous:
i) Oxides of Sulphur : SO_2 andSO_3
ii) Oxides of Phosphorous : P_4O_6 andP_4O_{10}

4) CorrosionandPassivity. [12]

4.1 Corrosion:-

I. Introduction
II. Types ofcorrosion
III. Electrochemical theory ofcorrosion
IV. Factors affecting thecorrosion
i) Position of metal in emfseries.
ii) Purity ofmetal.
iii) Effect ofmoisture.
iv) Effect ofoxygen.
v) Hydrogen overvoltage.
V. Methods of protection of metals fromcorrosion.

4.2 Passivity:-

I. Definition.
II. Types ofpassivity.
III. Oxide filmtheory.
IV. Application ofpassivity.

5. OrganometallicChemistry. [08]

5.1 Introduction -Definition,
5.2 Nomenclature of organometalliccompounds.
5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be andAl.
5.4 Mononuclear carbonyl and nature of bonding in simple metalcarbonyls.

Reference Books :

1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D.Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford, Oxford University Press, 2ndEdition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper andRow.
4. Basic Inorganic Chemistry : Cotton andWilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton andWilkinson.
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7. Fundamental concepts of Inorganic Chemistry by E. S.Gilreath.
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9. T. B. of Inorganic analysis - A. I.Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S.Manku.
11. Theoretical Inorganic Chemistry by Day andSelbine.
12. Co-ordination compounds S F AKettle.
13. Modern Aspects of Inorganic Chemistry. E.Sharpe.
14. New guide to Modern Valence Theory by G. I.Brown.
15. Essentials of Nuclear Chemistry by H. J.Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman -Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. PitampurDelhi.
19. Text book of Inorganic Chemistry by K. N. UpadhyayaVikas Publishing House – NewDelhi.
20. Progress in inorganic polymer by LaportandLeigh.
21. Co-ordination compounds by BaseloandPearson.
22. Organometallic Chemistry by P. L.Pauson.
23. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan
24. Selected Topics in inorganic chemistry by W U Malik, G. D. Tuli, R. D.Madan. (S.Chand)
25. Industrial chemistry part I and II by A. K.De
26. Industrial chemistry by B. K.Sharma

Paper - XV:DSE-3B
Organic Chemistry

Total Credits:4
Contact hrs:60

1 Heterocycliccompounds **[13]**

1.1 Introduction andclassification
1.2 Pyrrole
1.2.1 Methods ofsynthesis
i) Fromacetylene
ii) Fromfuran
iii) Fromsuccinamide
1.2.2 Physicalproperties
1.2.3 Reactivity ofpyrrole
i) Basic character
ii) Acidiccharacter
iii) Electrophilic substitution with generalmechanism
1.2.4 Chemicalreactions
i) Reduction
ii) Oxidation
iii) Nitration
iv) Sulphonation
v) Halogenation
vi) Friedel Craft'sreaction
vii) Couplingreaction

1.3 Pyridine
1.3.1 Methods ofsynthesis
i) From acetylene and hydrogencyanide
ii) Frompiperidine
1.3.2 Physicalproperties
1.3.3 Chemicalreactions
i) Basic character
ii) Electrophilic substitution reactions : Nitration, Sulphonation andBromination
iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyllithium.
1.4 Quinoline
1.4.1 Synthesis - Skraup's synthesis
1.4.2 Physicalproperties.
1.4.3 Reactions ofquinoline
i) Electrophilic substitution reactions - Nitration andsulphonation.
ii) Nucleophilic substitution reactions – Reactions with sodamide, alkyl lithium and aryllithium
iii) Reduction

2. Carbohydrates **[12]**

2.1 Introduction
2.2 Classification andnomenclature
2.3 Monosaccharide D-glucose - Open chainstructure
2.4 Chain lengthening of Aldoses –Kilianisynthesis
2.5 Chain shortening of Aldoses - Weerman'sreaction
2.6 Interconversion of glucose andfructose
2.7 Configuration of D-glucose fromD-arabinose
2.8 Objections against open chain structure ofD-glucose.
2.9 Mutarotation withmechanism.
2.10 Ring structure of D-glucose - Determination of size of ringby
i) Methylationmethod.
2.11 Disaccharides - Introduction, sucrose and lactose - sources, structural formulae anduses.
2.12 Polysaccharides–Introduction, Starch and Cellulose - sources, structural formulae and uses

3. VitaminsandHormones **[08]**

3.1 General idea of vitamins, structure and synthesis of vitaminA
3.2 General idea of hormones, structure and synthesis of Adrenaline andThyroxin

4. Pharmaceuticals **[11]**

4.1 Introduction
4.2 Qualities of idealdrug
4.3 Methods of classification of drugs - Classification based on the therapeuticalaction
4.4 Brief idea of pencillin-G (constitution, synthesis notexpected)
4.5 Synthesis and uses of the following drugs:

i) Antimalerials -Paludrin
ii) Antituberculars - Isoniazide andEthambutol
iii) C. N. S. drugs -Phenobarbitone
iv) Antidiabetics -Tolbutamide
v) Anti-inflammatory drugs -Ibuprofen
vi) Antibiotics -Chloromycetin
vii)Anticancer drugs : Chlorambucil(Leukeran)

5 Syntheticdyes **[09]**

5.1 Introduction, Qualities of gooddye
5.2. Classification based on constitution and methods of applications
5.3 Witt's theory - Colour andconstitution
5.4 Synthesis of Orange IV, Malechite green,phenolphthalein

6 Agrochemicals **[07]**

6.1 General idea of agrochemicals includingpyrethroides.
6.2 Synthesis and uses of the following agrochemicals:

i) Indole-3-acetic acid.
ii) Monocrotophos
iii) Methoxychlor
iv) Ethophan
v) Carbaryl
vi) Baygon

Reference Books :

1) Organic Chemistry - Cram D. J. and Hammond G.S. McGraw Hill book Company NewYork.
2) Organic Chemistry - Finar I. L. The English Language Book Society,London.
3) A Guide Book to mechanism in Organic Chemistry - Peter Sykes LongmanGreen and Co. Ltd. London 6thEdition.
4) Organic Chemistry - R. T. Morrison and R. N. Boyd Prentice Hall of India private limited New Delhi. 6thEdition.
5) Text book of organic Chemistry - Ferguson L. N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. NewDelhi.
6) Organic Chemistry Vol. I, II and III - S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Estern, Limited, NewDelhi.
7) A text book of organic Chemistry - K. S. Tewari, S. N. Mehrotra, N. K. VishnoiVikas Publishing House Private Ltd. NewDelhi.
8) A text book of Organic Chemistry - ArunBahl and B. S. Bahl S. Chand and Company Ltd. 6thEdition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism - Raj K. Bansal Wiley Easter Ltd. NewDelhi.
10) Reaction Mechanism and reagents in Organic Chemistry - G. R. Chatwal Himalaya Publishing House NewDelhi.
11) Organic Chemistry Volume I and II - I. L. Finar ELBS with Longman 6thEdition.
12) Organic Chemistry Volume I and II - William Kemp ELBS with Macmillion 3rdEdition.
13) Advanced Organic Chemistry - Jerry March Wiley EasternLtd.

14) Organic Chemistry - FieserandFieser.
15) Principles of Organic Chemistry - English andCassidy.
16) Chemicals for crop improvement and pest management - Green, HartlyandWest.
17) Chemistry of pesticides - K. H. Buchel (T.W.).
18) Medical Chemistry -Burger.
19) Principles of Organic Chemistry - M. K.Jain.
20) Organic Chemistry by Clayden, Greeves, Warren and WothersOxfordpress.
21) Organic Chemistry - A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical ScienceSeries.
22) Reactions, Rearrangements and reagents - S.N. Sanyl, BharatiBhawan publishers and DistributorsPatna.
23) Synthetic Organic Chemistry-KamleshBansal.
24) Synthetic Organic Chemistry-GurudeepChatwal.
25) Chemistry of Insecticides – U.S. SreeRamulu.
26) Medicinal Chemistry- AshitoshKar.

Paper-XVI : DSE-4B(I)
Analytical and Industrial Organic Chemistry

Total Credits:4
Contact hrs:60

1. Soaps and Detergents **[11]**

1.1 Soaps
i) Rawmaterials
ii) Types ofsoaps
iii) Manufacture of soap – Hotprocess
iv) Cleansing action ofsoaps
1.2 Detergents
i) Rawmaterials
ii) Types of detergents - Cationic, anionic, amphoteric, neutraldetergents
iii) Preparation of teepol andderiphat
1.3 Comparison between soaps anddetergents

2. Synthetic Polymers **[11]**

2.1 Introduction
2.2 Classification:
i) According to origin, composition, method of preparation and general physicalproperties
ii) Classification based uponstructure
2.3 Process of addition polymerisation - free radical polymerisation of alkenes andDienes
2.4 Ionicpolymerisation
2.5 Ziegler – Nattapolymerisation
2.6 Methods of preparation and uses of:
i) Polystyrene ii) PVC iii) Phenol formaldehyde resin iv)Polyurethane
2.7 Natural rubber : General idea andvulcanisation
2.8 Synthetic rubbers : Synthesis and uses of:
i) Polychloroprene ii) Buna rubber - Buna N and BunaS

3. Sugar andAlcoholIndustry **[11]**

3.1 Manufacture of raw canesugar
3.2 Refining of rawsugar
3.3 Whitesugar
3.4 By-products of sugarindustry
3.4.1 Manufacture of ethyl alcohol frommolasses
3.4.2 Rectified spirit, Denatured spirit absolute alcohol and poweralcohol
3.4.3 By-products of alcoholindustry

4. SyntheticReagents **[09]**

4.1 Sodium borohydride: Use in reduction of aldehydes andketones
4.2Lithium aluminium hydride: Use in reduction of aldehydes, ketones,acids, amides andesters
4.3 Osmium tetroxide **:** Hydroxylation ofalkenes
4.4 1,3-dithiane : Umpolung concept, reactions with alkyl halide and acylhalide
4.5 Selenium dioxide : Oxidation of carbonyl compounds and allylicoxidation

5. Green Chemistry **[06]**

5.1 Introduction - Twelve principles of greenchemistry
5.2 PTC: Introduction, Role in organic reactionscatalysis
5.3 Biocatalytic reactions - Hydroxylation and oxidation usingenzymes
5.4 Introduction to microwave assistedreactions
5.5 Ionic liquids – Introduction and examples of ionicliquids

6 Chromatography **[12]**

6.1 Introduction
6.2 Generalprinciples
6.3 Classification
6.4 Study of following chromatographic techniques with reference to principle, methodology andapplications
i) Paperchromatography
ii) Columnchromatography
iii) Thin layerchromatography
iv) Gas chromatography

Reference) Books:

1. Basic Concepts of Analytical Chemistry - S. M. Khopkar, Wiley Eastern Ltd.Bombay.
2. Industrial Chemistry - R. K. Das, Asia Publishing,Mumbai.
3. Text Book of Quantitative Organic Analysis - A. I. Vogel, Pearson Edn.Delhi.
4. Quantitative Organic Chemistry - A. I. Vogel, Pearson Edn.Delhi.
5. Hand Book of Organic Analysis - H. T. Clarke, Arnold Heinemann Pub.Delhi.
6. Advanced Organic Chemistry - B. S. Bahl and ArunBahl, S. Chand Comp.Delhi.
7. Riegel's Handbook of Industrial Chemistry - J. A. Kent, Van. Nostrard,Londan.
8. Chemical Process Industries - Shreve and Brinic - Ostin, Magraw Hill, NewYork.
9. Analytical Chemistry- Walton.
10. Biotechnology and Applied Microbiology - Alani andMoo-Young.
11. Immobilize Biocatalysis– JoyWleser.
12. Introduction to Polymer Chemistry - Raymond B.Seymour.
13.Polymer Science - V. R. Gowarikar, N. V. Viswanathan and JayadevSreedhar Willey EasternLimited.
14. Advances in Green Chemistry: Chemical synthesis using MW-irradiation by R. S.Varma.
15. GreenChemistry:EnvironmentFriendlyalternatives-RashmiSanghiandM. M. Srivastava (Eds) (c) 2003 Narosa Publishing House, New Delhi, India.
16. Reactions, rearrangements and reagents : S. N.Sanyal
17. Organic reaction mechanism : V. K. Ahluwalia and K.R.KParashar
18. Environment friendly synthesis using ionic liquids: JairtonDupont, Toshiyuki Itoh and Sanjay V. Malhotra (CRCPress)

Paper-XVI :DSE-4B(II)
Applied Organic Chemistry

Total Credits: 4
Contact hrs: 60

1. Theory of binarymixtureanalysis 08

1.1 Types of organic compounds, nature and types of binarymixtures.
1.2 Reactions of acid, base, phenol and neutrals with sodium bicarbonate, sodium hydroxide and hydrochloricacid
1.3 Principle of binary mixtureseparation.
1.4 Determination of type of themixture
1.5 Separation of mixture- using aqueous medium andether.

2. GreenChemistry 06

2.1 Introduction
2.2 Twelve principles of greenchemistry
2.3 Zeolites as greencatalysts
2.4 Ultrasound assistedreactions
2.5 Reactions in ionicliquids
2.6 Solvent freereactions

3. Chemistryofcosmetics 15

3.1 Ageneralstudyincludingpreparationandusesof-Hairdye,hairspray,shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, cold creams, vanishing creams and shavingcreams

4. Chemistryofperfumes 15

4.1 Ageneralstudyincludingpreparationandusesof-antiperspirants,andartificial flavours
4.2 Essentialoilsandtheirimportanceincosmeticindustrywithreferencetoeugenol, geraniol, sandalwood oil, eucalyptus oil, rose oil, 2-phenyl ethyl alcohol, jasmone, civetone andmuscone

5. Fermentation 07

5.1 Aerobic and anaerobicfermentation
5.2 Production of antibiotics-streptomycin
5.3 Production of vitamins-Vit.B12

6. TextileChemistry 09

6.1 Introduction, classification offibers
6.2 Sizing: object of sizing, sizing ingredients and theirfunctions
6.3 General idea of processes : singeing, desizing,scouring
6.4 Bleaching: Brief study of the outline of the process of bleachingcotton and syntheticmaterial.
6.5 Dyeing : Study of dyeing of cellulosic material and synthetic fibers with dyes like direct, vat, reactive and dispersedyes.

Reference Books

1. Industrial chemistry : B. K. Sharma(Goel Publishing House,Meerut)
2. Engineering Chemistry: P. C. Jain and M. Jain(Dhanpatrai and sons,Delhi)
3. Practical Organic Chemistry: A. I. Vogel
4. Advances in green chemistry-Chemical synthesis using Microwave irradiation: R. S.Verma
5. A book of textile chemistry: A. J.Hall
6. Bleaching and Dyeing : Dr. V.Shenai
7. Sizing : D. B.Ajgaonkar
8. Chemical process industries : Shreve and Brinik (OstinMcGrawHill Publication, NewYork)
9. Medicinal and Pharmaceutical Chemistry: Hakishan, V. K. Kapoor (VallabhPrakashanPimpura NewDelhi)
10. Industrial Chemistry, Vol. I:E. Stocchi (Ellis Horwood Ltd,UK)

PRACTICALS

N.B. i. Use of Electronic balance with 0.001g accuracy ismandatory.
ii. Use of Scientific calculator is allowed.

Physical Chemistry

I) Non instrumental Experiments(Any Five) :

1. To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by the distributionmethod.
2. To determine the partition coefficient of CH_3COOH between H_2O andCCl_4.
3. Critical SolutionTemperature.
To determine the CST for phenol – water system.
4. The study of energy of activation of first order reaction i.e. hydrolysis ofmethyl acetate in presence of 0.5 NHCl.
5. The study of energy of activation of first order reaction i.e. hydrolysis ofmethyl acetate in presence of 0.5 NH_2SO_4.
6. The study of energyof activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Equalconcentrations).
7. The study of energyof activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Unequalconcentrations).
8. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of thereaction.
9. To study the effect of addition of electrolyte (KCl) on the reaction between $K_2S_2O_8$ and KI (Equalconcentrations).

II. Instrumentalexperiments

A. Potentiometry (AnyThree).

1. Titration of strong acid with strongalkali.
2. Preparation of buffer solution and determination of their pH (Any five buffer solutions), - Theoretical calculation of pH values by using Henderson'sequation.
3. Determination of standard electrode potential of Zn/Zn^{++} , Cu/Cu^{++} , Ag/Ag^{+} (Anytwo).
4. Determination of solubility and solubility product ofAgCl.
5. Titrationofferrousammoniumsulphateusing$K_2Cr_2O_7$solutionandtocalculateredox potential of Fe^{++} , Fe^{+++}system

B. Conductometry(any three).

1. Titration of weak acid with strongalkali.
2. Titration of a mixture of weak acid and strong acid with strongalkali.
3. Tostudytheeffectofsubstituentondissociationconstantofweakacidwithrespecttoacetic acid and monochloroacetic acid (cell constant to begiven).
4. To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometricmethod.

C. Refractometry.

1. To determine the percentage composition of unknown mixture by (i)graphical method and (ii) by composition law (Densities of pure liquids A & B begiven).
2. To determine the molar refractivityof methyl acetate, ethyl acetate, n-hexane and carbon tetrachloride and calculate the refraction equivalents of C, H and Clatoms.

D. Colorimetry (AnyTwo).

1. To verify Lambert - Beer's law using $CuSO_4$solution.
2. To estimate Fe^{+++} ions by thiocynatemethod.
3. To estimate Fe^{+++} ions using salicylic acid by colorimetrictitration.

E. pH - metry (AnyOne).

1. To determine the dissociation constant of monobasic acid (Aceticacid).
2. To determine the dissociation constant of dibasic acid (Malonicacid).

Reference Books :

1. Findlay's Practical Physical Chemistry(Longman)
2. Advanced Practical Physical Chemistry by J. B. Yadav, Goelpublishinghouse.
3. Practical Physical Chemistry by B. D. Khosla, V. C. Garg (R. Chand andCo.)
4. Systematic experimental Physical Chemistry by Rajbhoj, Chandekar (AnjaliPublicaiton)
5. Practical Physical Chemistry :Nandkumari, Kothari andLavande.
6. Practical Physical Chemistry by Gurtu (S.Chand).

Inorganic Chemistry

I. Gravimetric Estimations(G).

N. B. : Any two experiments from G1 to G3 and any two experiments from G4 to G7

G1. Gravimetric estimation of iron as ferric oxide from the given solution containing ferrous ammonium sulphate, copper sulphate and free sulphuric acid.

G2. Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, ferrous ammonium sulphate and free sulphuric acid.

G3. Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride, ferric chloride and free hydrochloric acid.

G4. Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate, copper sulphate and free sulphuric acid.

G5. Gravimetric estimation of barium as barium chromate from the given solution containing barium chloride, ferric chloride and free hydrochloride acid.

G6. Gravimetric estimation of Aluminium as Aluminiumoxinate i.e.
tris (8-hydroxyquinolinato) aluminate (III) from a given solution containing potash alum, copper sulphate and free sulphuric acid.

G7. Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) from the given solution containing nickel sulphate, ferrous ammonium sulphate and free sulphuric acid.

[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm and asked to dilute to 100 cm (or the stock solution should be given in the range of 20 to 30 cm and asked to dilute to 250 cm). Use 50 cm of this diluted solution for estimation.]

II. Inorganic Preparations (P): (anyfive).

N. B.–1. Calculations of % yield isexpected.

2. After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in termsof:
   a) Name of central metalion
   b) Oxidation number of metalion
   c) Nature ofligand
   d) Nature ofbonding
   e) Type ofhybridization
   f) Inner orbital or outer orbitalcomplex
   g) Geometry of the complex withstructure
   h) Magnetic property of thecompound
   i) Color of thecompound
   j) Nature: Crystalline /Amorphous

P1. Preparation of potassium trioxalatoferrate(III)

P2. Preparation of potassium trioxalatoaluminate (III)

P3. Preparation of tris(ethylenediamine)nickel (II) thiosulphate

P4. Preparation of sodium hexanitrocobaltate (III)

P5. Preparation of ammonium diamminetetrathiocynatochromate(III) (Reineck's salt)

P6. Preparation of nickel ferrite.

P7. Preparation of hexamminenickel (II) chloride

P8. Preparation of tris(thiourea)cuprous(I) sulphate

III) Titrimetric Estimations:

A) Percentage Purity (anythree)

V1. Determination of percentage purity of ferrous ammonium sulpahte.

V2. Determination of percentage purity of tetramminecopper (II) sulphate.

V3. Determination of percentage purity of potassium trioxalatoaluminate(III).

V4. Determination of percentage purity of potassium trioxalatoferrate (III).

B) Analysis of Commercial Sample (any three).

V5. Determination of percentage of magnesium in the given sample of talcum powder.

V6. Determination of amount of aluminium in the given solution of potash alum.

V7. Determination of titrable acidity in the given sample of milk or lassi.

V8. Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.

V9. Determination of percentage purity of boric acid using supplied sodium hydroxide (Standard succinic or oxalic acid solution to be prepared for standardization of the given sodium hydroxide solution.)

C) Ion exchange method

V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).

V11. Determination of amount of magnesium and zinc in the given solution containing (Mg^{++} and Zn^{++}) using anion exchange resin and standard solution of EDTA.

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Reference Books:

1. A text book of quantitative Inorganic Analysis - A. I.Vogel.
2. Text book of Quantitative Inorganic Analysis - Kolthoff andSandell.
3. Experimental Inorganic Chemistry - Palmer W.G.
4. Advanced Practical Inorganic Chemistry - Adams andRaynor.
5. Handbook of Preparation Inorganic Chemistry. Vol. 1 and 11 -Brauer.
6. Manual in Dairy Chemistry - I.C.A.R. Sub-Committee on DairyEducation.
7. Chemical methods for environmental analysis - R. Ramesh and M.Anbu.

Organic Chemistry

I) Qualitativeanalysis

Separation of binary mixture and Identification of its components. 5g of mixture is to be given for separation. At least **08 mixtures** are to be separated.

Nature 1) Solid - Solid: 4 mixtures

2) Solid - Liquid : 2mixtures

3) Liquid - Liquid : 2mixtures

1) Solid - Solid Mixtures:

One mixture from each of the following types should be given:

i) Acid+Phenol ii) Acid +Base

iii) Acid+Neutral iv) Phenol +Base

v) Phenol+Neutral vi) Base +Neutral

2) Solid - LiquidMixtures

One mixture of type Neutral + Neutral and One mixture of type Acid + Neutral should be given.

3) Liquid - LiquidMixtures

One mixture of type Neutral + Neutral and One mixture of type Base + Neutral should be given.

Following compounds should be used for preparation of mixtures:

Acids: Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, Aspirin, Oxalic acid.

Phenols: α-naphthol, β-naphthol

Bases: o -nitroaniline, m-nitroaniline, p-nitroaniline, aniline, o-toluidine and N, N-dimethyl aniline.

Neutrals: Naphthalene, acetanilide, m-dinitrobenzene, chloroform, carbon tetrachloride, acetone, nitrobenzene, ethyl acetate, ethyl benzoate, acetophenone, bromobenzene, urea and thiourea.

II) Quantitative analysis:

III) Organic estimations:**(Any four)**

1) Estimation ofsucrose

2) Estimation of nitrogroup

3) Saponification value ofoil.

4) Estimation of formaldehyde from given formalinsolution.

5) Estimation of acid and ester present in the given mixture of acid andester.

6) Estimation of acid and amide from the mixture of acid andamide.

IV) Organic Preparations : **(anyfour)**

N.B.: a) Calculation of percentage practicalyield.

b) Recrystallisation of crude product and its meltingpoint.

c) The purity of the product may be confirmed byTLC.

1) Preparation of m-nitroaniline fromm-dinitrobenzene.

2) Preparation of aspirin from salicylicacid.

3) Preparation of nerolin fromβ-naphthol.

4) Preparation of p-iodonitrobenzene fromp-nitroaniline.

5) Preparation of benzene azo - β -naphthol.

6) Preparation of benzoic acid from cinnamicacid.

IV Preparation of Derivatives:

N.B.:During practical course, name of the organic compound should not to be given.

1) Bromo derivative of aniline and cinnamicacid.

2) Nitro derivative of salicylic acid andnitrobenzene.

3) Benzoyl derivative of β-naphthol andaniline

4) Picrate derivative of anthracene andβ-naphthol.

5) Oxalate and nitro derivatives ofurea.

6) Anhydride derivative of phthalicacid.

7) Oxime derivatives of Ketones : Acetone andacetophenone.

8) 2: 4 DNP ofacetophenone.

Reference Books:

1. Practical Organic Chemistry by A. I.Vogel.

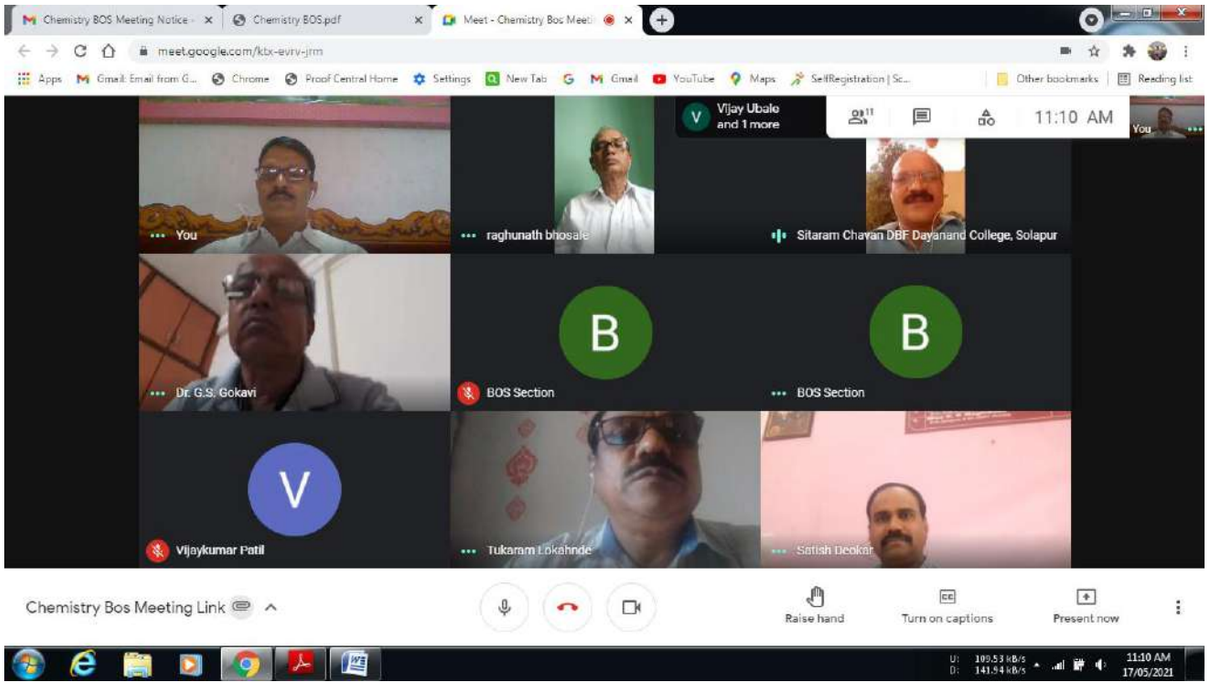
2. Hand book of Organic qualitative analysis by H. T.Clarke.

3. A laboratory Hand Book of Organic qualitative analysis and separation by V. S. Kulkarni. DastaneRamchandra&Co.

4. PracticalOrganicChemistrybyF.G.MannandB.C.Saunders. Low-pricedTextBook. ELBS.Longman.

5. Experiments in General Chemistryby C. N. R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.

6. Advanced Practical Organic Chemistry by N. K. Vishnoi. Vikas Publishing House Private Limited.
7. ComprehensivePracticalOrganicChemistryQualitativeAnalysisbyV.K.Ahluwalia, SunitaDhingra. University Press. Distributor - Orient LongmanLtd.
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V.K. Ahluwalia, Renu Agarwal. University Press. Distributor-Orient LongmannLtd.
9. PracticalChemistry-Physical-Inorganic-OrganicandViva-vocebyBalwantRaiSatija. Allied Publishers PrivateLimited.30
10. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House,Mumbai.
11. College Practical Chemistry by Patel, Jakali, Mohandas, IsraneyTurakhia. Himalaya Publishing House,Mumbai.
12. Practice of thin layer chromatography by Joseph C. Touchstone, Murrell F. Dobbins. A Wiley - Interscience Publication John-Wiley &Sons.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: ZOOLOGY

Name of the Course: B.Sc. III (Sem–V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

P.A.H.Solapur University, Solapur , Faculty of Science
Choice Based Credit System (CBCS)
B.Sc.-III Zoology
(2021-2022 : W.e.f. June 2021)

Background of Curriculum:

In accordance with the UGCs reference to standardize curricula at the national level and bring a match across all the Indian Universities, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template.
Zoology deals with the study of animal kingdom specially the structural diversity, biology, embryology, evolution, habits and distribution of animals, both living and extinct. As it covers a fascinating range of topics, the modern zoologists need to have insight into many disciplines. The learning outcomes-based curriculum framework for a B.Sc. degree in Zoology is designed to cater to the needs of students in view of the evolving nature of animal science as a subject. The framework is expected to assist in the maintenance of the standard of Zoology degrees/programmes across the country by reviewing and revising a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework, however, does not seek to bring about uniformity in syllabi for a programme of study in Zoology, or in teaching learning process and learning assessment procedures. Instead, the framework is intended to allow for flexibility and innovation in programme design and syllabi development, teaching learning process, assessment of student learning levels. A comprehensive knowledge of structure-function relationship at the level of gene, genome, cell, tissue, organ, and systems, through development would further add to the knowledge base and the learning outcome in terms of editing of genes and genomes for industrial application and research purposes.

Learning Outcomes based approach to Curriculum Planning:

The courses should be delivered in terms of concepts, mechanisms, biological designs & functions and evolutionary significance cutting across organisms at B.Sc. level. These courses should be studied by students of all branches of biology. Both chalk and board, and PowerPoint presentations can be used for teaching the course. The students should do the dissertation/ project work under practical of different courses, wherever possible.

The students are expected to learn the courses with excitements of biology along with the universal molecular mechanisms of biological designs and their functions. They should be able to appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how contributions from research and innovation have made the subjects modern, interdisciplinary and applied and laid the foundations of Zoology, Animal Sciences, Life Sciences, Molecular Biology and Biotechnology. These courses and their practical exercises will help the students to apply their knowledge in future course of their career development in higher education and research. In addition, they may get interested to look for engagements in industry and commercial activities employing Life Sciences, Molecular Biology

and Biotechnology. They may also be interested in entrepreneurship and start some small business based on their interest and experience.

Graduate Attributes in Zoology:

- Disciplinary knowledge and skills: Competent of demonstrating (i) complete information and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (ii) capacity to apply modern instrumentation for advanced genomic and proteomic technology.

- Skilled communicator: Capability to communicate complex technical knowledge relating to Zoology in an obvious and brief manner in writing and oral skills.

- Critical thinker and problem solver: Talent to have critical thinking and competent problem solving skills in the basic areas of Zoology

- Sense of inquiry: Capability for asking appropriate/proper questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

- Team player/worker: Accomplished of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

- Skilled project manager: Able of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

- Digitally literate: Skilled of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

- Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

- Lifelong learners: Capable of self-paced and self-directed learning aimed at individual growth and for improving knowledge/skill development and re-skilling

Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level. The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is

necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

• Outline of Choice Based Credit System:

1. *Core Course:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. *Elective Course:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. *Ability Enhancement Courses (AEC):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• Credit: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

PAH Solapur University, Solapur

Faculty of Science-New Choice Based Credit System (CBCS) - (w.e.f.2021-22)

Structure for B. Sc-III

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)		**English (Business English)**	Paper- III	4.0	--	--	100	80	20	4.0
Discipline Specific Elective (DSE) (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.		**DSE-1A- Molecular Biology**	Paper- IX	3	--	--	100	80	20	4.0
		DSE- 2 A- Principles of Genetics	Paper -X	3	--	--	100	80	20	4.0
		DSE- 3 A-Endocrinology	Paper- XI	3	--	--	100	80	20	4.0
		DSE 4 A- Wildlife Conservation & Management	Paper- XII	3	--	--	100	80	20	4.0
		(Add-on /-self learning)- MOOC/SWAYAM/Skill based -certificate course –institute or university /internship/ apprenticeship		--	--	--	--	--	--	4.0
Grand Total				**16.0**	**--**	**--**	**500**	**400**	**110**	**24**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)		**English (Business English)**	Paper IV	4.0	--	--	100	80	20	4.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.		**DSE- 1B -Animal Physiology: Life Sustaining Systems**	Paper -XIII	3.0	--	--	100	80	20	4.0
		DSE- 2B- Evolutionary Biology	Paper- XIV	3.0	--	--	100	80	20	4.0
		DSE- 3B -Animal Behaviour And Chronobiology	Paper- XV	3.0	--	--	100	80	20	4.0
		DSE 4B- Applied Zoology	Paper- XVI	3.0	--	--	100	80	20	4.0
Total (Theory)				**16.0**	**--**	**--**	**500**	**400**	**100**	**20**

DSE - Practical (Annual Exam)	**DSE- 1 A&B**	Practical- IX & XIII	--	--	5	100	80	20	4.0
	DSE -2 A&B	Practical- X&XIV	--	--	5	100	80	20	4.0
	DSE- 3 A&B	Practical- XI&XV			5	100	80	20	4.0
	DSE- 4 A& B	Practical- XII & XVI			5	100	80	20	4.0
Total (Practicals)					**20**	**400**	**320**	**80**	**16**
Grand Total			**32.0**		**20**	**1400**	**1120**	**280**	**60**

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks- Theory	Credits- Theory	Marks- Practical	Credits- Practicals	Total – credits
B.Sc.-I	I	500	20	--	--	20
	II	550	20	400	16	36
B.Sc.-II	III	350	14	--	--	14
	IV	350	14	300	12	26
B.Sc.-III	V	500	22	--	--	22
	VI	500	20	400	16	36
Total		2750	110	1100	44	154

B.Sc.Programme :

Total Marks : Theory + Practical's = 2750 +1100 =3950
Credits : Theory + Practical's = 110 + 44 = 154
Numbers of Papers Theory: Ability Enhancement Course(AECC) : 05
Theory: Discipline Specific Elective Paper (DSE) : 08
Theory: DSC : 12
Skill Enhancement Courses /Add on : 01
Total : Theory Papers : 31
: Practical Papers : 11

Abbreviations :

L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

PAH SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science
Choice Based Credit System (CBCS)
(w.e.f. 2021-22)

• Title of the Course: B.Sc. Part-III (Honors)
• Subject: Zoology

• **Introduction**: This course provides a broad overview of Zoology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Zoology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

• **Objectives of the course: The objectives of B. Sc. Zoology course are:**
To provide an intensive and in depth learning to the students in field of Zoology. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world. To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

- **Course outcome and Advantages:** Zoology has tremendous job potential. The successful students will be able to establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc. Scientific Research Organizations. Universities in India & aboard.

• Medium of Instruction: English
• Syllabus Structure:
• The University follows semester system.
• An academic year shall consist of two semesters.
• B.Sc. Part-IIl Zoology shall consist of two semesters: Semester V and Semester VI

In semester V: there will be Four DSC papers having paper IX to XII of 100 marks each. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English and one self learning compulsory course of any one from - MOOC/SWAYAM COURSE/INTERNSHIP

In Semester VI: there will be two DSC papers having paper XIII to paper XVI of 100 marks each. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English

The scheme of evaluation of performance of candidates shall be based on University Assessment **(UA**) as well as **College Internal Assessment (CA)** as given below.

For B.Sc.Part-III Zoology Sem V & VI the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

- **Practical course examination** is of 100 marks shall be conducted at the end of semester II. The practical examination of 400 marks shall also consist of **320 marks for University practical assessment** and **80 marks for college internal assessment (CA)**.

• **Scheme of Evaluation**: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks..

Semester – V: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper IX to paper XII)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper IX to paper XII)
c) **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English
d) One Add-on - self learning course **(compulsory)** MOOC/SWAYAM/Sill based -certificate course – institute or university /internship/ apprenticeship

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

Semester – VI: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper XIII to paper XVI)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper XIII to paper XVI)

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
Practical Examination: (400 marks)
University Examination (320 marks): Number . of practicals': 04

Practical-I: Based on **Papers- IX & XIII** (80 UA + 20 CA)
Practical-II: Based on **Papers- X & XIV** :(80 UA + 20 CA)
Practical-III: Based on papers - **XI & XV** :(80 UA + 20 CA)
Practical-IV: Based on papers - **XII& XVI** :(80 UA + 20 CA)

Internal Continuous Assessment: Total 80
(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 320 marks (Practical I to IV for Four separate days) will be conducted at the end of semester VI
Passing Standard:
The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination

PAH SOLAPUR UNIVERSITY, SOLAPUR Faculty of Science and technology New CBCS Structure for B.Sc – III Zoology Theory -								
Semester V								
Paper No.	**Title of Paper**	**Hrs/Week**			**Paper Marks**	**UA**	**CA**	**Credits**
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE-IX	**DSE-1A -Molecular Biology**	3	-	-	100	80	20	4
DSE-X	**DSE- 2 A -Principles of Genetics**	3	-	-	100	80	20	4
DSE-XI	**DSE- 3A - Endocrinology**	3	-	-	100	80	20	4
DSE-XII	**DSE 4 A- Wildlife Conservation & Management**	3	-	-	100	80	20	4
SEC-	**(Add-on /-self learning)- MOOC/SWAYAM/Skill based - certificate course –institute or university /internship/ apprenticeship**	--	--	--	--	--	--	4.0
Total		16	-	-	500	400	100	24

only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same stipulated marks of external examination and his/her performance shall be scaled to 100 marks.

• ATKT:

passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Zoology examination and clearly passed in B.Sc. Part-I-Zoology shall be permitted to enter upon the course of Semester V of B.Sc. III Zoology.

Semester –VI

Paper No.	Title of Paper	Hrs/Week			Paper Marks	UA	CA	Credits
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE- -XIII	**DSE- 1B -Animal Physiology: Life Sustaining Systems**	3	-	-	100	80	20	4
DSE-XIV	**DSE- 2B- Evolutionary Biology**	3	-	-	100	80	20	4
DSE-XV	**DSE- 3 B- Animal Behaviour And Chronobiology**	3	-	-	100	80	20	4
DSE-A XVI	**DSE 4B- Applied Zoology**	3	-	-	100	80	20	4
Total		16			500	400	100	20

Practicals- B .Sc III Zoology (CBCS)									
Practical No.	**Paper No. based on**	**Title of Paper**	**Hrs/Week**			**Paper Marks**	**UA**	**CA**	**Credits**
			L	T	P				
I	Papers- IX & XIII	**DSE-1A- Molecular Biology AND DSE- 1B- Animal Physiology: Life Sustaining Systems**		-	5	100	80	20	4
II	Papers- X&XIV	**DSE- 2 A -Principles of Genetics** AND **DSE- 2B -Evolutionary Biology**		-	5	100	80	20	4
III	Papers- XI&XV	**DSE- 3A- Endocrinology AND DSE- 3 B - Animal Behaviour and Chronobiology**		-	5	100	80	20	4
IV	Papers- XII & XVI	**DSE 4 A- Wildlife Conservation & Management AND DSE 4B- Applied Zoology**		-	5	100	80	20	4
	Total				**20**	**400**	**320**	**80**	**16**

Abbreviations:

L: Lectures
T: Tutorials
P: Practicals
UA: University Assessment by End Semester Examination
CA: College Assessment by Internal Continuous Examination
UA: University Assessment: - University Theory paper shall be of 70 marks
CA: College Assessment: - The internal examination for theory and practical course

Theory Syllabus

B.Sc. III-Zoology (Semester-V)

w. e. f. June 2021

Paper- -IX- DSE-1A Molecular Biology
[Credits -4, Total Lectures-60]

Unit 1: Nucleic Acids **4**

Salient features of DNA and RNA
Watson and Crick model of DNA

Unit 2: DNA Replication **12**

DNA Replication in prokaryotes and eukaryotes, Semi-conservative mechanism of DNA replication, Replication of circular.

Unit 3: Transcription

10

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, transcription factors.

Unit 4: Translation **12**

Properties of genetic code: Degeneracy and Wobble Hypothesis; Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, amino-acyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Difference between prokaryotic and eukaryotic translation

Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA **6**

Mechanism of Capping, Splicing (concept of exon and intron) and Polyadenylation of eukaryotic m-RNA and its significance.

Unit 6: Gene Regulation **10**

Transcription regulation in prokaryotes: Principles of transcriptional regulation with example of lac-operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements.

Unit 7: DNA Repair Mechanisms **3**

Pyrimidine dimerization, mismatch repair & SOS mechanism

Unit 8: Recombinant DNA Technology **3**

Basic mechanism of R-DNA Technology and its applications in medicine, agriculture & industry; RNA interference, miRNA, siRNAs.

- **About the course:**

The course provides an insight into the life processes at the subcellular and molecular levels. Other important aspects include DNA and molecular genetics including gene cloning, sequencing and gene mapping in addition to the powerful techniques that revolutionized the pharmaceutical, health and agricultural industries.

- **Learning outcomes**:

After successfully completing this course, the students will be able to:

- Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario.
- Get well versed in recombinant DNA technology which holds application in biomedical & genomic science, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career building in all these fields.
- Apply their knowledge in problem solving and future course of their career development in higher education and research.
- Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry.

SUGGESTED READINGS:

1) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
2) Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: Molecular Biology of the Cell, IV Edition.
3) Cooper G. M. and Robert E. Hausman R. E. The Cell: A Molecular Approach, V-Edition, ASM Press and Sinauer Associates.
4) De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
5) Karp, G. (2010) Cell and Molecular Biology: Concepts and Experiments. VI-Edition. John Wiley and Sons. Inc.
6) Lewin B. (2008). Gene XI, Jones and Bartlett
7) McLennan A., Bates A., Turner, P. and White M. (2015). Molecular Biology IV-Edition. GS, Taylor and Francis Group, New York and London.

Paper- -X- DSE-2 A: Principles of Genetics
[Credits -4, Total Lectures-60]

Unit 1: Mendelian Genetics and its Extension **8**

Principles of inheritance-Laws of Mendelian Inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles; Gene Interactions: Supplementary, Complementary & Inhibitory interactions; Examples of Sex-linked, sex-influenced and sex-limited characters inheritance.

Unit 2: Linkage, Crossing Over and Chromosomal Mapping **12**

Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of crossing over including models of recombination, Recombination frequency as a measure of linkage intensity; Somatic cell hybridization.

Unit 3: Mutations **10**

Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method.

Unit 4: Sex Determination **4**

Chromosomal mechanisms of sex determination in Drosophila and Human; Human Genetic Disorders: Mechanism, symptoms, treatment: Down's Syndrome, Klinefeler's Syndrome and Turner's Syndrome

Unit 5: Extra-chromosomal Inheritance **6**

Extra-chromosomal inheritance with examples

Unit 6: Polygenic Inheritance **3**

Polygenic inheritance with suitable examples; simple numerical.

Unit 7: Recombination in Bacteria and Viruses **9**

Conjugation, Transformation, Transduction with examples; Complementation test in Bacteriophage.

Unit 8: Transposable Genetic Elements **8**

Transposons in bacteria

About the course

The course is designed to revise basic concepts of Genetics and then move on to advanced concepts. Some key aspects include the mechanism of inheritance, gene structure and function, sex chromosomal and autosomal anomalies, aspects of human genetics, etc. will be covered. A strong emphasis will be laid on the modern tools and techniques used in genetics.

Learning outcomes:

After successfully completing this course, the students will be able to:

- Understand how DNA encodes genetic information and the function of mRNA and tRNA
- Apply the principles of Mendelian inheritance.

- Understand the cause and effect of alterations in chromosome number and structure.
- Relate the conventional and molecular methods for gene manipulation in other biological systems.
- Discuss and analyse the epigenetic modifications and imprinting and its role in diseases.
- Get new avenues of joining research in related areas such as genetic engineering of cells, cloning, genetic disorders, human fertility programme, genotoxicity, etc

SUGGESTED READINGS:

1) Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India
2) Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V-Edition. John Wiley and Sons Inc
3) Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings
4) Russell, P. J. (2009). *Genetics- A Molecular Approach.*III Edition. Benjamin Cummings
5) Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.
6) Fletcher H. and Hickey I. (2015). *Genetics.* IV Edition. GS, Taylor and Francis Group, New York and London

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Paper- -XI- DSE-3 A: Endocrinology
[Credits -4, Total Lectures-60]

Unit 1: **Introduction to Endocrinology** **12**

History of endocrinology, Brief introduction of endocrine glands, Classification, Characteristic and Transport of Hormones, Neurosecretions and Neurohormones

Unit 2: Epiphysis **06**

Location & structure of pineal gland, Secretions and their functions in biological rhythms and reproduction.

Unit-3: Hypothalamo-hypophysial Axis
07

Structure of hypothalamus, Hypothalamic nuclei and their functions, Regulation of neuroendocrine glands, Feedback mechanism.

Unit 4: Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophysial
06
portal system, Control and Disorders of pituitary gland.

Unit 5: Regulation of Hormone Action **11**

Hormone action at Cellular level: Hormone receptors, transduction and regulation Hormone action at Molecular level: Molecular mediators, Genetic control of hormone action

Unit 6: Structure, Hormones, Functions and Regulation and Disorders of Testis **08**

Unit 7: Structure, Hormones, Functions and Regulation and Disorders of Ovary
06

Unit 8: Structure, Hormones, Functions and Regulation and Disorders of Placenta
04

About the course

The course envisages information on endocrine system with emphasis on the structure of hypothalamus and anterior pituitary. The associated hormones and the related disorders will be explained.

Learning outcomes:

- Understand neurohormones and neurosecretions.
- Learn about hypothalamo and hypapophysial axis.
- Understand about different endocrine glands and their disorders.
- Understand the mechanism of hormone action.

SUGGESTED READINGS

1) General Endocrinology C. Donnell Turner Pub- Saunders Toppan
2) Endocrinology: An Integrated Approach; Stephen Nussey and Saffron Whitehead.
3) Oxford: BIOS Scientific Publishers; 2001.
4) Hadley, M.E. and Levine J.E. 2007. Endocrinology, 6th Edition. Pearson Prentice-Hall, Pearson Education Inc., New Jersey.

5) David O. Norris & J. A. Carr. Vertebrate Endocrinology, 6th Ed., Academic Press

Paper- -XII- DSE-4 A: Wildlife Conservation & Management [Credits -4, Total Lectures-60]

Unit 1: Introduction to Wild Life **8**

Values of wild life - positive and negative; Conservation ethics; Importance of conservation; Causes of depletion; World conservation strategies.

Unit 2: Evaluation and Management of Wild life **8**

Habitat analysis, Physical parameters: Topography, Geology, Soil and water; Biological Parameters: food, cover, forage, browse and cover estimation; Standard evaluation procedures: remote sensing and GIS.

Unit 3: Management of Habitats **8**

Setting back succession; Grazing logging; Mechanical treatment; Advancing the succession process; Cover construction; Preservation of general genetic diversity; Restoration of degraded habitats.

Unit 4: Population Estimation **8**

Methods of population estimation: Sex ratio computation; Fecal analysis of ungulates and carnivores: Hair identification, Pug marks and census method.

Application of biostatistics in Biodiversity estimation: Analysis of Shannon and Simpson's Diversity Indices.

Unit 5: Management Planning of Wild life in Protected Areas **8**

Estimation of carrying capacity; Eco tourism / wild life tourism in forests; Concept of climax persistence; Ecology of perturbence.

Unit 6: Management of Excess Population **7**

Bio-telemetry; Care of injured and diseased animal; Quarantine; Common diseases of wild animal

Unit 7: Protected areas **8**

National parks & sanctuaries in India, Community reserve; important features of protected areas in India; Tiger conservation- Tiger reserves in India & its management challenges; Great Indian Bustard (GIB) Reserve & its management.

Unit 8: Wildlife Protection Acts: National: Wildlife Protection Act-1972; International: CITES, 1973
5

About the course

The course envisages information on wildlife management

Learning outcomes

- Students will understand the factors affecting the need to find sustainable practices

- Students will understand the general principles of ecology as how they related to terrestrial and/or aquatic plant and animal conservation and management.
- Students will be able to identify species, characteristics, habitat requirements and life cycles of birds, fish and/or wildlife species.
- Students will be able to evaluate current events and public information related to wildlife conservation and management as being scientifically-based or opinion

SUGGESTED READINGS:

1) Caughley, G., and Sinclair, A.R.E. (1994). Wildlife Ecology and Management. Blackwell Science.
2) Woodroffe R., Thirgood, S. and Rabinowitz, A. (2005). People and Wildlife, Conflict or Co-existence? Cambridge University.
3) Bookhout, T.A. (1996). Research and Management Techniques for Wildlife and Habitats, 5 th edition. The Wildlife Society, Allen Press.
4) Sutherland, W.J. (2000). The Conservation Handbook: Research, Management and Policy. Blackwell Sciences
5) Hunter M.L., Gibbs, J.B. and Sterling, E.J. (2008). Problem-Solving in Conservation Biology and Wildlife Management: Exercises for Class, Field, and Laboratory. Blackwell Publishing.

SEMESTER –VI

PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)
Theory Syllabus

B.Sc. III-Zoology (Semester-VI)

w. e. f. June 2021

Paper- -XIII- DSE-1B Animal Physiology: Life Sustaining Systems

[Credits -4, Total Lectures-60]

Unit 1: Physiology of Digestion **10**

Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Digestion and absorption in stomach and intestine; Hormonal control of secretion of enzymes in Gastrointestinal tract.

Unit 2: Physiology of Respiration **10**

General mechanism of respiration in mammals, Pulmonary ventilation; Respiratory volume and capacities; Transport of oxygen and carbon dioxide in blood; Dissociation curves and the factors influencing it; Control of respiration: Chemical & Nervous.

Unit 3: Respiratory pigments: Types structure and function **04**

Hemoglobin, hemocyanin, erythrocruorin-chlorocruorin, hemerythrin

Unit 4: Renal Physiology **8**

Structure of Kidney and its functional unit (nephron); Mechanism of urine formation; Regulation of water balance; Regulation of acid-base balance; Dialysis.

Unit 5: Blood and Blood groups : **12**

Haematopoiesis – Brief account, Components of blood – RBC, WBC & Platelets and their functions; Blood clotting system, Complement system & Fibrinolytic system.

Types of Blood groups -ABO and MN type, blood group antigens, Rh factor & Erythroblastosis Foetalis.

Unit 6: Physiology of Heart **08**

Structure of mammalian heart; Origin, structure & working of heart beat (SA Node, AV Node & Purkinje's Fibre), Coronary circulation; Pacemaker.

Unit 7: Cardiac cycle: **04**

Cardiac output and its regulation, nervous and chemical regulation of heart rate. Electrocardiogram, Blood pressure and its regulation

Unit 8: Physiology of Stress **04**

1. Introduction to stress physiology

2. Managing stress by exercise, yoga and meditation

About the course:

The course deals with various physiological functions in mammals. It also gives an account of the metabolic/ biochemical pathways and the probable impact of environment on them.

Learning outcomes

After successfully completing this course, the students will be able to:

- Understand the physiology at cellular and system levels.
- Understand the mechanism and regulation of breathing, oxygen consumption and determination of respiratory quotient. .
- Understand the process of digestion and excretion.
- Understand the renal physiology
- Understand the process in haematology
- Learn the determination of hemoglobin content, blood groups and blood pressure.
- Understand the process of Physiology of Heart

SUGGESTED READINGS

1) Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. W.B. Saunders Company.
2) Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI-Edition John Wiley & sons,
3) Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
4) Vander A, Sherman J. and Luciano D. (2014). Vander's Human Physiology: The Mechanism of Body Function. XIII Edition, McGraw Hills

Paper- -XIV- DSE-2B : Evolutionary Biology

[Credits -4, Total Lectures-60]

Unit 1: Life Beginnings **7**

Chemogeny, RNA world, organic evolution, Evolution of eukaryotes.

Unit 2: Historical Review of Evolutionary Concepts **4**

Lamarckism, Darwinism, Neo-Darwinism

Unit 3: Evidences of Evolution: **10**

Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse, Molecular evolution:- universality of genetic code and protein synthesizing machinery, example of globin gene family.

Unit 4: Sources of Variation **8**

Sources of variations: Heritable variations and their role in evolution

Unit 5: Population Genetics **10**

Hardy-Weinberg Law: statement and derivation of equation, application of law to human Population; Evolutionary forces upsetting H-W equilibrium: Natural selection, genetic drift, mutation and migration.

Unit 6: Product of Evolution: **10**

Micro evolutionary changes - inter-population variations, clines, races, species concept, isolating mechanisms, modes of speciation—allopatric, sympatric & parapatric; Adaptive radiation/ macroevolution as exemplified by Galapagos finches.

Unit 7: Extinctions **3**

Back ground and mass extinctions: causes and effects; example of K-T extinction.

Unit 8: Origin and Evolution of Man **8**

Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin; Socio-cultural evolution of man.

About the course

The course provides information about the patterns and processes of evolution above the species level. Besides elaborating the process of speciation, it also categorically differentiates between the three methods of phylogenetic analysis *viz*., evolutionary systematics, phonetics and cladistics.

Learning outcomes

At the end of the course the students will be able to

- Understand the historical development of systematics past to the present.
- Understand the similarities and differences of different types of data.
- Understand the uses and limitations of phylogenetic trees.
- Appreciate the complexities and difficulties of various species concepts.
- Gain a basic grasp on the rules and philosophy of nomenclature.

SUGGESTED READINGS:

1) Ridley,M (2004) Evolution III Edition Blackwell publishing
2) Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.
3) Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin & Cummings.
4) Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
5) Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell

Paper- -XV- DSE-3B : ANIMAL BEHAVIOUR AND CHRONOBIOLOGY

[Credits -4, Total Lectures-60]

Unit 1: Introduction to Animal Behavior **7**

Origin and history of Ethology; Brief profiles of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen, Proximate and ultimate causes of behavior.

Unit 2: Patterns of Behavior **8**

Stereotyped Behaviours (Orientation, Reflexes); Instinct vs. Learnt Behavior; Associative learning, classical and operant conditioning, Habituation, Imprinting.

Unit 3: Social Behavior **5**

Concept of Society; Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging & dance language in honey bee and its advantages.

Unit 4: Sexual Behavior **5**

Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice).

Unit 5: Introduction to Chronobiology **9**

Historical developments in chronobiology; Biological oscillation: the concept of average, amplitude, phase and period. Adaptive significance of biological clocks.

Unit 6: Biological Rhythm **8**

Types and characteristics of biological rhythms: Short- and Long- term rhythms;
Circadian rhythms; Tidal rhythms and Lunar rhythms;
Photoperiod and regulation of seasonal reproduction in vertebrates; Role of melatonin in biological rhythms.

Unit 7: Biological Clocks **4**

Relevance of biological clocks; Chronopharmacology, Chronomedicine, Chronotherapy.

Unit 8: Chronobiology and drug discovery **4**

Brief idea of chronopharmacology and its role in various diseases

About course:

- Many animal species have a sort of internal clock, called a biological clock, which predicts cyclical environmental change and prepares the animal to deal with it. Biological rhythms are self –sustaining natural cycles of animal life history which maintain themselves regardless of the environmental factors

Learning outcomes:

- Understand the. Biological Clocks and its importance
- Understand how Biological Rhythm influence animal behavior
- Understand Social and Sexual Behaviour of animals
- Understand Behaviour Patterns of animals

SUGGESTED READINGS:

1) David McFarland, Animal Behaviour, Pitman Publishing Limited, London, UK.
2) Manning, A. and Dawkins, M. S, An Introduction to Animal Behaviour, Cambridge, University Press, UK.
3) John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
4) Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer Associate Inc., Massachusetts, USA.
5) Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004, Sinauer Associates, Inc.Publishers, Sunderland, MA, USA
6) Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.)R.D.Lewis. (3rdEd) 2002 Barens and Noble Inc. New York, USA
7) Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

Paper- -XVI- DSE-4B : Applied Zoology

[Credits -4, Total Lectures-60]

UNIT 1: Introduction to Aquaculture: **7**

Fish Culture, Breeding Pond, Fish Seed, Hatching pond. Transport of fish fry to rearing ponds. Harvesting, preservation of fish. By products of fishing industry and common fish diseases; Prawn culture: Culture of fresh water prawn

UNIT 2: Fisheries: **8**

Inland Fisheries; Marine Fisheries
Fishing crafts and Gears; Depletion of fisheries resources; Application of remote sensing and GIS in fisheries; Fisheries law and regulations.
Application of biostatistics in Fishery: morphometric analysis of length, weight to determine mean, mode, variance and standard deviation

UNIT 3: Apiculture: **8**

a) Apiculture: Species of honey bees in India. Life history of *Apis.* Methods of Bee keeping. Bee products and their uses. Natural enemies and their control.; Medicinal value of honey; Importance of bee colonies in crop pollination.

Unit-4: Lac culture 7

Lac insect and its life cycle, Cultivation of lac insect, host plants, processing and uses of lac.

Unit 5: Sericulture 8

Types of silk; Silkworms and their host plants; Mulberry silkworm culture; Life history of silkworm; Natural enemies and their control

Unit 6: Dairy Management **7**

Introduction to common dairy animals. Techniques of dairy management. Milk and milk products. Cattle Diseases.

Unit 7: Poultry Management **10**

Types of breeds. Rearing method. Diseases and control measures. Housing and Equipment, Deep litter System, Laying cages, Methods of brooding and Rearing,. Feed formulations for chicks, Diseases of fowl. Nutritive value of egg and meat. Incubation and hatching of eggs.

UNIT 8: Recent advances applied zoology **5**

Zebrafish as a model organism in research, transgenic animals (Salmon, chicken, goat, pigs) & its significance.

About course:

Applied Zoology is the enterprise of raising or harvesting of fishes, prawns, honey bees, lac insects, silkworms, poultry birds and dairy industry. It will allow students to employ the knowledge of zoology in entrepreneurship.

Learning outcome :

- Students will understands the fisheries
- Students will learn the sericulture and Lac culture techniques
- Students will understand the Apiculture techniques
- Students will learn how to initiate Aquaculture practices.
- Students can incorporate social information about poultry and dairy

SUGGESTED READINGS

1) Q Bone and R Moore, Biology of Fishes, Talyor and Francis Group, CRC Press, U.K.
2) D. H. Evans and J. D. Claiborne, The Physiology of Fishes, Taylor and Francis Group, CRC Press, UK von der Emde, R.J. Mogdans and B.G. Kapoor.The Senses of
3) Fish: Adaptations for the Reception of Natural Stimuli, Springer, Netherlands
4) C.B.L. Srivastava, Fish Biology, Narendra Publishing House
5) J.R. Norman, A history of Fishes, Hill and Wang Publishers
6) S.S. Khanna and H.R. Singh, A text book of Fish Biology and Fisheries, Narendra Publishing House

PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)
B.Sc. III-Zoology
w. e. f. June 2021 --Practicals Syllabus
(Where ever possible use virtual /CD/ Videos /models/simulations should be used during practical demonstration)

Practical -I

Paper No. based on : Papers- IX & XIII-

DSE-1A Molecular Biology
AND
DSE- 1B Animal Physiology: Life Sustaining Systems
(Credits-4)

DSE-1A Molecular Biology:-Practicals

1) Cell Division: Study of meiosis in onion bud
2) Molecular Biology: Isolation of DNA from suitable material
3) Chromatography: Demonstration/ Separation of amino acids using paper chromatography by TLC
4) Quantitative estimation of DNA using colorimeter (Diphenylamine reagent)
5) Quantitative estimation of RNA using Orcinol reaction
6) Demonstration of DNA and RNA using methyl green pyronine
7) Demonstrate of retrieval of gene sequence using bioinformatics tools - NCBI, Entrez, BLAST- -hemoglobin / insulin-- gene /protein in FASTA format
8) Electrophoresis: Demonstration of electrophoretic separate of protein /DNA by/Agarose/PAGE method
9) Codon Analysis: To find out codon sequences for known polypeptide chain of ten amino acids or to find out amino acid sequence from given codons (chart will be provided)
10) Karyotyping: Study of human Karyotype(s): Normal male and female (Classification of chromosomes according to size and position of centromere); Down syndrome, Klinefelter's syndrome, Turners syndrome using pictures of karyotypes & Idiograms

DSE- 1B Animal Physiology: Life Sustaining Systems

1. Estimation of salivary amylase activity
2.Measurement of blood pressure and heart beat under normal and any two physical stress condition.
3. Determination of Body Mass Index (BMI)
4.Enumeration of Red Blood Cells (RBCs) and White Blood Cells (WBCs) using haemocytometer.
5. Differential count of WBCs using Leishman's/Geimsa stain
6. Estimation of haemoglobin and carrying capacity of blood.
7. Preparation of haemin crystals
8. To determine blood clotting time using capillary method
9.Determination of abnormal and normal constituents of urine
10. Estimation of normal oxygen (O2) consumption using any aquatic animal and /or effect of temperature on the rate of oxygen consumption
11. Histological studies of mammalian organs: oesophagus, stomach, duodenum, ileum, rectum, liver, trachea, lung, kidney
12. Estimation of uric acid from sample
13 .**Field Visits:** Local water bodies for collection of planktons / Visit to medical college/ blood bank / IVF center, / Pranayam and yoga meditation center for study and submission of report
(*Subject to UGC guidelines)

Practical –II
Paper No. based on : Papers- X &XIV
DSE- 2A Principles of Genetics
AND
DSE- 2B Evolutionary Biology
(Credits-4)

Practicals:-

DSE- 2A Principles of Genetics

1. Examples in Genetics based on Monohybrid ratio (05 examples)
2. Examples in Genetics based on Dihybrid ratio (05 examples)
3. Examples based on multiple alleles: Blood groups, Coat color in rabbit (05 examples)
4. Examples based on gene interactions (Complementary, Supplementary & Inhibitory interactions) (05 examples).
5. Examples based on human genetic traits: Rolling tongue, free & attached ear lobes, hitchhiker's thumb, PTC taste, Widows Peak Hairline (01 example from each)
6. Laboratory culture of *Drosophila* to study its life cycle
7. Study of normal genetic traits of *Drosophila* using cultured material
8. Pedigree analysis of some human inherited traits
9. Fieldwork to collect data on genetic diseases from local hospitals
10. To perform statistical analysis (age, sex, family history etc.) of data on genetical diseases from local hospitals (Bar diagram, Pie Chart)

DSE- 2B Evolutionary Biology

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1. Study of types of fossils using samples available in Zoology and Geology Lab./or models (for eg. Limulus, Peripatus, Dipnoi, Sphenodon, *Archaeopteryx*, examples based on: Molluscan, Echioderms, Brachiopods and as available in laboratory)
2. Study of Zoogeographical Regions of world to understand the concept of speciation with examples
3. Study of biogeographic zones of India to study evolutionary variation and adaptation in species with examples
4. Study of macroevolution using Darwin's Finches using charts/models

5. Study of homologous organs from suitable specimens/models in the museum
6. Study of analogous organs from suitable specimens/ models in the museum
7. Study of adaptive radiation in mammals from museum specimens/models
8. Examples based on Hardy Weinberg Law (08 examples)
9. Study of phylogeny of horse using model/charts (reconstruction using limbs and teeths of horse ancestors)
10. Construction of phylogenetic tree using bioinformatic tools/softwares (Searching sequences of any five genes or proteins using biological databased (NCBI, GenBank or DDBJ, construct phylogenetic tree using Clustal X, Phylip, NJ & submit the report).
11. Visit to natural history museum and submission of report
12.Project work- Research project should be prepared in consultation with faculty either individually or in group as required. The research guide will support students in selecting and executing the entire topic and preparing the report for final submission during examination after approval of the guide in the following format-
(a) Format of Report: Title, Introduction, Review of literature, Objectives, Material and Methodology, Result and discussion, Conclusion & References
(b) Submission & presentation of research work: At the time of practical examination submit the final project report (hard copy) and present your research findings using 'PowerPoint'.

Practical –III

Paper No. based on : Papers- XI & XV

DSE- 3A Endocrinology
AND
DSE- 3 B ANIMAL BEHAVIOUR AND CHRONOBIOLOGY
(Credits -4)

Practicals- DSE- 3A Endocrinology–

1. Identification explanation of endocrine glands in rat using model / virtual method
2. Study of the permanent slides of endocrine glands: Pineal, pituitary, testis, ovary and placenta
3. Observation of insect life cycle and its hormonal control- metamorphosis
4. Observation of amphibian metamorphosis and its hormonal control.
5. Study of circadian functions in human and its correlation with hormones (daily eating & pre & post-meal insulin level, sleep & role of melatonin and day length & body temperature w. r. t. hypothalamus).
6. To study cyclical variation in body temperature during menstrual cycle using model/chart
7. To study flight and fight behavior to understand reflex action and role of adrenalin hormone
8. To collect data on hormonal disorders from local hospitals and its interpretation
9. Hormonal regulation of reproductive hormones in human with age using chart
10. Study of contraceptive pills with reference to hormone and its mechanism
11. Visit to IVF centre/hospital and submit a report

Practicals- DSE- 3 B ANIMAL BEHAVIOUR AND CHRONOBIOLOGY–

1. Observation of nests and nesting behavior of the birds.
2. Observation of termatoria of ants and termites.
3. Study and observation of casts in ants and honey bees.
4. Observation of geotaxis behaviour in earthworm.
5. Observation of phototaxis behaviour in insect larvae.
6. Observation of intra-specific behavior: Dancing behavior in honey bees; flocking behavior in birds and Courtship behavior in Great Indian Bustard and Peacock (virtual)
7. Observation of inter-specific behavior between: Ant-*Acacia*, Buffalo-cattle egret, Fig-wasp pollination, Root nodules-bacteria, Tick-dog using models/charts/museum specimens

8. Recording and interpretation of calls, songs, vocalizations of insects (e.g. cricket), amphibians, birds and mammals and their importance in signaling behavior (based on actual records or internet collection)
9. Observation of foraging behavior in ants to study chemo-signaling
10. Observation of foraging behavior in *Calotes*, *Hemidactylus*, *Chameleon* and *Naja*
11. Observation of nest parasitism in Asian koel
12. **Study tour /:**
(a) Agriculture research center, Yoga & Meditation center, Biotechnology lab, etc.
(b)summer or winter training programmes/workshops/field survey with NGOs & GOs: students can work in various institutes/laboratories/NGOs etc. for period up to 07 days and prepare a report for submission during exam
(c) Visit to Forest/ Biodiversity Park/Zoological Park
to study behavioural activities of animals and prepare a short report.

Practical –IV

Paper No. based on : Papers- XII & XVI
DSE 4 A- Wildlife Conservation & Management
AND
DSE 4B- Applied Zoology

(Credits-4)

Practical-DSE 4 A- Wildlife Conservation & Management

1. Temporary preparation to study of faunal diversity of zooplanktons/insects/mollusca from surrounding area
2. Study of faunal diversity (amphibians, reptiles, birds and mammals) from campus & surrounding area
3. Demonstration of basic tools for field studies: Binocular, Global Positioning System, Cameras, Plankton & butterfly collecting net, insect collecting bottles, Mounting chamber for insects & preservation of museum specimens
4. Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers etc.
5. Casting of pug marks of common animals using plaster of Paris in and around campus
6. To perform line transect and quadrat method to study diversity in and around campus
7. To calculate species richness, abundance and Shannon diversity indices from collected data
8. Study of endangered species from India, their bio-geographic distribution and conservation status: Great Indian Bustard, Jerdon's Courser, Lesser Florican, Asian Elephant, Nilgiri Tahr, lion-tailed macaque, Nilgiri Langur, Lion, Sarus crane, Ganges River Dolphin, Hoolock Gibbon, Wild Ass, Olive Ridley Sea Turtle, Indian Pangolin, Leopard Cat.
9. Study of IUCN Categorization of Red List of animals (Data deficient, Least concern, Near Threatened, Vulnerable, Endangered, Critically endangered, Extinct in wild and Extinct)
10. Visit to local/state/national wildlife sanctuary or protected area or zoo and submission of report

Practical - DSE 4B- Applied Zoology

1. Morphometric and meristic characters of fishes (Length, width, weight, fins, scale type etc.)
2. Identification of major carps (*Labeo, Catla, Mrigal, Cyprinus*)
3. Preparation and study of temporary mount of cycloid and placoid scale from preserved specimens
4. Preparation and study of models of crafts, gears and their importance in Fisheries
5. Analysis of water quality parameters for Aquaculture: estimation of pH, Total Dissolved Solids (TDS);

dissolved O2 and free CO2 and hardness of given sample.
6. Study of honey bee morphology and identification of castes in honey bees (museum specimens/charts/specimens)
7. Observation of life cycle of mulberry silkworm, *Bombyx mori* (model/chart/specimens) and life cycle of tasar silkworm, *Antheraea mylitta*.
8. Test for good quality eggs (Floating test, cracking test) and for fertilized and unfertilized eggs (Light test, Cracking test).
9. Common dairy and poultry breeds in Solapur district
10. Biostatics: examples based on fish morphometry (any 05)
10. Demonstration of induced breeding in Fishes (video/model)
12. **Tour/Review of research:**

a) Excursion/Study Tour:- Visit to any National Parks/ Zoo parks / visit to any fish farm/ pisciculture unit/or Lab./marine water / freshwater habitat / Wildlife Sanctuaries / National or State Research Institutes / University departments / or other appropriate Institutes/poultry/dairy/sericulture units.
OR
b) Review of research work / student research publication: Review of 10 research papers related to zoology or life science and to prepare a review articles of minimum 5-10 pages
OR
c) Publication of one research paper in a peer reviewed journal in collaboration with teacher (accepted/published or personated research paper in seminar/conferences/symposia and submission of copy of presented paper with certificate

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Note:
1. Kindly note that during field visits students shall observe only animals and make record of the observations without disturbing natural habitat not kill the animals. Students should be told about the importance of biodiversity and conservation;
2. Students are encouraged to prepare and submit a concise report of the excursion;
3. Report on multiple excursion tours may be clubbed for preparing and submitting report at the time of final examination will be allowed;
4. Reduce or avoid the use of plastic files during submission of reports / projects as an ecofriendly method

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Skeleton paper for practical examination
(University Examination for 80 Marks)
Practical – I-

Practical – I-: Papers- IX & XIII-
DSE-1A Molecular Biology
AND
DSE- 1B Animal Physiology: Life Sustaining Systems

Question	Marks
Que:1- Preparation of meiotic stages from onion buds/ bioinformatics	10
Que:2- Isolation of DNA from given material /DNA estimation/RNA estimation	10
Que:3- Example(s) based on codon analysis/Chromatography/	10
Que:4- Estimation/enumeration of- haemoglobin/RBC/WBCs/salivary amylase /uric acid from sample/BMI	10
Que:5- Preparation of haemin crystals from given sample/Differential count of WBCs/Estimation of O2 consumption from aquatic animals/ Determination of blood	10

clotting time/ abnormal and normal constituents of urine	
Que:6- Spottings based on: a) Identify and describe: analysis karyotype b) Identify and describe: analysis of nucleotides separated using electrophoresis c) Identify and describe: methyl green pyronin-tissue /stained image d) Identify, sketch and describe: T.S. of esophagus, stomach, duodenum, ileum e) Identify, sketch and describe: T.S. of rectum, liver, trachea, lung, kidney	10
Que:7- Submission of Field Visit Report (any one of): Visit to local water bodies for collection of planktons / Visit to medical college/ blood bank / IVF center/yoga center	10
Que:8- Journal & Viva	10

Practical –II
Papers- X&XIV
DSE- 2 A Principles of Genetics
AND
DSE- 2B Evolutionary Biology

Questions	Marks
Que:1-Example based on monohybrid/dihybrid ratios/supplementary /complementary interactions/Multiple alleles (any one)	10
Que:2-Perform statistical analysis of given data on genetic disease(s) using MS-Excel©	10
Que:3- Construction of pedigree analysis of given data/example	05
Que:4-Example based on Hardy-Weinberg Law (any one)	10
Que:5-Construction of phylogenetic tree using bioinformatics tool	05
Que:6- Spottings based on: a) Identify and describe: Human genetic traits (rolling tongue, free & attached ear lobes, hitch-hikers thumb, wideow's peak, PTC taste) b) Identify and describe: Genetic traits of *Drosophila* (any one) c) Identify and describe: types of fossils (*Limulus*, *Peripatus*, *Archaeopteryx*, *Sphenodon* etc.) d) Identify, sketch and describe: Zoogeographic zones/biogeographic zones/macroevolution using charts/models/photographs e) Identify, sketch and describe: Analogous/homologous organs/adaptive radiation using charts/models/photographs/museum specimens	10
Que:7-Submission of Research Project Report & PPT presentation	20
Que:8-Journal & Viva	10

Practical –III **Papers- XI & XV** **DSE- 3A Endocrinology** **AND** **DSE- 3 B ANIMAL BEHAVIOUR AND CHRONOBIOLOGY**	
Questions	**Marks**
Que:1-Identify, sketch and discuss location, structure and function of endocrine glands of rat from model/chart (any two)	10
Que:2-Identify, sketch and discuss: insect life cycle & its hormonal control/amphibian metamorphosis & its hormonal control	10
Que:3-Interpret the given behavioral interaction: ant-Acacia; buffalo-cattle egret; fig-wasp; root nodules-bacteria; tick-dog based on model/chart/museum specimens	10
Que:4-Identify and interpret behavioral significance of call/song/vocalization (any 01 from journal)	10
Que:5-Discuss the behavior & its significance: Nest/termatoria/geotaxis/phototaxis/foraging (model/chart/museum specimens)	10
Que:6- Spottings based on: a) Identify and describe: Temperature variation during menstrual cycle/Circadian cycle & its hormonal correlation (any 01 from journal) b) Identify and describe: Flight & Fight response/contraceptive pill/ c) Identify and describe: hormonal regulation of reproduction d) Identify and describe behavior: Dancing/flock/courtship e) Identify and describe: Casts in honey bee	10
Que:7-12. Study tour / Internship: (a) Agriculture research center, , Biotechnology lab, etc. (b) summer or winter training programmes/workshops/field survey with NGOs & GOs: students can work in various institutes/laboratories/NGOs etc. for period up to 07 days and prepare a report for submission during exam (c) Visit to Forest/ Biodiversity Park/Zoological Park to study behavioural activities of animals and prepare a short report.	10
Que:8-Journal & Viva	10

Practical –IV **Papers- XII & XVI** **DSE 4 A- Wildlife Conservation & Management** **AND** **DSE 4B- Applied Zoology**	
Question	**Marks**
Que:1-Calculate Shannon Diversity Indices from given data	**10**
Que:2-Perform line transect/quadrat method to study diversity	**10**
Que:3-Perform temporary mount & identification of zooplanktons/insects/mollusca from given sample	**10**
Que:4-Perform estimation of O_2/CO_2 /Hardness/TDS from given sample/biostatistics example	**10**
Que:5-Perform temporary mount of cycloid/placoid scales from preserved specimens	**10**
Que:6- Spottings based on: a) Identify and describe: GPS/Binocular/Plankton collection Net/camera b) Identify and describe: Pug mark/bio-geographical distribution of endangered species from India (any 01 from journal) c) Identify and describe: IUCN categorization of given fauna / air breathing organs in fish-(any one from journal) d) Identify and describe morphology & economic importance of fish /types of castes of honey-bee/poultry & dairy breeds (chart/photo)-Any 01 from journal e) Identify and describe: any 01 cast or gear from journal	**10**
Que:7- a) Excursion/Study Tour:- Visit to any National Parks/ Zoo parks / visit to any fish farm/ pisciculture unit/or Lab./marine water / freshwater habitat / Wildlife Sanctuaries / National or State Research Institutes / University departments / or other appropriate Institutes//poultry/dairy/sericulture units. OR	**10**

b) Review of research work / student research publication: Review of 10 research papers related to zoology or life science and to prepare a review articles of minimum 5-10 pages OR c) Publication of one research paper in a peer reviewed journal in collaboration with teacher (accepted/published or personated research paper in seminar/conferences/symposia and submission of copy of presented paper with certificate	
Que:8 Journal & Viva	**10**

Important Instructions:
-All necessary precautions must be taken while organizing study tour with special reference to the safety of students as per Higher Education rules and regulations.
Note:
-As per the guidelines of **UGC notification number F.14-6/2014(CPP-II) dated 1stAugust, 2014** it is now essential to make necessary modifications to stop dissection and promote and orient students towards the knowledge component rather than skill development. However, ITC based virtual dissections are promoted. Now, the responsibility to discontinue dissections and use of animals in experiments totally rests on concerned authorities of respective colleges/Institutes. As per the notification it is important to encourage the field trips and observations without disturbing the biodiversity. For laboratory observations existing permanent slides and specimens should be shown. As per the guidelines of UGC , all the Zoology departments should be empowered with infrastructure to adopt Information communication technology (ICT) required for the purpose of virtual dissections for which virtual class room / laboratory to be enriched with few computers (according to the strength of students),internet facility , printer etc.

Equivalence:

Paper no.	**Old CBCS**	**New CBCS w e f .2021-22**
	Semester-V	
Paper no. IX	Non-chordate	**NO- Equivalence**
Paper no. X	Biostatistics, bioinformatics, medical zoology, evolutionary biology and Biodiversity & Conservation Biology	**NO- Equivalence**
Paper no. XI	Comparative anatomy of chordates	**NO- Equivalence**
Paper no. XII	Developmental biology	**NO- Equivalence**

Semester-VI		
Paper no. XIII	Physiology	**DSE- 1B -Animal Physiology: Life Sustaining Systems (cc) - Equivalence**
Paper no. XIV	Endocrinology, environmental biology & toxicology	**NO- Equivalence**
Paper no. XV	Molecular Biology & Biotechnology	**DSE-1A -Molecular Biology (CC-Hon) Equivalence**
Paper no. XVI	Techniques in Biology **AND** Economic Zoology	**NO- Equivalence**

Chairman
(Board of studies in Zoology)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Microbiology

Name of the Course: B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

P.A.H.Solapur University, Solapur , Faculty of Science
Choice Based Credit System (CBCS)
B.Sc.-III Microbiology
(2021-2022 : W.e.f. June 2021)

Introduction:

The Curriculum development plays a very vital role in the development of quality of education. The education system should be such that students will be able to compete locally, regionally, nationally as well as globally. The present situation demands developing "learner-centric approach while redesigning of curriculum. There is also need to allow the flexibility in education system. The choice based credit system (CBCS) allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers and thus offers more flexibility for student. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. In view of this,PAH Solapur University, Solapur has implemented Choice Based Credit System of Evaluation at Undergraduate level. While designing the syllabi of microbiology for undergraduate course for semester V and VI, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template. This will help to bring a match across all the Indian universities.

Microbiology deals with the study of microorganisms. This branch of life science has immensely grown up widening its horizons and opening new frontiers of knowledge. The scope of microbiology as a subject is immense due to its ability to control all critical points of many fields like medical, dairy, pharmaceutical, industrial, clinical, research, water industry, agriculture, nanotechnology, etc. A career in microbiology is lucrative option. There is demand of trained microbiologists in a vast range of industries and institutes like research and development laboratories of government and private hospitals, research organizations, pharmaceutical, food, beverage and chemical industries. To cater the needs, discipline specific papers on industrial,agricultural,environmental,medicalmicrobiology,microbial biochemistry,virology,immunology have been included in the curriculum for semester V and VI. At the same time, the framework is so designed as to maintain standards of microbiology degree and the learning outcomes.

Learning Outcomes based approach to Curriculum Planning:

The Learning Outcomes-based Curriculum Framework (LOCF) for the B.Sc. (Honours) degree in Microbiology is designed to suit the need of the hour, in keeping with the emergence of new areas of microbiology. The framework is architected to allow for flexibility in programme design and course content development, while at the same time maintaining a basic uniformity in structure in comparison with other universities across the country. The programme is designed to build a strong microbiology knowledge base in the student and furthermore, acquaints the students with the applied aspects of this fascinating discipline as well. The student is thus equipped to pursue higher studies in an institution of her/his choice, and to apply the skills learnt in the programme to solving practical societal problems. The programme offers an elective course to the student for skill enhancement courses that prepares the student for an eventual job in academia or industry.

Graduate Attributes in Microbiology:

Some of the characteristic attributes of an Honors graduate in Microbiology include:

- **Disciplinary Knowledge acquisition**: gathers in-depth knowledge of basic and applied areas of microbiology.

- **Core microbiology laboratory skills**: understands various methods of safe handling, culturing and storage of microorganisms in the laboratory.
- **Interdisciplinary approach**: becomes aware of the role of microbiology in interdisciplinary research as well as in daily life.
- **Environmental literacy**: develops a basic understanding of the microbiological principles that have environmental implications, and gains an awareness of regulatory requirements and their compliance in biotechnology and microbiological research.
- **Thinking ability**:inculcates independent thinking and apply knowledge acquired.
- **Spirit of Team work**: Reveals the importance of interacting with and working alongside people from diverse backgrounds.
- **Global perspective**: becomes acquainted with standard international practices and emerging technologies used to study microbes.
- **Skills for Communication**: acquires oral as well as written skills through oral presentations of ongoing developments in the field and compiling of information in brief in written format.
- **Ethical awareness:develops** attitude of conducting their work with honesty
- **Self-motivation**: develops planning, organization and time management skills.
- **Digitally literatracy**: : acquires Skills of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

Outline of Choice Based Credit System:

1. **Core Course***:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. **Elective Course***:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. **Ability Enhancement Courses (AEC***):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• **Credit**: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

PAH Solapur University, Solapur
Faculty of Science-New
Choice Based Credit System (CBCS)- (w.e.f.2021-22)
Draft Structure for B. Sc-III

Subject/ Core Course	**Name and Type of the Paper**		**No. of papers/ Practical**	**Hrs/week**			**Total Marks Per Paper**	**UA**	**CA**	**Credits**
	Type	**Name**		**L**	**T**	**P**				
Class :	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)		**English (Business English)**	Paper- III	4.0	--	--	100	80	20	4.0
Discipline Specific Elective (DSE) (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.		**DSE-1A-** Virology	Paper- IX	3	--	--	100	80	20	4.0
		DSE- 2 A- Agricultural Microbiology	Paper -X	3	--	--	100	80	20	4.0
		DSE- 3 A- Immunology	Paper- XI	3	--	--	100	80	20	4.0
		DSE 4 A-: Industrial Microbiology	Paper- XII	3	--	--	100	80	20	4.0
		(Add-on-self learning)-MOOC/SWAYAM COURSE/INTERNSHIP		--	--	--	--	--	--	2.0
Grand Total				**16.0**	--	--	**500**	**400**	**110**	**22**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)		**English (Business English)**	Paper IV	4.0	--	--	100	80	20	4.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.		**DSE- 1B-** Microbial Genetics	Paper -XIII	3.0	--	--	100	80	20	4.0
		DSE- 2B- Microbial Biochemistry	Paper- XIV	3.0	--	--	100	80	20	4.0

	DSE- 3B- Clinical Microbiology	Paper- XV	3.0	--	--	100	80	20	4.0
	DSE 4B- Environmental Microbiology	Paper- XVI	3.0	--	--	100	80	20	4.0
	SEC-								
Total (Theory)			**16.0**	--	--	**500**	**400**	**100**	**20**
DSE - Practical (Annual Exam)	**DSE- 1 A&B**	Practical- IX & XIII	--	--	5	100	80	20	4.0
	DSE -2 A&B	Practical- X&XIV	--	--	5	100	80	20	4.0
	DSE- 3 A&B	Practical- XI&XV			5	100	80	20	4.0
	DSE- 4 A& B	Practical- XII & XVI			5	100	80	20	4.0
Total (Practicals)					**20**	**400**	**320**	**80**	**16**
Grand Total			**32.0**		**20**	**1400**	**1120**	**280**	**58**

Summary of the Structure of B.Sc.Programme as per CBCS pattern

Class	**Semester**	**Marks-Theory**	**Credits-Theory**	**Marks-Practical**	**Credits-Practicals**	**Total – credits**
B.Sc.-I	I	500	20	--	--	20
	II	550	20	400	16	36
B.Sc.-II	III	350	14	--	--	14
	IV	350	14	300	12	26
B.Sc.-III	V	500	22	--	--	22
	VI	500	20	400	16	36
Total		2750	110	1100	44	154

B.Sc.Programme :
Total Marks : Theory + Practical's = 2750 +1100 =3950
Credits : Theory + Practical's = 110 + 44 = 154
Numbers of Papers Theory: Ability Enhancement Course(AECC) : 05
Theory: Discipline Specific Elective Paper (DSE) : 08
Theory: DSC : 12
Skill Enhancement Courses /Add on : 01
Total : Theory Papers : 31
: Practical Papers : 11

Abbreviations :
L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper

SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

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- **Title of the Course**: B.Sc. Part-III (Honors)
- **Subject:** Microbiology

- **Introduction**: This course provides a broad overview of Microbiology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Microbiology knowledge. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

- **Objectives of the course**: The objectives of B. Sc. Microbiology course are:

1) To impart knowledge with respect to the subject and its practicable applicability.
2) To enhance understanding of basic and advanced concepts in microbiology.
3) To develop the awareness of various emerging areas of Microbiology.
4) To train students for further studies helping in their bright career in the subject
5) To expose the students to different processes used in industries and in research field
6) To develop their ability to apply the knowledge of microbiology in day to day life.
7) To prepare the students to accept the challenges in life sciences.
8) To make students skillful to work in various industries, research labs and health sector.

Course outcome and Advantages: After completing the course students will be familiarized the with necessary laboratory techniques and tools of microbiology and provide an exposure in research, analytical and presentational skills. Microbiology has tremendous job potential. The successful students will be able well trained to get various microbiology related job. .

- Medium of Instruction: English
- Syllabus Structure:
- The University follows semester system.
- An academic year shall consist of two semesters.
- B.Sc. Part-Ill Mcrobiology shall consist of two semesters: Semester V and Semester VI

In semester V: there will be Four DSC papers having paper IX to XII of 100 marks each. There will a Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English and one self learning compulsory course of any one from -MOOC/SWAYAM COURSE/INTERNSHIP

In Semester VI: there will be four DSC papers having paper XIII to paperXVI of 100 marks each. There will a Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English

The scheme of evaluation of performance of candidates shall be based on University Assessment (UA) as well as College Internal Assessment (CA) as given below.

For B.Sc.Part-III Microbiology SemV& VI the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

- Practical course examination is of 100 marks shall be conducted at the end of semester II. The practical examination of 400 marks shall also consist of 320 marks for University practical assessment and 80 marks for college internal assessment (CA).

• **Scheme of Evaluation**: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks..

Semester – V: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper IX to paper XII)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper IX to paper XII)
c) Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English
d) One Add-on - self learning courseMOOC/SWAYAM COURSE/INTERNSHIP

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

Semester – VI: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper XIII to paper XVI)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper XIII to paper XVI)

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
Practical Examination: (400 marks)
University Examination (320 marks): Number of practicals : 04

Practical-I: Based on Papers- IX & XIII (80 UA + 20 CA)
Practical-II: Based on Papers- X & XIV :(80 UA + 20 CA)
Practical-III: Based on papers -XI& XV :(80 UA + 20 CA)
Practical-IV: Based on papers -XII& XVI :(80 UA + 20 CA)
Internal Continuous Assessment: Total 80
(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 320 marks (Practical I to IV for Four separate days) will be conducted at the end of semester VI

Passing Standard:
The student has to secure a minimum of 4.0 grade points (Grade C) in each paper.

A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same stipulated marks of external examination and his/her performance shall be scaled to 100 marks.

• **ATKT:**

passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Mcrobiology examination and clearly passed in B.Sc. Part-I-Mcrobiology shall be permitted to enter upon the course of Semester V of B.Sc. III Microbiology.

PAH SOLAPUR UNIVERSITY, SOLAPUR Faculty of Science and technology New CBCS Structure for B.Sc – III Microbioology Theory -								
Semester V								
Paper No.	**Title of Paper**	**Hrs/Week**			**Paper Marks**	**UA**	**CA**	**Credits**
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE-IX	**DSE- 1A-** Virology	3	-	-	100	80	20	4
DSE-X	**DSE- 2A-** Agricultural Microbiology	3	-	-	100	80	20	4
DSE-XI	**DSE- 3A-** Immunology	3	-	-	100	80	20	4
DSE-XII	**DSE 4A-** Industrial Microbiology	3	-	-	100	80	20	4
SEC-	**Add-on-self learning - MOOC/SWAYAM COURSE/INTERNSHIP**	--	--	--	--	--	--	2.0
Total		16	-	-	500	400	100	22

Semester –VI								
Paper No.	**Title of Paper**	**Hrs/Week**			**Paper Marks**	**UA**	**CA**	**Credits**
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE- -XIII	**DSE- 1B-** Microbial Genetics	3	-	-	100	80	20	4
DSE-XIV	**DSE- 2B-** Environmental Microbiology	3	-	-	100	80	20	4
DSE-XV	**DSE- 3B-** Clinical microbiology Microbiology	3	-	-	100	80	20	4
DSE-A	**DSE 4B-** Microbial Biochemistry	3	-	-	100	80	20	4
SEC-								
Total		16			500	400	100	20

Practical No.	Paper No. based on	Title of Paper	Hrs/Week			Paper Marks	UA	CA	Credits
			L	T	P				
I	Papers - IX & XIII	**DSE-1A-** Virology **AND** **DSE- 1B-** Microbial Genetics	-	-	5	100	80	20	4
II	Papers - X&XIV	**DSE- 2 A -** Agricultural Microbiology AND **DSE- 2B -** Environmental Microbiology	-	-	5	100	80	20	4
III	Papers - XI&XV	**DSE- 3A-** Immunology **AND** **DSE- 3 B -** Clinical Microbiology	-	-	5	100	80	20	4
IV	Papers - XII & XVI	**DSE 4 A-** : Industrial Microbiology **AND** **DSE 4B-** Microbial Biochemistry	-	-	5	100	80	20	4
	Total		**-**	**-**	**20**	**400**	**320**	**80**	**16**

Abbreviations:

L: Lectures
T: Tutorials
P: Practicals
UA: University Assessment by End Semester Examination
CA: College Assessment by Internal Continuous Examination
UA: University Assessment: - University Theory paper shall be of 70 marks
CA: College Assessment: - The internal examination for theory and practical course

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[Credits -4, Total Lectures-60]

DSE – 1- A: Paper MIC IX: Virology

Unit I Introduction and Classification of Viruses (11)

A. General properties and structure of virus
B. Viroids and Prions
C. Viral classification on the basis of LHT system and as per international committee

Unit II Reproduction of bacterial viruses (11)

A. T_4 Bacteriophage - Lytic cycle
B. Temperate phages and lysogeny of λ phages

Unit III Animal Viruses (14)

A. Reproduction of Animal viruses: Adeno viruses and Influenza viruses
B. Oncogenic Viruses- i) Types of Oncogenic viruses, DNA and RNA viruses, (ii) Types of cancer, Characteristics of cancerous cells, (iii) Hypotheses of Cancer: Somatic mutation, Viral gene and Defective immunity

Unit IV Plant Viruses (12)

A. Viral plant Diseases – Tobacco mosaic virus[TMV],Cauliflower Mosiac virus[CaMV]
B. Prevention and Control of Plant Viral Diseases

Unit V Techniques in Virology (12)

A. Isolation, cultivation,Purification and Enumeration of viruses
B. One step growth experimen**t**

References:

1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Genetics of bacteria and their viruses – William Hays
4. Virology – Biswas
5. Virology – Luria
6. Microbiology - Prescott, Harley and Klein's, Willey Sherwood

Woolverton,McGraw – Hill International Edition, (2008).

7. Plant viruses- by Mathews

8. Microbiology by Davis
9. Plant diseases by Singh

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[Credits -4, Total Lectures-60]

DSE – 2 – A: Paper MIC - X: Agricultural Microbiology

Unit I- Introduction toSoilMicrobiology (11)

A. Introduction to soil– Definition of soil, Soil formation, types, structure andproperties
B. Soil as anecosystem, rhizosphere and phyllosphere
C. Soil microorganisms, types and theirrolein soil fertility, humus.
D. Interactions in soil.

Unit II- Role of microorganisms inelementalcycle (11)

A. Carboncycle
B. Nitrogencycle
C. Sulphurcycle
D. Phosphorouscycle

Unit III- Composting and Biodegradation (14)

A. Compost production with reference to organic waste, types of microorganisms, and factors affecting - aeration, C:N:P ratio, moisture content, temperature, pH, and period ofcomposting.
1. Greenmanure
2. Farm yardmanure
3. Towncompost
4. Vermicompost
B. Biodegradation of Cellulose, hemicelluloses, Lignin, Pectin, and Pesticides

Unit IV-Plantpathology (12)

A. Common symptoms produced by plantpathogens
B. Modes of transmission of Plant diseases: Oily spots on pomegranate – *Xanthomonasoxynopodis*, whip smut of sugarcane, soft rot ofpotato
C. Control measures of plantdiseases

Unit V Applications of BiotechnologyinAgriculture (12)

A. Biofertilisers (Azo and Rhizo and PSB) production andapplications.
B. Bioinsecticides – *Bacillus thuriengenesis* and *Trichodermaviridae, Other examples*
C. Genetically Modified Crops with examples
D. Viral pesticides:Concepts & applications

References

1. Soil Microbiology – Subbarao,N.S.

2. Microbial dynamics and diversity – DesyStaley

3. Biology of Microorganisms – Brock, Parker, Madigen, 9thedition
4. Agricultural Microbiology- Bagyaraj andGhosh
5. Plant Diseases- SinghR.S.
6. Soil Microbiology –Alexander.
7. Industrial Microbiology – PatelA.H.
8. Textbook of Biotechnology – R.C.Dubey,

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[Credits -4, Total Lectures-60]

DSE – 3 – A: Paper MIC - XI: Immunology

Unit I. Immune system and Adaptive Immunity (16)

A] Immune system

a]structure &function of lymphoid organs:

1]Primary and organs - Thymus, bone marrow,

2] Secondary lymphoid organs-- spleen , lymph node and Mucosa associated lymphoid tissue(MALT)

b]cells of immune system &their role

i]. Classification of cells of immune system-Lymphoid and myeloid cells

ii]. Structure and functions of Lymphoid cells- T cells and T cell subsets, NK cells, B cells and dendritic cells

iii]. Structure and functions of myeloid cells – Granulocytes, Monocytes and macrophages

B]Adaptive Immunity

a) Humoral (antibody) mediated response –Cells involved and mechanism
b) Cell mediated – cells involved, mechanism (endogenous and exogenous pathways); cytokines and their role
c) Primary and secondary immune response
d) **Monoclonal antibodies** – i) Production (hybridoma technology) ii) Applications of Monoclonal antibodies in Diagnosis, Research and Treatment

Unit II.Major Histocompatibility complex (12)

A. Organization of MHC genes in man, Classes of MHC molecules – structure and their role,
B. HLA typing
C. Types of grafts and their rejection.

Unit III.Complement system **(06)**

A. Components of complement and their properties,
B. Activation of complement –classical and alternate pathway
C. Biological effects of complement

Unit IV Immunological disorders **(16)**

A. Hypersensitivity – Classification - based on

1. Time:Immediate and delayed typehypersensitivity
2. Mechanism of Pathogenesis
   - **a) Type I :** Anaphylaxis, Atopy
   - **b) Type II :** Autohaemolytic anemia
   - **c) Type III :** Arthus reaction, Serum sickness
   - **d) Type IV:** contact dermatitis, Allergy of infection

B. Autoimmunity :a. Mechanism of Autoimmunity

b. Types of Autoimmune diseases-

a) Hemocytolytic b) Organ Specific(Graves disease, Myasthenia gravis,pernicious anemia)

c) Non organ specific (S.L.E., R.A.)

Unit V Immunohaematology **(10)**

A. ABO blood group system
B. Rh blood group system
C. Blood transfusion reaction and its complications

References

1. Essentials of Immunology Roitt Evan, Brostoff J. Male D. (1993) 6th Edition.
2. Immunology - Kuby J. (1996) - W.H. Freeman and Co.
3. Immunology – Fudenberg
4. Medical Microbiology - Davis and Dulbecco
5. Medical laboratory technology – RamnaikSood
6. Diagnostic Microbiology – Bailey's and Scotts
7. Immunology – a problem approach by Wood, Hood and Weison
8. Medical Bacteriology – Dey and Dey
9. Handbook of Immunology- G.P. Talwar (1983) Vikas Publishing Pvt. Ltd 10.Textbooks of medical microbiology-Anant Narayan
11. Immunolgy& Serology-Carpenter.

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[Credits -4, Total Lectures-60]

DSC – 4A : Paper MIC – XII : Industrial Microbiology

Unit I Food Microbiology **(11)**

A. Food as a substrate for microorganisms
B. Food Spoilage (Meat and Poultry, Fruits and Vegetables)& food borne diseases-food infection (Salmonella) & food poisoning (Clostridium)
C. Principle and methods of food preservation
D. Food Fermentations – i) Idli ii) Bread

Unit II Dairy Microbiology **(11)**

A]Spoilage of milk
B]Fermented dairy products: i) Cheese ii) Yogurt

Unit III Industrial production of **(12)**

A. Streptomycin
B. Lysine
C. rDNA products – Insulin
D. Vitamin B12

Unit IV Production of alcoholic beverages **(12)**

A. Grape wine – Definition, types, production of White table wine and Red table wine
B. Post fermentation spoilage of wines: Microbial and non microbial spoilage of wines
C. Beer – Definition, types, production of Lager beer and Ales Beer.

Unit V Downstream processing and quality control: **(14)**

A) Downstream processing:
Filtration, Cross flow filtration, Flocculation, Whole broth processing Solvent extraction, Concentration, Centrifugation, Crystallization, Distillation, Adsorption elution, Precipitation and Chromatography
B) Quality control in fermentation industry: Test for sterility, pyrogenicity, allergy, Carcinogenicity, toxicity for Pharmaceutical and health care and food products

References

1. Principles of fermentation technology – Whitkar and Stanbury
2. Pharmaceutical Microbiology – Huggo
3. Biochemistry – Fox and Nelson
4. Industrial Microbiology – Prescott and Dunn
5. Microbial technology – Peppler
6. Advances in Biotechnology – S.W. Jogdand.
7. Textbook of Biotechnology – R.C. Dubey,
8. Biotechnology – B.D. Singh

9. Industrial Microbiology – Casida
10. Industrial Microbiology by A.H. Patel.
11. Food Microbiology: an Introduction by Adam and Dick
12. Food Microbiology by Frazier

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[Credits -4, Total Lectures-60]

DSE – 1B – B:PaperMIC - XIII: Microbial Genetics

Unit I: Basic concepts of microbial genetics (11)

A) Structural organization of *Escherichia coli* chromosome, folded fiber model
B) Replication of DNA: Enzymes involved and mechanisms of replication
C) Transcription: RNA polymerase enzyme, process and post transcriptional modification
D) Operon concept – Lac Operon

Unit II: Effect of mutation in bacteria (12)

A) Effect of mutation on translation
B) Effect of mutation on phenotypes
C) Time course of phenotypic expression
D) Selection, detection and Isolation of mutants
E) Genetic Complementation – Cis – Trans Test

Unit III: Genetic engineering and Protein engineering (14)

A) Introduction, Tools and Techniques of Genetic engineering
B) Applications of Genetic engineering
C) Protein Engineering – concept and applications

Unit IV : Techniques in molecular biology (12)

A) Electrophoresis of DNA.
B) DNA sequencing – Sanger Dideoxy method
C) DNA finger printing- method and applications

Unit V Bioinformatics **(11)**

A. Introduction to Bioinformatics.
B. Introduction to major bioinformatics resources on Internet: National Centre for Biotechnology Information (NCBI), DDBJ, EMBL.
C) Protein data bank (PDB) and Nucleic acid sequence database (GenBank)
D) The Basic Local Alignment Search Tool (BLAST)

References:

1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Biochemistry – Lehninger
4. Molecular Biology of Gene – J.D. Watson
5. Recombinant DNA – J.D. Watson

6. Microbiology - Davis
7. Biochemistry - Purohit
8. Genetics of bacteria and their viruses – William Hays
9. http://www.ncbi.nlm.nih.gov/

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[Credits -4, Total Lectures-60]

DSE – 2 – B Paper MIC - XIV: Environmental Microbiology

Unit I: Air microbiology and biosafety issues (16)

A]Concept and definition of biosaftey,objectives of biosafety,NIH guidelines

B] Regulatory framework of biosaftey in India-

a]Recombinant DNA,Advisory committee[RDAC]

b] Institutional biosaftey committee[ISBC]

c]State biosaftey coordination committee [SBCC]

d] District level biosaftey committee[DLBC]

C]Microorganisms in air – Launching, transport and deposition of aerosols, survival of microorganisms in air
D]Significance of microorganisms in air (extramural and intramural)
EMethods to study air borne microorganisms. Sampling, qualitative and quantitative methods.
F]Bioaerosal control (ventilation, filtration, biocidal control, UV gaseous (quarantine)

Unit II : Marine microbiology and Fresh water ecosystem (10)

A. Microorganisms in marine water, methods to study aquatic microorganisms. Characteristics of marine environment, types of organisms and their role.
B. Fresh water ecosystem : Eutrophication, Types of fresh water bodies a) Classification of lakes b) Sources c) Consequences d) Control

Unit III Extremophiles: (8)

General characteristics of extremophiles and their role -
Acidophiles, Alkalophiles, Thermophiles, Psychrophiles, Barophiles and Osmophiles

Unit IV Environmental impact assessment and Industrial Waste Management: (12)

A) Types of wastes, Waste water assessment and management, BOD, COD,
B. **Industrial waste treatment** : Characteristics and treatment of wastes from different industries, – paper and pulp, sugar and distillery, textile, and dairy industries,
C) Bioremediation :Lead, mercury, arsenic and radioactive substances

Unit V Geomicrobiology and carbon sequestration (14)

A) Introduction, Microorganisms involved, Biochemistry of microbial leaching,

Commercial leaching – slope, heap, in situ leaching, Leaching of Iron, Copper and Uranium,

B) Oilrecovery: Methods – primary, secondary, and microbially enhanced oil recovery,

C) Concept of carbon sequestration and carbon credit

References:

1. Physiology and Biochemistry of Extremophiles- Charles Gerday and Nicolas Glansdorff
2. Environmental Microbiology – Maier
3. Microbial ecology – Fundamentals and applications - Atlas and Bartha
4. Microbial dynamics and diversity – Desy Staley
5. Biology of Microorganisms – Brock, Parker, Madigen, 9th edition
6. Microbiology – Prescott and Harley, 5th edition

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[Credits -4, Total Lectures-60]

DSE – 3 B– Paper MIC - XV: Clinical Microbiology

Unit I: Microbial diseases (24)

(characters of etiological agent, , modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases)

1.Bacterial: 1. Pseudomonas aeruginosa 2.Mycobacterium leprae 3.Clostridium perfringens 4.Vibrio cholerae

2.Viral: 1. Rabies 2.AIDS 3.Swine flu 4. Ebola

3.Fungal:1.Dermatophycoses[Tinea],2.cryptococcosis

4.protozoal: 1.Malaria 2. Giardiasis

Unit II :Biomedical Waste Management (06)

Laboratory disposal of – Sharp devices, Smeared Slides, Cultures, Culture Media and Clinical Samples, Fomites

Unit III mechanism of Pathogenecity – (8)

1. Definition & Concept
2. Basic principles of Microbial adhesion
3. Mechanism of Bacterial invasion
4. Bacterial toxins – Types & mechanism of action
5.Mechanism of pathogenecity of viral & fungal infections

Unit IV:Vaccinology & bioweapons (8)

1. Basic concept

2. Types:A]traditional-live attenuated,killed,toxoids

B]New generation vaccines: subunit, Recombinant ,conjugated, DNA

3.Definition,Characteristics of bioweapons ,Advantages &disadvantages of bioweapons,Examples

Unit-V : Chemotherapy (14)

1. Ideal characteristics of chemotherapeutic agents
2. Mechanism of action of different chemotherapeutic agents:

A]antibiotics
i. Acting on Cell Wall: Penicillin, Bacitracin, Vancomycin,
ii. Acting on Protein Synthesis: Streptomycin, Chloramphenicol,
iii. Acting on nucleic acid synthesis: quinolenes, rifampicin
iv. Drugs Acting on folic acid synthesis: Sulphonamide, Trimethoprim,
B]antiviral agents
C]antifungal agents
D]antiprotozoal agents

3.Mechanism of antibiotic resistance
4.Tests to guide chemotherapy:diffusion and broth dilution methods

References:

1. Pharmaceutical Microbiology – Huggo
2. Text book of Medical Microbiology – Ananthnarayan
3. Review of Medical Microbiology – Jawetz et al
4. Microbiology – Zinsser
5. Medical Microbiology – Cruickshank
6. Medical Microbiology - Davis and Dulbecco
7. Parasitology – Chattergii
8. Medical laboratory technology – RamnaikSood
9. Diagnostic Microbiology – Bailey's and Scotts
10. Medical Bacteriology – Dey and Dey

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[Credits -4, Total Lectures-60]

DSE – 4– B: Paper MIC - XVI: Microbial Biochemistry

Unit I Enzyme, Enzyme kinetics and regulation **(16)**

A) **Enzymes**:
(i) Definition, properties, structure, specificity, mechanism of action (Lock and key model, induced fit hypothesis)
(ii) Allosteric enzymes – Definition, Two models explaining mechanism of action (Sequential and Concerted)
(iii) Ribozymes and Isozymes
iv) Factors affecting catalytic efficiency of enzymes
i) Proximity, orientation ii) Strain and distortion iii) Acid base catalysis iv) Covalentcatalysis
B) **Enzyme kinetics** – Derivation of MichaelisMenten equation, Significance of Km and Vmax
C) Regulation of enzyme synthesis
i) Positive control – Arabinose Operon ii) End product repression – Tryptophan Operon
iii) Catabolite repression

Unit II Extraction, purification and assay of enzymes **(10)**

A) Cell disruption and homogenization of membrane bound enzymes, Extraction
B) Purification of enzymes on the basis of - i) Molecular size ii) Solubility
iii) Electric charge iv) Adsorption characteristics) Biological affinity
C) Immobilization of enzymes – Methods and applications
D) Assay of enzymes (enzyme unit, enzyme activity, Specific activity)

Unit III Assimilation of: **(10)**

A. Carbon
B. Nitrogen – N2 and NH3 (GOGAT)
C. Sulphur

Unit IV Bioenergetics:

A) Pyruvate as key metabolite inCarbohydratemetabolism **(14)**
B) Metabolic Pathways
i) ED pathway
ii) Glyoxylate bypass
iii) Pentose Phosphate Pathway
iv) Phosphoketolase pathway
C) Bioluminescence

Unit VBiosynthesisof: **(10)**

A) Nucleotides- Purines and pyrimidines B) Protein C) Peptidoglycan

References:

1. Molecular Biology of Gene – J.D. Watson
2. Principles and techniques of Practical Biochemistry – K. Wilsons J.Walkar.
3. Analytical Chemistry – Robert B. Dilts
4. Chromatographic methods by Braithwaite and White
5. Outline of Biochemistry – Cohn and Stump
6. Biochemistry – West and Todd Russel
7. Biochemistry – Lehninger
8. Enzymes – Dixon and Web
9. Biological chemistry – Mahler and Cordes
10. Nature of Enzymology – R.L. Foster
11. Microbial technology – Peppler
12. Biochemistry – A problem approach by Wood, Hood and Weison

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PRACTICAL COURSE

Practical V:

1. Isolation of DNA from bacteria by J. Marmur's method
2. Electrophoretic separation of DNA
3. Isolation of coliphages from sewage
4. One step growth curve
5. Determination of dose of U.V. by UV survival curve
6. Isolation of Lac negative mutants of *E.coli* by visual detection method.
7. Isolation of Streptomycin resistant mutants by gradient plate technique.
8. Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
9. Cultivation of Viruses in Embryonated chicken egg
10. Study of Virally infected lesions of Plant materials
11. Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites.
12. Exploring protein sequence database (PDB) and GeneBank and BLAST.

Practical VI:

1. Isolation of **Azotobacter**from soil. (Identification up to genus level)
2. Isolation of ***Rhizobium*** from root nodules.
3. Isolation of ***Xanthomonas***from infected plant material
4. SPC of market **Biofertilizers.**
5. Estimation of available phosphorous from soil (Stannous chloride method)
6. Estimation of Calcium and Magnesium from soil (EDTA method)
7. Determination of organic carbon contents of soil (Walkley and Black method)
8Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test
9Determination of potability of water by MPN.
10Waste water analysis: Chemical Oxygen Demand
(COD)
11.Biological Oxygen Demand (BOD)

Practical VII:

1. Separation and Preservation of Serum and Plasma
2. Widal test (quantitative test), RA test, Pregnancy test
3. Haematology –
   1] Estimation of Hb by Sahlis method
   2] Total blood cell count:RBC count, WBC count,
   3]differential WBC count
   4]Determination of Erythrocyte sedimentation Rate
4. Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*
5.Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% H2O2, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli,*

Staphylococcus aureus, Bacillus) by disc diffusion method

6.Antimicrobial susceptibility testing by disc diffusion method

7.Urine analysis :

A]Microscopic examination – pus cells, RBc, bacteria, crystals.

B] Chemical examination –

1]glucose (benedict's method,

2]protein (acetic acid),

3]bile salt (sulphur method),

4]ketone bodies (Rothera's test)

Practical VIII:

1. Examination of milk

   i) DMC

   ii) Quantitative analysis of milk by SPC (using nutrient agar)

2. Phosphatase Test (qualitative)

3. Isolaton and identification of microorganisms from spoiled food

4.Bioassay of Streptomycin

5. Estimation of alcohol by using K2Cr2O7

6.Diauxic growth curve of Escherichia coli (glucose and lactose).

7.Immobilization of enzyme by using Sodium alginate

8.Thin layer chromatography- amino acid

9.Study of Substrate concentration on enzyme activity.

10.Purification of enzyme and study of its activity

11.Production of citic acid by Aspergillus niger and estimation of Citric acid by titration method

12.Bioassay of Vitamin B12

13.Sterility testing of media and pharmaceutical products

14..Isolation of Lactic acid Bacteria (MRS Medium)

15.Amylase assay (Iodometric method)

Practical Examination

A) The university practical examination will be conducted on four (4) consecutive days for not less than 6 hours on each day of the practical examination. The practical examination shall be conducted by the two external examiners appointed by the University.
B) Each candidate must produce a certificate from the Head of the Department in his/her college stating that he/she has completed in a satisfactory manner the practical course on the guidelines laid down from time to time by Academic council on the recommendation of Board of studies and has recorded his/her observations in the laboratory journal and written a report on each exercise performed. Every journal is to be checked and signed periodically by a member teaching staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journal at the time of practical examination. Candidate has to visit two places of Microbiological interest (Pharmaceutical industry, Dairy, Research institutes etc) and submit the report of their visit at the time of examination. The report should be duly certified by the Head of the Department.

Distribution of Marks for practical examination

1) One major experiment: 30 marks
2) Two minor experiment: 15 marks each
3) Journal: 5 marks
4) Viva:10

Total marks:

Practical V: 75
Practical VI: 75
Practical VII: 75
Practical VIII: 75
Tour Report : 20
Total Marks: 320

Practical V Marks: 75

Que1. Major Experiments

Isolation of DNA from bacteria by J. Marmur's method

OR

Isolation of coliphages from sewage

Que2. Minor Experiments

One step growth curve
OR

Determination of dose of U.V. by UV survival curve

OR
Cultivation of Viruses in Embryonated chicken egg

OR

Study of Virally infected lesions of Plant materials
OR

Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites

Que3. Minor Experiments

Isolation of Lac negative mutants of *E.coli* by visual detection method.
OR
Isolation of Streptomycin resistant mutants by gradient plate technique.
OR
Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
OR
Exploring protein sequence database (PDB) and GeneBank and BLAST.

Practical VI

Que 1 Major Experiment

Isolation of **Azotobacter**from soil. (Identification up to genus level)

OR

Isolation of ***Rhizobium*** from root nodules.

OR

Isolation of ***Xanthomonas***from infected plant material

OR
Biological Oxygen Demand (BOD)
OR

Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test

Que2 Minor Experiment

SPC of market **Biofertilizers.**

OR

Determination of potability of water by MPN.

Que 3 Minor Experiment

Estimation of available phosphorous from soil (Stannous chloride method)

OR

Estimation of Calcium and Magnesium from soil (EDTA method)

OR

Determination of organic carbon contents of soil (Walkley and Black method)

OR

Waste water analysis: Chemical Oxygen Demand (COD)

Practical VII

Que. 1 Major Experiment

Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*

Que 2 Minor Experiment

Widal test (quantitative test)/ RA test,/Pregnancy test

OR

Estimation of Hb by Sahlis method

OR

RBC count/ WBC count/differential WBC count

OR

Determination of Erythrocyte sedimentation Rate

OR

Microscopic examination – pus cells, RBC, bacteria, crystals.

OR

Chemical examination – glucose (benedict's method,protein (acetic acid),bile salt (sulphur method), ketone bodies (Rothera's test)

Que. 3 Minor Experiment

Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% H_2O_2, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli, Staphylococcus aureus, Bacillus*) by disc diffusion method

OR

Antimicrobial susceptibility testing by disc diffusionmethod

Practical VIII

Que 1 Major experiment

Bioassay of Streptomycin

OR

Bioassay of Vitamin B12

OR

Isolaton and identification of microorganisms from spoiled food

OR

Examination of milk -DMC & Quantitative analysis of milk by SPC (using nutrient agar)

OR

Isolation of Lactic acid Bacteria (MRS Medium

Que 2 Minor Experiment

Phosphatase Test(qualitative)

OR

Estimation of alcohol by using $K_2Cr_2O_7$

OR

Diauxic growth curve of Escherichia coli (glucose and lactose).

OR

Sterility testing of media and pharmaceutical products

OR

Amylase assay (Iodometric method)

Que 3Minor Experiment

.Immobilization of enzyme by using Sodium alginate

OR

Thin layer chromatography- amino acid

OR

Study of Substrate concentration on enzyme activity.

OR

Purification of enzyme and study of its activity

OR

Estimation of Citric acid by titration method

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List of the Minimum equipments and related requirements for B.Sc – III

1) Replica plating units for genetics experiments: Two
2) Rotary shaker for fermentation experiments: One
3) Centrifuge (High speed): One
4) Hot plate: One
5) Hot air oven: One
6) Bacteriological incubator: One
7) Spectrophotometer: One
8) Research Microscope: one for each student
9) Haemocytometer: Two
10) Haemoglobinometer: Two
11) ESR stands and tubes: Two
12) Separate room for fine instruments of size 10'×15' feet dimension
13) A separate culture room of at least 10'×10' feet dimension
14) Electrophoresis assembly: One
15) Laminar air flow cabinet: One
16) Distillation assembly: One (Glass)
17) Reflux assembly: Four
18) Serological water bath: One
19) Colony counter: One
20) Refrigerator: One
21) TLC UNIT: One
22) Hand Refractometer
23) Computer with Internet facilities and printer: One
24) Micropipette: One
25) Anaerobic Jar: One
26) Heating Mantle: One
27) UV Chamber

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Geography

Name of the Course: B. A. /B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

PunyashlokAhilyadeviHolkar Solapur University, Solapur
Choice Based Credit System (CBCS) (w.e.f. June 2021)
Revised Structure for B.A. III

Semester V								
Sr. No.	**Code**	**Paper No**	**Name of the paper**	**CA**	**UA**	**Total Marks**	**Lectures / week**	**Credit**
1	DSC 7	VII	Regional Planning and Development	10	40	50	04	04
Select Any One								
2	DSE 1A	VIII	Urban Geography	10	40	50	04	04
3	DSE 1B	VIII	Agriculture Geography	10	40	50	04	04
Select Any One								
4	DSE 2A	IX	Resource Geography	10	40	50	04	04
5	DSE 2B	IX	Population Geography	10	40	50	04	04
Semester VI								
6	DSC 8	X	Evaluation of Geographical Thought	10	40	50	04	04
Select Any One								
7	DSE 3A	XI	Geography of Health and Well being	10	40	50	04	04
8	DSE 3B	XI	Political Geography	10	40	50	04	04
Select Any One								
9	DSE 4A	XII	Hydrology and Oceanography	10	40	50	04	04
10	DSE 4B	XII	Social Geography	10	40	50	04	04
Annual								
11	DSC 9	Practical P. I	Map Making and Map Interpretation	20	80	100	10	08
12	DSC 10	Practical P. II	Advanced Tools, Techniques (Computer, Remote Sensing, GIS, GPS) & Field Work	20	80	100	10	08
Select Any One Short Term Course								
1	SEC 1	-	A Certificate Course in Land Survey	10	40	50		04
2	SEC 2	-	A Certificate Course Travel and Tourism	10	40	50		04
3	SEC3	-	A Certificate Course in QGIS	10	40	50		04

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Bachelor of Arts (B. A.)

B. A. Part - III

Regional Planning and Development

Syllabus to be implemented from June 2021 onwards

1. **Title :** Regional Planning and Development
2. **Year of Implementation :**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: Regional Planning is the need of time to everyone. Geography subject can lead to the development of human activities through regional planning. In the process of development of geography, the changing nature of subject will make aware to the students about the recent technologies used in geography. This will further help to improve the use of geographical techniques and methods in teaching, learning and research work through regional planning.
4. **Objectives:**
    - To Familiarize the student with the types of region and types of Regional Planning and Delineation of planning region.
    - To Familiarize the student with the theory and models of regional planning
    - To get familiar with indicators of measurement of development.
5. **Course Outcomes:**

    After the completion of course, the students will have ability to:
    - The students were known the importance of regional planning.
    - The students understood the concepts of region, regionalization, regional planning & development and detailed knowledge of region.
    - The students were familiar with indicators of measurement of development.
    - Detail understanding of Growth Pole Model, Center place Theory and Growth Foci Model in Indian context.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Theory	Term work	Total
1	Regional Planning and Development	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Resource Geography**	**VII**	**Regional Planning and Development**	**DSC 7 OR VII**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – V

i. **DSC 7 OR Paper No. VII**
ii. Title of Paper: **Regional Planning and Development**

Unit I: Region and Regional Planning **15**

1.1. Concept of Region

1.2. Types of Region : (Formal and Functional)

1.3. Need of Regional Planning

1.4. Types of Regional Planning

Unit II. Delineation of Planning Region **15**

2.1. Choice of Region for Planning

2.2. Characteristics of Ideal Planning Region

2.3. Delineation of Planning Region

2.4. Planning Regions of India

Unit III. Theories and Models for Regional Planning **15**

3.1. Growth Pole Model of Perroux

3.2. Centre Place Theory of Walter Christaller

Unit IV.Measuring of Development. **15**

4.1. Indicators of Economic Development

4.2. Indicators of Social Development

4.3. Indicators of Environmental Development

4.4 Human Development index

References:

- Blij H.J. (Dec.1971):,Geography: Regional and Concept, Johan Wiley and Sons.
- Cloud P.I. (1998), An Introduction to Regional Geography, BlackWell Publication, Oxford and Massachusettes.
- Friedemann J.&Alonson W.(1964): Regional Development and Planning, MIT Press, Cambridge.
- Gore C.G. (1984): Regions in Question: Space Development Theory and Regional Policy, Methuen London.
- Gore C.G., Kohler G., Rich U.P. &Ziesemer T. (1996) :Quetioning Development, Essay on the Theory, Policies and Practice of Development Intervetion, Motropolis-Verlaje, Marburg.
- Peet R. (1999) :Theories of Development, Guilford Press, New York.
- Alden J. & Morgan (1974) :Regional Planning A Comprehensive view, Leonard Hill Books.
- Chand M. &Puri V. (1983): Regional Planning in India, Allied Publisher Ltd., New Delhi.
- Chandana R.C. (2000): Regional Planning & Development, Kalyani Publishers, Ludhiyana.
- Cook P. (1983): Theories of Planning & Spatial Development, Hutchinson & Com. Ltd. London.
- Glasson, John (1974): An Introduction to Regional Planning, Hutchinson Educational London.
- Misra R.P., Sundaram K.V. & Rao, etd.(1974): Regional Development Planning in India.
- Misra R.P (1992): Regional Planning, Concept Publishing Com. New Delhi.

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Bachelor of Arts (B. A.)
B. A. Part - III
Urban Geography
Syllabus to be implemented from June 2021 onwards

1. **Title :** Urban Geography
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: The Board of studies should briefly mention foundation, core and applied Components of the course/ Paper. The student should get into the prime objectives and expected level of study with required outcome in terms of basic and advance knowledge at examination level.
4. **Objectives:**
   - To study the basics of unban Geography.
   - To study the type of urban Settlements, site and situations.
   - To get as ideas of relationship between human activities and urban development.
   - To make the students capable for handling the present problematic situation in urban development.
   - To make students as a good urban planner and environmental conservator.
5. **Course Outcomes:**

   After the completion of course, the students will have ability to:
   - The students were known the importance of urban settlements through urban geography.
   - The students understood the types of urban Settlements, Site and situations.
   - The students were familiar with an idea of relationship between human activities and urban development.

- Detail understanding of students regarding present urban problems and students are capable to handling of present problematic situations in urban areas.
- The students are developed as a good urban planner and environmental conservator.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Theory	Term work	Total
1	Urban Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Urban Geography**	**VIII**	**Urban Geography**	**DSE 1A OR VIII**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – V

i. DSE 1A OR Paper No. VIII

ii. Title of Paper: **Urban Geography**

Unit I: Introduction to Urban Geography **15**

1.1 Meaning and definition of Urban Geography

1.2 Nature and scope of Urban Geography

1.3. Approaches of Urban Geography

1.4. Significance of Urban Geography

Unit II. Patterns of Urbanization **15**

2.1 Meaning of urban settlement and Urbanization

2.2 Concept and factors of urbanization

2.3 Patterns of Urbanization in developed and developing countries

Unit III. Function, Structure and Morphology of Urban centers **15**

3.1 Functional classification of town and cities

3.2 Structure and morphology of urban centers

3.3 City Regions and C.B.D.

3.4 Models of urban Morphology; The Concentric Zone Theory, The Sector Theory and the Multi-Nuclei Theory

Unit IV. Urban Issue and Case studies **15**

4.1 Problemsof housing and growth of slums

4.2 Issuesof civic amenities (Water and Transport)

4.3 Problems of environmental pollution

4.4 Case studies of Solapur smart city and Pandharpur town (with reference to Land use and Urban Issues)

References:

- Fyfe N. R. and Kenny J. T., 2005: The Urban Geography Reader, Routledge.
- Graham S. and Marvin S., 2001: Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition, Routledge.
- Hall T., 2006: Urban Geography, Taylor and Francis.
- Kaplan D. H., Wheeler J. O. and Holloway S. R., 2008: Urban Geography, John Wiley.
- Knox P. L. and McCarthy L., 2005: Urbanization: An Introduction to Urban Geography, Pearson Prentice Hall New York.
- Knox P. L. and Pinch S., 2006: Urban Social Geography: An Introduction, Prentice-Hall.
- Pacione M., 2009: Urban Geography: A Global Perspective, Taylor and Francis.
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- Ramachandran R (1989): Urbanisation and Urban Systems of India, Oxford University Press, New Delhi
- Ramachandran, R., 1992: The Study of Urbanisation, Oxford University Press, Delhi
- Singh, R.B. (Eds.) (2001) Urban Sustainability in the Context of Global Change, Science Pub., Inc., Enfield (NH), USA and Oxford & IBH Pub., New Delhi.

- Singh, R.B. (Ed.) (2015) Urban development, challenges, risks andresilience in Asian meg

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Bachelor of Arts (B. A.)

B. A. Part - III

Agriculture Geography

Syllabus to be implemented from June 2021 onwards

1. **Title :** Agriculture Geography
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: Agricultural Geography is the most and comparatively developed branch of Economic Geography. The presence syllabus of this paper includes Nature and Scope of Agricultural Geography, Agricultural determinants, Land use Theory and Agricultural Practices, agricultural concepts like crop combination and productivity, impact of Green revolution and the modern technology used in agriculture. This study will be helps in making aware the students to the use of modern technologies which are used in agriculture.
4. **Objectives:**

- To help students to know the approaches to study agriculture geography.
- To study the methods of regionalization of agriculture.
- To provide in depth knowledge about agriculture geography.

5. **Course Outcomes:**

After the completion of course, the students will have ability to:

- The students were known the importance and modern techniques of Agricultural geography.
- The students understood the factors affecting on agriculture.
- The students were familiar agriculture theories, green revolution and problems associated with agriculture

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Theory	Term work	Total
1	Agriculture Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	Development of Geography	**IX**	**Agriculture Geography**	**DSE 1B OR IX**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – V

i. DSE 1B Paper No. IX

ii. Title of Paper: **Agriculture Geography**

Unit I: Introduction to agriculture Geography **15**

1.1 Definition, Nature and Scope of Agriculture Geography

1.2 Importance of Agriculture

1.3 Modern Techniques in Agriculture

Unit II. Determination of Agriculture **15**

2.1 Physical

2.2 Economical

2.3 Social

2.4 Cultural

Unit III. Agriculture Regions of India **15**

3.1 Agro-Climatic regions

3.2 Agro-Ecological regions

3.3 Crop-Combination

3.4 Crop-Diversification

Unit IV.Agricultural Land use theory **15**

4.1 Von Thunen Theory of Agricultural land use

4.2 Green and white revaluation in India

4.3 Agricultural problem and prospects in India - Physical and non-Physical

References:

1. Bayliss Smith, T.P.: The Ecology of Agricultural Systems. Cambridge University Press, London. 1987.
2. Gregor, H.P.: Geography of Agriculture. Prentice Hall, New York, 1970.
3. Grigg, D.B.: The Agricultural Systems of the World, Cambridge University Press, New York. 1974.
4. Fulle S.J.: KrushiBhugol; VidhyabhartiPrakashanLatur, 2000.
5. Bhatt, M.S. (ed.) 2004: Poverty and Food Security in India Problems and Policies. Akkar Books, New Delhi.
6. Morgan W.B. & Muton R.C.(1971): Agricultural Geography, Mathuen, London.
7. Singh Jasbir& Dhillon S.S. (2004): Agricultural Geography, Tata Mc-Graw Hill Education, New Delhi.
8. Bhatia B.M. (1977): Socio-Economic Growth, Vikas New Delhi.
9. Hussain, M. (1999): Systematic Agricultural Geography, Rawat publications, Jaipur. (India)
10. Shafi M. (1983): Agricultural Productivity and Regional Imbalances a Study of Uttar Pradesh, Concept, New Delhi.
11. Symon, L. (1968): Agricultural geography, London.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Bachelor of Arts (B. A.)

B. A. Part - III

Population Geography

Syllabus to be implemented from June 2021 onwards

1. **Title :** Population Geography
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: This curriculum focuses on the understanding of core and fundamental branches of the discipline. This paper is specially designed to learn the role of demography and population studies as a distinct field of human geography. It encompasses sound knowledge of key concept, different components of population. The curriculum has been carefully designed to include conceptual, basic themes, population dynamics and characteristic with contemporary issues.
4. **Objectives:**
   - To study the basics of population geography.
   - To study the population growth trends and its distribution.
   - To study the population dynamics and various theories of population.
   - To study the population compositions and its characteristics.
5. **Course Outcomes:**

   After the completion of course, the students will have ability to:
   - This paper would bring an understanding of population geography along with relevance of demographic data.

- The students would get an understanding of distribution and trends of population growth in the developed and less developed countries, along with population concepts.
- The students would get an understanding of the dynamics of population.
- An understanding of the implications of population composition in different regions of the world.
- An appreciation of the contemporary issues in the field of population studies

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Theory**	**Term work**	**Total**
1	Population Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	Development of Geography	**IX**	**Population Geography**	**DSE 2A OR IX**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – V

i. DSE 2A OR Paper No. IX

ii. Title of Paper: **Population Geography**

Unit I: Introduction to Population Geography **15**

1.1 Definition of population geography

1.2 Nature and Scope of population Geography

1.3 Significance of population Geography

1.4 Sources of population data (Census, Statistical abstract, NSS)

Unit II. Population Growth and Distribution **15**

2.1 Growth of World population

2.2 Factors affecting the distribution of population

2.3 Population distribution inthe world

2.4 Theories of population Growth: Malthus Theory and Demographic Transition Theory

Unit III. Population Dynamics **15**

3.1 Concept of population Dynamics

3.2 Fertility: Causes, Effects and Measures

3.3 Mortality: Causes, Effects and Measures

3.4 Migration: Types, causes and effects, Major international migration of the world after World War II

Unit IV.Population Composition and Characteristics **15**

4.1 Age-Sex Composition Causes, Effects, Measures and Characteristics

4.2 Rural and Urban Composition Causes, Effects, Measures and Characteristics

4.3 Literacy**:** Effects and Characteristics

4.4Contemporary Issues: HIV/ AIDS,andCovid 19

References:

- Barrett H. R., 1995: Population Geography, Oliver and Boyd.
- Bhende A. and Kanitkar T., 2000: Principles of Population Studies, Himalaya Publishing House.
- Chandna R. C. and Sidhu M. S., 1980: An Introduction to Population Geography, Kalyani Publishers.
- Clarke J. I., 1965: Population Geography, Pergamon Press, Oxford.
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- Panda B P (1988): JanasankyaBhugol, M P Hindi GranthAcademy,Bhopal
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- Chandna, R C (2006), JansankhyaBhugol, Kalyani Publishers, Delhi
- Trewartha, G T (1969), A Geography of Population: world patterns, John Wiley, New York.
- MOOCS - NPTEL: https://nptel.ac.in/

- MOOCS - SWAYAM: https://swayam.gov.in/
- National Digital Library of India: https://ndl.iitkgp.ac.in/

PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Bachelor of Arts (B. A.)

B. A. Part - III

Resource Geography

Syllabus to be implemented from June 2021 onwards

1. **Title :** Resource Geography
2. **Year of Implementation :**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: Resource Geography is a major and developing branch of Economic Geography. The world countries are trying to make overall development with blindly utilizing different resources. The growing population exerts its pressure on present resources which generates various problems in front of countryside. The present syllabus of this paper includes Definition, Scope, concept, classification and significance of Resource Geography. It also includes major natural resources such as water, forest, energy and human resources with its distribution, utilization and problems. Newly evolved concept sustainable development is also studied with said resources.
4. **Objectives:**
    - To understand the concept and classification of Resources.
    - To examine the major resources (water, forest, energy and human) with their distribution, utilization and problems.

- To study the sustainable resource development.

5. Course Outcomes:

After the completion of course, the students will have ability to:

- The students were known the importance of Resources.
- The students were familiar with distribution, utilization and problems of resources like water, forest, energy and human.
- Detail understanding the sustainability of natural resource development.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Theory	Term work	Total
1	Resource Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	Development of Geography	**IX**	**Resource Geography**	**DSE 2B OR IX**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – V

i. DSE 2B OR Paper No. IX

ii. Title of Paper: **Resource Geography**

Unit I: Introduction to Resource Geography **15**

1.1 Definition, Nature, and Scope of Resource Geography.

1.2 Concept and Classification of Resource.

1.3 Importance of Resource.

Unit II. Natural Resource **15**

2.1 Soil Resource – Distribution, Utilization, Problems and Conservation.

2.2 Water Resources-Distribution, Utilization, Problems and Conservation.

2.3 Forest Resource-Distribution, Production, Problems and Conservation.

Unit III. Energy Resource **15**

3.1 Conventional Resource-Distribution, Utilization, Problems and Conservation.

3.2 Non-Conventional Resource-Distribution, Utilization, Problems and Conservation.

Unit IV.Sustainable Resource development **15**

4.1 Concept of sustainable Resource Development.

4.2 Sustainable Natural Resource Development- Land, Water, Forest, Energy.

4.3 Human Resource Development

References:

1. Cutter S. N., Renwich H. L. and Renwick W., 1991: Exploitation, Conservation, Preservation: AGeographical Perspective on Natural Resources Use, John Wiley and Sons, New York.
2. Gadgil M. and Guha R., 2005: The Use and Abuse of Nature: Incorporating This Fissured Land: An Ecological History of India and Ecology and Equity, Oxford University Press. USA.
3. Holechek J. L. C., Richard A., Fisher J. T. and Valdez R., 2003: Natural Resources: Ecology, Economics and Policy, Prentice Hall, New Jersey.
4. Jones G. and Hollier G., 1997: Resources, Society and Environmental Management, Paul Chapman, London.
5. Klee G., 1991: Conservation of Natural Resources, Prentice Hall, Englewood.
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7. Mitchell B., 1997: Resource and Environmental Management, Longman Harlow, England.
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B. A. Part - III

Evolution of Geographical Thought

Syllabus to be implemented from June 2021 onwards

1. **Title :** Evolution of Geographical Thought
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: This paper is basically designed to cater to foundation building of the students by imparting knowledge about the pillars of geography. It encompasses the evolution of the subject right from the experiences and understanding of travelers and explorers to the progression towards establishment of the discipline geography in sciences
4. **Objectives:**
   - To study the evolution of geographic thought.
   - To evaluating the contemporary trends in geographical studies.
   - To understands the debates in the geographical studies.
   - To study the recent trends in geography
5. **Course Outcomes:**

- Students were able to visualize the basic theme, ideas and approaches of geographic knowledge with relation to historical juncture, varying schools and era of their emergence.
- Detailed knowledge about the debates in the geographical studies.
- Understanding of recent trends in Geography.

6. Pattern of Exam : Semester

7. Scheme of Teaching & Examination

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Theory**	**Term work**	**Total**
1	Evolution of Geographical Thought	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Geography of Economic Activities**	**X**	**Evolution of Geographical Thought**	**DSC 8 OR X**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – VI

i. DSC 8 OR Paper No. X

ii. Title of Paper: **Evolution of Geographical Thought**

Unit I. History of Geographical Idea **15**

1.1 Ancient period – contribution of Greek, Roman and Indian Geographers

1.2 Medieval period – Arab Geographers

Unit II. Schools of Geography **15**

2.1 German School of Geography – Humboldt, Ritter &Razel

2.2 French School of Geography – Vidal -de-la- Blache

2.3 American School of Geography – Ellen Semple

2.4 British School of Geography – Mackinder

Unit III. Dichotomy in Geography **15**

3.1 Environmental Determinism Vs Possibilism

3.2 Physical Vs Human Geography

3.3 Systematic Vs Regional Geography

Unit IV. Development of Geography after World War II **15**

1.1 Quantitative revolution in Geography concept, objectives and merits

1.2 Impact of Quantitative revolution in Geography.

1.3 Perspectives in Geography: Behaviouralism, Humanism, Systems Approach, Radicalism

References:

1. Hartshorne Richard (1959) - Perspective on the nature of Geography Rand McNally& Co., New York
2. Dixit R.D. - Geography Thought: A contextual history of Idea
3. Dickinson R.E. - Makers of Modern Geography
4. Taylor Griffith - Geography of 20th Century
5. SudiptaAdhikari: History of Geographical Thought
6. Harvey David (1980) - Explanation in Geography Edward - Arnold Landon
7. Husain Majid (1984) - Evolution of Geographical Thought Rawat Publication, Jaipur
8. खतीब के . ए. व भांजे बी. एम- भूविज्ञान विकास, संजोग प्रकाशन, कोल्हापूर.

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B. A. Part - III

Geography of Health and Wellbeing

Syllabus to be implemented from June 2021 onwards

1. **Title : Geography of Health and Wellbeing**
2. **Year of Implementation :**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble:** Geography of Health and Wellbeing considers the significance for physical and mental health of interactions between people and their environment. This branch of Geography becomes popular due to its significance. In this course the fundamental concepts and knowledge of Geography of Health and wellbeing have been included. The present syllabus of this course includes perspectives of health, pressure on environmental quality and health, exposure and health risks, health and disease patterns.
4. **Objectives:**
    - To study the awareness about the health and wellbeing.
    - To evaluating the contemporary trends in geographical studies.

- To understands the debates in the geographical studies.
- To understands the curiosity about disease and health.

5. Course Outcomes:

After the completion of course, the students will have ability to:

- Understand various geographical perspectives related to human health.
- Create awareness of human health and environment.
- The students are familiar with geographical background of diseases and their regional pattern.
- Detail understanding of pressure on environmental quality and human health.
- The students are familiar with the process of health care planning in India.
- The students are aware about impact of climate change on human health.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Theory**	**Term work**	**Total**
1	Geography of Health and Wellbeing	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Political Geography**	**XI**	**Geography of Health and Wellbeing**	**DSE 3A OR XI**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – VI

i. DSE 3A OR Paper No. XI

ii. Title of Paper: **Geography of Health and Wellbeing**

Unit I. Perspectives on Health: **15**

1.1 Definition and scope

1.2 Linkages with environment and development

1.3 Health and Environmental trends: Population dynamics, urbanization, poverty and inequality

Unit II. Pressure on Environmental Quality and Health **15**

2.1 Human activities and its pressure on environmentand Health

2.2 Land use and agricultural development

2.3 Industrialization

2.4 Transport

Unit III. Exposure and Health Risks **15**

3.1 Air pollution

3.2 Water Pollution

3.3 Household wastes

3.4 Housing

3.5 Workplace

Unit IV. Climate Change, Health and Disease Patterns **15**

(In Environmental Context with special reference to India)

4.1 Communicable diseases and their regional pattern – AIDS and Covid 19

4.2 Lifestyle related diseases and their regional pattern – Cancer and Diabetes

4.3 Climate change and human health

4.4 Nutrition and human health

References:

1) Akhtar Rais (Ed.), 1990:Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.
2) Avon Joan L. and Jonathan A Patzed., 2001:Ecosystem Changes and Public Health, Baltimin, John Hopling Unit Press(ed).
3) Bradley, D., 1977: Water, Wastes and Health in Hot Climates, John Wiley Chichesten.
4) Brown T., S. Mc Lafferty, and G. Moon. 2009. A companion to health and medical geography. Chichester, UK: Wiley-Blackwell. DOI:
5) Christaler George and HristopolesDionissios, 1998:SpatioTemporalEnvironment Health Modelling, Boston Kluwer Academic Press.
6) Cliff, A.D. andPeter, H., 1988: Atlas of Disease Distributions, Blackwell Publishers, Oxford.

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8) Gatrell, A., and Loytonen, 1998: GISand Health, Taylor and Francis Ltd, London.
9) Gatrell A., and S. Elliott. 2009. Geographies of health. Chichester, UK: Wiley- Blackwell.
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11) HardhamT. andTannavM., (eds):Urban Health in Developing Countries; Progress, Projects, Earthgoan, London.
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MOOCS - SWAYAM: https://swayam.gov.in/

National Digital Library of India: https://ndl.iitkgp.ac.in/

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B. A. Part - III

Political Geography

Syllabus to be implemented from June 2021 onwards

1. **Title : Political Geography**
2. **Year of Implementation :**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: This paper is an academic discipline which is designed for student to convey knowledge about political activity of people and integral geographical space, which includes physical, economic, social, cultural, and political spaces. Also concerned with the study of both the spatially uneven outcomes of political processes and the ways in which political processes are themselves affected by spatial structures.
4. **Objectives:**
    - To understand the basic concepts of politicalgeography.
    - To familiarize the students with the geographical factors which havea bearing

on the geopolitical/ administrative organization ofspace.

- To enhance awareness of multidimensional nature of geo-politicalspace.

5. Course Outcomes:

After the completion of course, the students will have ability to:

- Student will understand the history and development of political geography.
- Get knowledge about evaluation of state and nation.
- Get knowledge of Geo-political theories.
- Investigates problems and disputes of India with the most current research topics in political geography.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Theory	Term work	Total
1	Political Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Political Geography**	**IX**	**Political Geography**	**DSE 3B OR XI**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – VI

i. DSE 3B OR Paper No. XI

ii. Title of Paper: **Political Geography**

Unit I. Introduction of Political Geography **15**

1.1 Definition of Political Geography

1.2 Nature and Scope of Political Geography

1.3 Historical Development of Political Geography

1.4 Significance of Political Geography

Unit II. Concepts in Political Geography **15**

2.1 Concept of State, Nation, State- Nation, Frontiers and Boundaries

2.2 Elements of State: Location, Shape, Size, Topography, Climate, Vegetation, Resources, Population andCommunication.

2.3 Concept of Geopolitics

Unit III. Theories in Political Geography **15**

3.1 The Heartland Theory of H. J. Mackinder

3.2 Rim Land Theory of N. J. Spykman

Unit IV.Resource Conflicts and Politics of Displacement **15**

4.1 Krishna Water Conflict (Inter State)

4.2 Ganga Water Conflict (International)

4.3 Issues of Relief, Compensation and Rehabilitation: Sardar Sarovar Projects

4.4 Issues of Relief, Compensation and Rehabilitation: Ujani Projects

References:

1. Agnew J., 2002: *Making Political Geography*,Arnold.
2. Agnew J., Mitchell K. and Toal G., 2003: *A Companion to Political Geography*,Blackwell.
3. Cox K. R., Low M. and Robinson J., 2008: *The Sage Handbook of Political Geography*, Sage Publications.
4. Cox K., 2002: *Political Geography: Territory, State and Society*,Wiley-Blackwell
5. Gallaher C., et al, 2009: *Key Concepts in Political Geography*, SagePublications.
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7. Jones M., 2004: *An Introduction to Political Geography: Space, Place and Politics*, Routledg.
8. Mathur H M and M MCernea (eds.) Development, Displacement and Resettlement – Focus on Asian Experience, Vikas,Delhi
9. Painter J. and Jeffrey A., 2009: *Political Geography*, SagePublications.
10. Taylor P. and Flint C., 2000: *Political Geography*, PearsonEducation.
11. Verma M K (2004): Development, Displacement and Resettlement, Rawat Publications,Delhi
12. Hodder Dick, Sarah J Llyod and Keith S McLachlan (1998), *Land Locked States of Africaand Asia* (vo.2), FrankCass

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B. A. Part - III

Hydrology and Oceanography

Syllabus to be implemented from June 2021 onwards

1. **Title :** Hydrology and Oceanography
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.
3. **Preamble**: This paper is basically designed to cater to foundation building of the students by imparting knowledge about the hydrological cycle. It encompasses the availability of water on the globe and its uses on the earth surface.
4. **Objectives:**
    - To study the basic knowledge of hydrological cycle on the globe.

- To study the importance of oceans and seas related to precipitation on the earth surface and its impact on agriculture.
- To understands the riverine basin and its impact on human settlement
- To study the marine importance and its necessity to over population in future

5. Course Outcomes:

After the completion of course, the students will have ability to:

- Students were able to visualize the basic theme, ideas and approaches of geographic knowledge about hydrological cycle related to formation of precipitation, infiltration, ground water recharge.
- Understanding of human interference on hydrological cycle and its impact on globally drought region, flooded area.

6. Pattern of Exam: Semester

7. Scheme of Teaching & Examination

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Theory**	**Term work**	**Total**
1	Hydrology and Oceanography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.
1.	**Applied Geography**	**XII**	**Hydrology and Oceanography**	**DSE 4A OR XII**

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – VI

i. DSE 4A OR Paper No. XII

ii. Title of Paper: **Hydrology and Oceanography**

Unit I. Hydrological Cycle **15**

Systems approach in hydrology, Hydrological Cycle, human impact on the hydrological cycle; Precipitation, interception, evaporation, evapo-transpiration, infiltration, ground-water, run off and over land flow; Hydrological input and output. Water budget on globe.

Unit II. River Basin and Problems of Regional Hydrology 15

Characteristics of river drainage basins, basin surface run-off, measurement of river discharge; floods and droughts.

Unit III. Ocean Floor Topography ,Ocean Properties and Circulations 15

Ocean Floor Topography, Ocean Waves, Currents and Tides. Ocean Salinity and Temperature –Distribution and Determinants.

Unit IV.Coral Reefs and Marine Deposits 15

Types and Theories of Origin of Coral formation; Biotic and Mineral wealth in seas and oceans

References:

- Andrew. D. ward and Stanley, Trimble (2004): Environmental Hydrology, 2nd edition, Lewis Publishers, CRC Press.
- Karanth, K.R., 1988 : Ground Water: Exploration, Assessment and Development, Tata-McGraw Hill, New Delhi.
- Ramaswamy, C. (1985): Review of floods in India during the past 75 years: A Perspective. Indian National Science Academy, New Delhi.
- Rao, K.L., 1982 : India's Water Wealth 2nd edition, Orient Longman, Delhi,.
- Singh, Vijay P. (1995): Environmental Hydrology. Kluwar Academic Publications, The Netherlands.
- 6.Anikouchine W. A. and Sternberg R. W., 1973: The World Oceans: An Introduction to Oceanography, Prentice-Hall.
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- Kershaw S., 2000: Oceanography: An Earth Science Perspective, Stanley Thornes, UK.

- Pinet P. R., 2008: Invitation to Oceanography (Fifth Edition), Jones and Barlett Publishers, USA, UK and Canada.
- Sharma R. C. and Vatal M., 1980: Oceanography for Geographers, Chaitanya Publishing House, Allahabad.
- Sverdrup K. A. and Armbrust, E. V., 2008: An Introduction to the World Ocean, McGraw Hill, Boston.
- Singh, M., Singh, R.B. and Hassan, M.I. (Eds.) (2014) Landscape ecology and water management. Proceedings of IGU Rohtak Conference, Volume 2. Advances in Geographical and Environmental Studies, Springer
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- Cech, T.V. (2009): Principles of Water Resources: History, Development, Management, and Policy (3rd Ed.), Wiley, Hoboken, New Jersey.
- Trujillo, A.P., and Thurman, H.V. (2010): Essentials to Oceanography (10th Ed.), Prentice Hall, New Jersey.

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B. A. Part - III

Social Geography

Syllabus to be implemented from June 2021 onwards

1. **Title :** Social Geography
2. **Year of Implementation:**Revised Syllabi will be implemented from June 2021 onwards.

3. **Preamble**: This curriculum focuses on the understanding of social geography of the discipline. This paper is specially designed to cater to social study of the students by imparting knowledge about the society. Social geography is the branch of human geography that is most closely related to social problems and well being, dealing with the relation of social phenomena and its spatial components. The different conceptions of social geography have been overlapping with other sub-fields of geography.

4. **Objectives:**
   - Understanding the concept, nature and scope of social geography.
   - To study the technological, occupational and migration changes of peoples in India.
   - An analysis of different social categories and their spatial distribution.
   - To understand the geographies of social welfare, well being and social problem.

5. **Course Outcomes:**

   After the completion of course, the students will have ability to:
   - In depth understanding the problems and prospects of society in India.
   - The students are fully aware about the technological, occupational and migration changes of peoples in India.
   - Detailed knowledge about the social categories and their spatial distribution.
   - Understanding concepts of social wellbeing, welfare and social problem in India.

6. **Pattern of Exam:** Semester

7. **Scheme of Teaching & Examination**

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Theory**	**Term work**	**Total**
1	Social Geography	04	04	--	04	40	10	50

8. Equivalence in accordance with titles and contents of papers (For revised papers)

Sr. No.	Title of Old Paper	Old paper No.	Title of New paper	New Paper No.

1.	Applied Geography	XII	Social Geography	DSE 4B OR XII

NEW/REVISED SYLLABUS FOR
B. A. Part-III Geography
(Introduced from June 2021 onwards)
Semester – VI

i. DSE 3A OR Paper No. XII

ii. Title of Paper: **Social Geography**

Unit I: Introduction of Social Geography **15**

1.1 Definition of Social Geography

1.2 Nature and Scope of Social Geography

1.3 Branches of Social Geography

1.4 Approaches and Importance of Social Geography

Unit II. Peopling Process of India **15**

2.1 Concept of peopling process

2.2 Technological Changes

2.3 Occupational Changes

2.4 Migration

Unit III. Social Categories and their spatial distribution of World **15**

3.1 Tribe- (Bushman and Gond)

3.2 Race-

3.3 Religion

Unit IV.Social Welfare, Wellbeing and Social Problems in India **15**

4.1 Concept of Social Welfare and Wellbeing

4.2 Components of Social Welfare and Wellbeing – Healthcare, Housing and Education

4.3 Social Problems- Slums, Communal Conflicts and Crime

References:

1. Ahmed A., 1999: Social Geography, Rawat Publications.

2. Casino V. J. D., Jr., 2009) Social Geography: A Critical Introduction, Wiley Blackwell.

3. Cater J. and Jones T., 2000: Social Geography: An Introduction to Contemporary Issues, Hodder Arnold.

4. Holt L., 2011: Geographies of Children, Youth and Families: An International Perspective, Taylor & Francis.

5. Panelli R., 2004: Social Geographies: From Difference to Action, Sage.

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7. Smith D. M., 1977: Human geography: A Welfare Approach, Edward Arnold, London.

8. Smith D. M., 1994: Geography and Social Justice, Blackwell, Oxford.

9. Smith S. J., Pain R., Marston S. A., Jones J. P., 2009: The SAGE Handbook of Social Geographies, Sage Publications.

10. Sopher, David (1980): An Exploration of India, Cornell University Press, Ithasa

11. Valentine G., 2001: Social Geographies: Space and Society, Prentice Hall.

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B. A. Part – III Geography

(Practical Paper -I)

1.	**Title**	**:**	Map Work & Map Interpretation
2.	**Year of Implementation**	**:**	Revised Syllabi will be implemented from June 2021 onwards.

3.	**Preamble**	**:**	Practical Work is the most important part of Geography. Map is an indispensable tool in Geographical Studies & Research activities. The present syllabus of this paper includes study of maps and their types, Map Projections, S.O.I. Topomaps, I.M.D. Weather Maps, and Cartographic Techniques.
4.	**Objectives**	**:**	2. To introduce the students with the importance of map making and map Interpretation. 3. To make the students to understand map, concept of scale and concept of projection. 4. To provide training in analysis of landforms. 5. To give basic information to the students about S.O.I. maps and I.M.D. weather Reports. 6. To develop the skill of map Interpretation among the students.
5.	**Course Outcomes**	**:**	1.In depth understanding the map, concept of scale and projection. 2.Detailed knowledge about the analysis of landforms and its identification. 3.The students are deeply aware about basic information to the students about S.O.I. toposheets and I.M.D. weather reports and obtained the skills about map interpretation.
6.	**Pattern of Exam**	**:**	Annual
7.	**Scheme of Teaching & Examination**		

Sr. No.	**Subjects/Papers**	**Teaching Scheme Hrs./Week**				**Examination scheme (Marks)**		
		L	**T**	**P**	**Total**	**Practical**	**Term work**	**Total (Annual)**
1	Map Making and Map Interpretation	--	--	10	10	100	--	100

Revised Syllabus for B. A. – III
(Introduced from June 2021 Onwards)
Revised Syllabus for
B. A. (Part III) Geography
Practical Paper -I

Title of Paper - Map Making and Map Interpretation (100 Marks)

Unit – 1: Introduction to Map and Map Scales **Periods 50 Marks (15)**

1.1Map

1.1.1 Map – Definition, Elements

1.1.2 Classification of Maps: Based on Scale and Purpose

1.2 Map Scale

1.2.1 Meaning and Definition of Map Scale

1.2.2 Methods of Representation of scale - Verbal, Numerical and Graphical.

1.2.3 Scale Conversion

1.2.4 Construction of Graphical Scale – i) Simple (Plane Scale) ii) Time and Distance Scale iii) Diagonal Scale

Unit – 2. Map Projection **Periods 50 Marks (15)**

2.1. Definition, Classification of Projections:

- Based on Method of Construction: perspective and non-perspective
- Based on Developable Surface used: Conical, Cylindrical, Zenithal, Conventional.
- Based on Position of Tangent Surfaces: Polar, Equatorial (normal), Oblique.
- Based on Position of view point or light: Gnomonic, Stereographic, Orthographic

2.2. Graphical Construction of the following Projections with Properties and Use:

- Zenithal Polar Gnomonic Projection
- Zenithal Polar Equal Area Projection
- Simple Conical Projection with one standard Parallel
- Simple Conical Projection with two standard Parallel
- Cylindrical equal area projection
- Mercator's Projection and Reference to Universal Transverse Mercator (UTM) Projection

Unit – 3: Relief Profile Analysis **Period 50 Marks (15)**

3.1 Slope and Gradient

3.1.1 Types of Slope: Gentle, Steep, Even, Uneven, Convex, Concave, Terraced.

3.1.2 Methods of Relief Representation

Qualitative: - Hachures, Hill shading, Layer Tint

Quantitative: - Contours, Form lines, Spot Heights, Bench Marks, Triangulation Mark

3.1.2 Expression of Slopes: a) Gradient b) Degree c) Per Cent d) Mills

3.1.3 Representation of Relief by Contours: Hill, Mountain, Ridge, Cliff, Saddle, Plateaue, Col or Pass, Gorge, 'V' Shaped Valley, Waterfall, 'U' Shaped Valley, Cirque, Sea cliff.

3.2 Profiles- Simple profile, longitudinal profile

Unit – 4 : Topographical Maps **Periods 50 Marks (15)**

4.1 Development of Survey of India

4.2 Indexing of S.O.I. Topographical Maps

4.3 Signs, Symbols and Colors used in SOI Toposheet

4.4 Interpretation of S.O.I.'s Topographical Map (Mountain, Plateau and Plain) a) Marginal Information b) Physical environment: Relief, Drainage and Vegetation c) Cultural environment: Settlements, Transportation and Communication, Irrigation. d) Land Use

Unit 5: Weather Instruments and IMD Maps Periods 50 Marks (15)

5.1 Study of weather Instruments with reference to Principle, Mechanism, and Function a) Thermograph b) Barograph c) Dry and Wet Bulb Thermometer d) Wind vane e) Cup Anemometer f) Rain Gauge.

5.2 Sign and Symbols used in Indian Daily Weather Maps.

5.3 Isobaric Patterns: Cyclone, Anticyclone, Col, Wedge, Trough and Secondary Depression.

5.4 Interpretation of Indian Daily Weather Maps (Rainy, Winter and Summer) Marginal Information, Atmospheric Pressure, Winds, Clouds, Rainfall, other weather phenomena's, Sea Condition, Temperature departure from normal.

Unit 6 : Representation of Statistical Data Periods 50 Marks 15

6.1 Graphs and Diagrams

6.1.1 Diagrammatic Data Presentation: i) Climograph, ii) Hythergraph iii) Ergograph (Crop Calendar)

6.2 Thematic Mapping Techniques: i) Proportional Circle ii) Choropleth Map iii) Dot Map iv) Isopleths v) Star Diagram

7 Journal and Viva Voce Marks 10

Note :

1. Use of stencils, log tables, computer and calculator is allowed.
2. Journal should be completed and duly certified by practical in-charge and Head of the Department.
3. Examiners should set jointly the question paper for each batch.
4. Each batch should not more than 12 students

Reference:

- Bygoot, J: An Introduction to Mapwork and Practical Geography, University Tutorial, London 1964.
- Khan MD. Zulfequar Ahmad : Text Book of Practical Geography, Concept Publishing Company, New Delhi, 1998
- Mishra, R.P. and Ramesh A. : Fundamentals of Cartography, Concept Publishing Company, New Delhi, 2000
- Monkhouse F.J. and Wilkison, H.R.: Maps and Diagrams, Mathuen. London, 1971.
- Negi., Dr. Balbir Singh : Practical Geography, KedarNath Ram Nath, Meerut, Delhi.
- Raisz, E.: Principals of Cartography, McGraw Hill Book Com., Inc, New York, 1962.
- Robinson, A.H. and Sale, S.D.: Elements of Cartography, John Witey and Sons, Inc, New York, 1969.
- Saha, Pijushkanti and BasuPartha : Advanced Practical Geography – A Laboratory
- Manual Books and Allied (P) Ltd, Kolkata. 2010.
- Sarkar, Ashis : Practical Geography: A systematic Approach, Orient Longman limited, Calcutta, 1997.
- Singh, Gopal : Map work and Practical Geography Vikas Publishing House Pvt. Ltd. New Delhi, 1996.
- Singh, R and Kanaujia, L.R.S.: Map Work and Practical Geography, Central Book Depot, Allahabad.
- Singh, R. L. and Rana P.B. : Elements of Practical Geography, Kalyani Publishers, New Delhi – Ludhiana, 1998.
- Aher A. B., Chodhari A. P. &Bharambe S. N. Techniques of Spatial Analysis Prashant Publication Jalgaon 2015
- Maurice Yeats, An Introduction to Quantitative Analysis in Human Geography, McGraw Hill, New York, 1974.
- P. Saha and P. Basu (2006): Advanced Practical Geography, Books and Allied Publication, Kolkata, India.
- Khullar, Essentials of Practical Geography, New Academic Publishing Co, India.
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PUNYASHLOK AHILYADEVI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR
Bachelor of Arts (B. A.)
B. A. Part – III Geography
(Practical Paper -II)

1. Title : Advanced Tools, Techniques & Field Work

2. Year of Implementation **:** Revised Syllabi will be implemented from June 2021 onwards.

3. Preamble **:** Modern science & technology have gained momentum. In the process of development of science and technology, the changing nature of subject of Geography will make aware to the students about the advanced techniques such as Remote Sensing, GIS and GPS. The application of computers has revolutionized the use of methods & techniques. The present syllabus of this paper includes study of Aerial Photographs, Remote Sensing, GIS, Application of Computer and use of field work in Geography. This will further help to improve the use of advanced techniques and methods in teaching-learning and research work.

4. Objectives **:**

1) To introduce the students with the importance of field work and advanced Techniques in Geography.
2) To provide training in application of modern tool and techniques in Geography.
3) To enable the students to understand the use of computer for analysis of Geographical data.
4) To enhance the skill of the students in instrumental survey.
5) To give basic information to the students about Arial Photographs, Remote Sensing, GIS and GPS.

5. Course Outcomes **:**

1. In depth understanding the importance of field work and advanced Techniques in Geography.
2. The students are trained to implement modern tool and techniques in Geography.
3. The students are deeply aware about the basics and trained in instrumental survey.
4. The students are deeply familiar with computer, GIS, GPS and Remote Sensing.

6. Pattern of Exam **:** Annual

7. Scheme of Teaching & Examination

Sr. No.	Subjects/Papers	Teaching Scheme Hrs./Week				Examination scheme (Marks)		
		L	T	P	Total	Practical	Term work	Total (Annual)
1	**Advanced Tools, Techniques & Field Work**	--	--	10	10	100	--	100

Revised Syllabus for B. A. – III
(Introduced from June 2021 Onwards)
Revised Syllabus for
B. A. (Part III) Geography
Practical Paper -II

Title of Paper - Advanced Tools, Techniques In Geography (Computer, Remote Sensing, GIS, GPS) & Field Work (100 Marks)

Unite: 1 Introduction to Computer **Lectures-50 Marks-10**

1.1: **Computer Fundamentals**: Definition, Characteristics, Hardware & Software.

1.2: **Application of computer in geography**

1.2.1: Construction of Line Graphs, Bar Graphs

1.2.2: Construction of Pie Diagram and Scatter Diagram.

1.3: **Significance and application of Internet in Geographical Studies.**

Unit: 2 Remote Sensing **Lectures- 50 Marks-15**

2.1 Definition, Components and Development of Remote Sensing.

2.2 Principles of Remote Sensing: EMR, Sensors and Platforms.

2.3 Application of Remote Sensing in Geography.

2.4 Aerial photographs and Satellite imagery: Definition, types

2.5 Identification of Physical and cultural features from Aerial Photographs or Satellite Imagery.

Unit: 3 GIS and GNSS (GPS) **Lectures- 50 Marks 15**

3.1 Geographical Information System (GIS)

3.1.1 Definition and components

3.1.2 GIS Data Structure: Types (spatial and non-spatial), Raster and Vector data

3.1.3 Georeferencing, Digitization, Map Layout Preparation

3.1.4 Application of GIS in Geography: Land use or Land Cover, Urban Sprawl Analysis, Forests Monitoring

3.2 Global Navigation Satellite System (Global Positioning System)

3.2.1 Definition and components

3.2.2 Application of GPS in Geography

3.2.3 Field work through GPS: Determining latitude, longitude and altitude

3.2.4 Exercise with Google earth Program.

Unit :4 Statistical methods and techniques **Lectures- 60 Marks-15**

4.1: Geographical Data / information:

4.1.1. Spatial and Temporal

4.1.2. Individual, Discrete and Continuous Data

4.2 Analysis of data by the following statistical techniques

4.2.1 Measures of Central Tendency: Mean, Median and Mode

4.2.2 Dispersion: Mean deviation, Standard deviation and Quartile Deviation.

4.2.3 Correlation: Karl Pearson's Method

4.2.4 Analysis of Time Series: Semi-average Method and Moving average method

Unit :5 Surveying **Lectures- 60 Marks-15**

5.1 Survey: Meaning and types

5.2 Preparation of plans of the given area with the following survey method **(Any one methodamong them)**

A)Dumpy Level survey

B) Plane Table survey (Radial, Intersection, and open and closed Traverse method)

C)Abony Level Survey.

5.3 Preparation of plans by Prismatic compass survey (Radical, Intersection and open and closed Traverse method)

5.3.1 Correction of bearing.

5.4 Preparation of plans by Chain and Tape survey (Triangulation and open and closed Traverse method)

5.4.1. Cross staff surveying

Unit:6 Project work based on field work (any one from below) Marks-10

6.1 Research Methodology

6.2 Resource, Population, Agricultural, Settlement, Environmental, Industrial, Health issues, any other issues related to local area.

(Project Report must be content of following points: Introduction – Aims – Objectives - Review of the literature - Data collection – Methodology - Data Analysis – Interpretation - Findings – Suggestions – Bibliography)

Unit:7 Study Tour Marks-10

Maximum 15 days at Geographical Interest in India and preparation of Excursion report.

Unit:8 Journal and Viva Voce Marks 10

Note : 1. Use of stencils, log tables, computer and calculator is allowed.

2. Journal should be completed and duly certified by practical in-charge and Head of the Department.

3. Examiners should set jointly the question paper for each batch.

4. Each batch should not more than 12 students

5. Each department should have at least 2 computers, 1 printer, 1 scanner, 10 pairs of Aerial Photographs, 5 Pocket Stereoscopes, 2 Mirror Stereoscopes and 5 Remote Sensing Images.

Reference:

- Bygoot, J: An Introduction to Mapwork and Practical Geography, University Tutorial, London 1964.
- Khan MD. Zulfequar Ahmad : Text Book of Practical Geography, Concept Publishing Company, New Delhi, 1998
- Mishra, R.P. and Ramesh A. : Fundamentals of Cartography, Concept Publishing Company, New Delhi, 2000
- Monkhouse F.J. and Wilkison, H.R.: Maps and Diagrams, Mathuen. London, 1971.
- Negi., Dr. Balbir Singh : Practical Geography, KedarNath Ram Nath, Meerut, Delhi.
- Raisz, E.: Principals of Cartography, McGraw Hill Book Com., Inc, New York, 1962.

- Robinson, A.H. and Sale, S.D.: Elements of Cartography, John Witey and Sons, Inc, New York, 1969.
- Saha, Pijushkanti and BasuPartha : Advanced Practical Geography – A Laboratory
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- Sarkar, Ashis : Practical Geography: A systematic Approach, Orient Longman limited, Calcutta, 1997.
- Singh, Gopal : Map work and Practical Geography Vikas Publishing House Pvt. Ltd. New Delhi, 1996.
- Singh, R and Kanaujia, L.R.S.: Map Work and Practical Geography, Central Book Depot, Allahabad.
- Singh, R. L. and Rana P.B. : Elements of Practical Geography, Kalyani Publishers, New Delhi – Ludhiana, 1998.
- Aher A. B., Chodhari A. P. &Bharambe S. N. Techniques of Spatial Analysis Prashant Publication Jalgaon 2015
- Maurice Yeats, An Introduction to Quantitative Analysis in Human Geography, McGraw Hill, New York, 1974.
- P. Saha and P. Basu (2006): Advanced Practical Geography, Books and Allied Publication, Kolkata, India.
- Khullar, Essentials of Practical Geography, New Academic Publishing Co, India.
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PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Bachelor of Arts (B. A.)

B. A. Part - III

SEC 01
A CERTIFICATE COURSE IN LAND SURVEY

Objectives –The course aims to achieve the following objectives:

- To introduce the students a new technology of Land Surveying.
- To acquaint the students with reading obtained with Total Station/GPS forming a database for surveying and mapping.
- To offer practical training in land surveying to the students and make them surveying experts.
- To generate job opportunities in the corporate and government sector.

Paper I Theory

Unit No.	Topic	Subtopic	No. of Periods
1.	**Introduction to Surveying**	Meaning and definition of surveying, History of survey, Types of surveying, Concept of Surveying, Uses of surveying	**05**
2.	**Scale and Contours**	Definitionandmeaning, Characteristics and properties, Methods of contour, Definition and Methods of expression of Scale, Measurement units	**05**
3.	**Introduction to S.O.I. Toposheets**	Indexing, Conventional Signs, Symbols Interpretation of SOI topographical map	**05**
4.	**Surveying**	Introduction to chain and tape, plane table and prismatic compass survey Survey instruments and its use, merits and demerits	**05**
5.	**Dumpy level Survey**	Definition and Principles, Instruments and its use, Merits and demerits	**05**
6.	**Theodolite Survey**	Definition and Principles, Horizontal & Vertical angles, Instrument and its use, Merits and demerits	**05**
7.	**Computer Cartography**	Principles of Computer Cartography, Hardware and Software, Application of Computer Cartography, Advantages and Limitation	**10**

8.	**Total Station Surveying**	Basic Terms used in Total Station Surveying, Total Station instrument components, Phases of Total Stations Survey, Sources of error for total stations, Electronic Notebook, Advantage and disadvantage	**10**

REFERENCES

- Rangwala S.C. 2011. Surveying and Leveling, Charotar Publishing HousePvt. Ltd. Anand,(GJ)
- Mishra, R.P. (1973): Elements of Cartography. Prasaranga, University of Mysore.
- S. K. Roy (2004) Fundamentals Of Surveying, PHI Learning Pvt. Ltd.
- Robinson, A.H & Sale R.D.: Elements of Cartography. Johns House & Sons, London.
- Sing R. L. (1996) : Map Work & Practical Geography, Central Book Dept. Allahabad.
- Ahmed, E-I. Rabbany 2006) :Introduction to GPS: The Global Positioning System, Artech House, Boston
- Nel, S . (2008):Global Positioning, John Wiley and Sons, Hoboken

Paper II

Paper – II (Practical)

Field Work and Laboratory Work

Unit No	Topic	Subtopic	No. of Periods
i.	**Scale and Area Measurement**	1. Conversion of units 2. Conversion and Construction of scale 3. Exercises on area measurement. 4. Interpolation of contour lines	**15**
ii.	**Modern Land Surveying Techniques**	• **Total Station-** Vertical and horizontal angle measurement, topographical survey (plain table and contour survey), Stake out / Demarcation/ Survey of Building Layouts / Plot Layouts / Roads / Alignments, Establish Benchmarks, Measurement of remote distance and elevation using special function of TS, Solution of trigonometric problems using COGO function on the field / Site, Calculate 2D, 3D area on the field / Site, Calculation of surface volume on the field / Site, Survey work estimation factors, procedure for download and upload data to TS, TS data formats, Preparation simple survey map using Software.	**25**
iii.	**Field trip**	Organization of field trip for Total Station	**05**
iv.	**Project work**	(Application of Total Station in specific domain area) Total Station data acquisition, Processing and Presentation Project Report : Final Reporting	**20**
v.	**Viva – voce**	Based on Project Work	**05**

REFERENCE

- Satheesh Gopi, (2007), Advanced Surveying: Total Station, GIS and Remote Sensing Pearson Education India,
- Charles D. Ghilani, Paul Richard Wolf (2008): Elementary Surveying: An Introduction to Geomatics, Prentice Hall,
- N. N. Basak (1994): Surveying and Leveling, Tata McGraw Hill Publishing Company LTD., New Delhi.

- Parkinson, B. Spilker J. : (Eds.) (1996) GPS : Theory and Applications Vol. I & II, AIAA, Washington.

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PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Bachelor of Arts (B. A.)

B. A. Part - III

SEC 02

A CERTIFICATE COURSE TRAVEL AND TOURISM

Objectives:

i. To introduce the fundamental concept of Travel and Tourism.

ii. To familiarize with the significance and emerging trends in tourism.

Unit No	Topic	Subtopic	No. of Periods
1	Introduction to Tourism	Meaning & definitions of tourism, traveler, excursionist, tourists - Objectives, nature & Classification of tourism & tourists. Tourism recreation & leisure inter-relationship. Growth and development of Tourism through the ages.	**10**
2	Economics of Tourism Industries	Emergence of Thomas Cook – Emergence of Travel Intermediaries- Definition - The travel Market: Business Travel - Corporate Travel - Commercial Group Travel - Institutional Travel - Leisure Travel - Family Travel - Single Resort Travel - Special Interest Travel. Types of travel agency and tour operations - Inter-relationship between Travel agency and tour operation. Indian travel agencies and tour operators - an overview.	**10**
3	Components and Forms of Tourism	Components of tourism Forms of Tourism: religious, Medical Tourism, historical, social, adventure, health, business, conferences, conventions, incentives, sports Agro and adventure tourism	**10**
4	Major tourist attractions in India	physical and political attractions of Indian subcontinents. Tourism attractions in different states and territories of India.	**10**
5	Tourism Marketing	Marketing for Hospitality and Tourism – Definition – Core Marketing Concepts – Marketing Philosophies – Selling Vs Marketing, Differences between Products and Services – Technology and Marketing – Specific features of Tourism Marketing.	**10**
		FIELD WORK CASE STUDIES Planning and Organization of tour on famous routs for 2 to 15 days.	**40**

References:

8. Dennis L &Foseter – Glencoe (2003), an Introduction to Travel & Tourism, McGrawHill
9. Ghosh Bishwanth (2000), Tourism & Travel Management, Second Revised Edition Vikas Publishing House Pvt Ltd, New Delhi.
10. Kaul R.N 91991), Dynamics of Tourism, Sterling Publishers Pvt Ltd, Volume 1,2 & 3 New Delhi,
11. PranNath Seth(1997),Successful Tourism Management, Sterling Publishers Pvt Ltd, New Delhi,
12. Praveen Sethi(1999), Tourism for the Next Millennium, Rajat Publication New Delhi.
13. Singh Anand (2005), Tourism in Ancient India, Serials Publications, New Delhi.
14. Sinha R.K (2003), Growth and Development of Modern Tourism, Dominant Publishers, New Delhi

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Bachelor of Arts (B. A.)

B. A. Part - III

SEC 03

A CERTIFICATE COURSE IN QGIS

Objectives:

- Learn the concepts of open-source software
- Understand the interface of QGIS and its plug-ins
- Learn how to fetch data into QGIS and work with table attributes
- Create maps using QGIS followed by its printing process

Unit I :Introduction of QGIS 15

Objectives, working with projection, installation of software and plugins

Unit II :Georeferencing and Digitization **20**

Toposheet Registration.

Digitization of Toposheet - point, Line and polygon

Unit III :Types of data and Analysis **15**

Vector data, raster data

Dissolving and Merging

Clipping and Union Buffering techniques

Unit IV: Layoutand map composition **20**

Map Preparation and composition,
Symbology in of QGIS.
Working with Tables(Join Tables)

Unit V:Application in Urban Planning: 20

Mapping urban landuse, transportation network, Utility-Facility mapping

References:

- A comprehensive introduction to Quantum GIS – RudigerThiede and others
- Introduction to QGIS – Scott Madry
- Learn QGIS – Andrew Cutts, Anita Graser
- www.qgis.org

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Geology

Name of the Course: B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

Preamble:

The role of the undergraduate program in geology is vital in gaining skills based on geology, geological thinking, and understanding the nature of gainful employment and/or further access to the best postgraduate program elsewhere. The New Education Policy (NEP) initiated by the Ministry of Human Resource Development (HRD), Govt. of India, actively engaged in the improvement of quality higher education by offering the highest priority to inculcate knowledge, skill, and training to achieve and magnify student's thinking, cognizance and application abilities to make them ready to compete, succeed and excel universally. The following student-centric syllabus is designed with well-defined objectives, goals, and learning outcome-based.

Objectives:

1. To develop an understanding of concepts in Geology and geological processes
2. The ability to address real geological problems in the field.
3. To inculcate the ability to read, write and speak cogently using the language of geology..
4. To enhance the broad and balanced knowledge and understanding of economic importance and exploration of natural resources, applications of geological expertise in various fields, geological mapping, and understanding the earth's geological evolution.
5. Applications of various concepts, theories, and principles learned to demonstrate, design, and perform experiments in the laboratory.
6. To develop the ability to apply the knowledge acquired in the laboratories and classroom in the field visits.
7. To enhance digital literacy and spatial thinking by imparting knowledge of remote sensing and GIS and using digital resources.
8. To provide knowledge for a career in professional practice in industries related to geogenic hazards associated with environmental issues.
9. To develop scientific reasoning ability for surface and subsurface water conservation issues.
10. To understand various applications and linkage of geology in interdisciplinary areas/subjects such as geography, chemistry, physics, etc.

Choice Based Credit System CBCS

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, PunyashlokAhilyadeviHolkar Solapur University has implemented Choice Based Credit System (CBCS) of Evaluation at Undergraduate level. Credit is a numerical value that indicates students work load (Lectures, Lab works, Seminars, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. As per present norms, there are 3 contact hours per paper (subject) per week which works out to be 60 contact hours / 4 credit points per paper (subject) per semester.

In PunyashlokAhilyadeviHolkar Solapur University, for B.Sc.-III Geology, there are 4 papers in each semester and Compulsory English (AECC). For B.Sc.-III Geology, there are 3 contact hours per paper (subject) per week for each paper and Compulsory English (AECC) carry 4 contact hours per week. Therefore, total contact hours per week are for semester V is 18

(including 2 contact hours of add-on course of Certificate Course in Geoinformatics) and for semester VI total contact hours allotted are 16. Each paper has 60 contact hours, which are transformed into 4 credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks. It is 80+20 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are presented in the following table.

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class:	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)	**English (Business English)**		Paper- III	4.0	--	--	50	40	10	2.0
Discipline Specific Elective (DSE) (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.	**DSE-1A-Economic Geology**		Paper- IX	3	--	--	100	80	20	4.0
	DSE- 2 A-Hydrogeology		Paper -X	3	--	--	100	80	20	4.0
	DSE- 3 A-Applied Geology Part – I		Paper- XI	3	--	--	100	80	20	4.0
	DSE 4 A- Applied Geology Part – II		Paper- XII	3	--	--	100	80	20	4.0
	(Add-on-self learning)- MOOC/SWAYAM Course/Internship/Industrial Training/ **Certificate course in Geoinformatics**		Annexure - I	2	--	--	50	40	10	2.0
Grand Total				**18.0**	**--**	**--**	**500**	**400**	**100**	**22**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)	**English (Business English)**		Paper IV	4.0	--	--	50	40	10	2.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.	**SEC- 1B-Photogeology & Remote Sensing**		Paper -XIII	3.0	--	--	100	80	20	4.0
	SEC- 2B- Geomorphology and Geotectonics		Paper- XIV	3.0	--	--	100	80	20	4.0
	SEC- 3B-Environmental Geology		Paper- XV	3.0	--	--	100	80	20	4.0
	SEC 4B- Geochemistry		Paper- XVI	3.0	--	--	100	80	20	4.0
	SEC-									
Total (Theory)				**16.0**	**--**	**--**	**450**	**360**	**90**	**18**
DSE - Practical (Annual Exam)	**DSE- 1 Unit I**		Practical- IX & X	--	--	5	100	80	20	4.0
	DSE -2 Unit II		Practical- XI &XII	--	--	5	100	80	20	4.0
	SEC–1&2Unit III		Practical- XIII &XIV			5	100	80	20	4.0
	SEC–3&4 Unit IV		Practical-			5	100	80	20	4.0

		XV& XVI							
	(Add-on-self learning) Certificate course in Geoinformatics	Practical + Project + Oral			2	50	30	20	2.0
Total (Practicals)					**22**	**450**	**350**	**100**	**18**
Grand Total			**34.0**		**22**	**1400**	**1110**	**290**	**58**

Abbreviations:

L: Lectures
P: Practical
CA: College Assessment
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course
T: Tutorials
UA: University Assessment
CC: Core Course
DSE: Discipline Specific Elective Paper
GE: Generic Elective

Conversion of marks into Grades:

A table for the conversion of the marks obtained by a student in each paper (out of100) to grade and grade point is as given below:

Sr. No.	Range of Marks	Grade	Grade Point
1	80-100	O	10
2	70-80	A+	9
3	60-69	A	8
4	55-59	B+	7
5	50-54	B	6
6	45-49	C+	5
7	40-44	C	4
8	<39	FC	0 (Failed in Term Exam)
9	<39	FR	0 (Failed in Internal Assessment)

1. **Grade Point Average at the end of the Semester (SGPA)**

$$SGPA = \frac{(G_1 \times C_1) + (G_2 \times C_2) + \ldots\ldots\ldots\ldots}{\Sigma Ci}$$

(Σ Ci= The total number of credits offered by the student during a semester)

2. **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{(G_1 \times C_1) + (G_2 \times C_2) + \ldots\ldots\ldots\ldots}{\Sigma Ci}$$

(Σ Ci= The total number of credits offered by the student upto and including the semester
for which CGPA is calculated.)

3. **Final Grade Point Average (FGPA)**
   It will be calculated in the similar manner for the total number of credits offered for the completion of the said course.
   Where: Ci= Credits allocated for the i^{th}course.
   Gi= Grade point scored in the i^{th}paper (subject)

4. Conversion of average grade points into grades:

SGPA/CGPA/FGPA	Letter Grade
9.5 – 10	O
8.5 – 9.49	A+
7.5 – 8.49	A
6.5 – 7.49	B+
5.5 – 6.49	B
4.5 – 5.49	C+
4.0 – 4.49	C
<3.99	FC / F
	FR

GENERAL STRUCTURE OF B. Sc. PROGRAM (CBCS PATTERN)

Class	Semester	Marks Theory	Credits Theory	Marks Practical	Credits Practical	Total Credits
B.Sc. – I	I	500	20	--		20
	II	550	20	400	16	36
B.Sc. – II	III	350	14			14
	IV	350	14	300	12	26
B.Sc. – III	V	500	22			22
	VI	500	18	400	16	36
Total		**2750**	**110**	**1100**	**44**	**154**

B.Sc. Programme:

Total Marks:	Theory + Practical's = 2750 +1100	=3950
Total Credits:	Theory + Practical's = 110 + 44	= 154
Numbers of Papers:	Theory: Ability Enhancement Course (AECC)	= 005
	Theory: Core Courses (CC)	= 008
	Theory: Discipline Specific Elective Paper (DSE)	= 004
	Skill Enhancement Courses (SEC)	= 004
	Add on self-learning course (SEC) theory + practical	= 001

STRUCTURE OF B.Sc. III

Semester	Paper No.	Title	Contact Hrs.	Credit Point	Total Marks (UA + CA)
Semester V	IX	Economic Geology	60	4	80 + 20 = 100
	X	Hydrogeology	60	4	80 + 20 = 100
	XI	Applied Geology – Engineering Geology	60	4	80 + 20 = 100
	XII	Applied Geology – Prospecting and Mining Geology	60	4	80 + 20 = 100
		Add on Course: Certificate course in Geoinformatics	30	2	40 + 10 = 50
Semester VI	XIII	Photogeology and Remote Sensing	60	4	80 + 20 = 100
	XIV	Geomorphology and Geotectonics	60	4	80 + 20 = 100
	XV	Environmental Geology	60	4	80 + 20 = 100
	XVI	Geochemistry	60	4	80 + 20 = 100
Semester V and VI	Practical Course	Practical Examination (Two Days)(Annual Pattern)		16	320 + 80 = 400
		Practical + Project: Certificate course in Geoinformatics	30	2	30 + 20 = 50
			Total	**52**	**1300**

GENERALRULES AND STRUCTURE OF B.SC. III GEOLOGY

1. The university follows the semester system.
2. An academic year shall consist of two semesters.
3. Each B.Sc. course shall consist of three years, i.e. six semesters.
4. B.Sc. Part-III Geology shall consist of two semesters: Semester V and Semester VI.
5. **In semester V there will be four courses / Papers. One add-on course is added by the DBF Dayanand College of Arts and Science, Solapur (for details, refer to Annexure).The Certificate Course in Geoinformatics (CCG) carry a total of 4 credits.** The structure of this add-on course is as follows:

Certificate Course in Geoinformatics

Semester	Paper	Total contact Hrs.	Examination			Total Credits
			Univ. Exam.	Internal Exam.	Total Marks	
B.Sc.-III (Sem.-V)	Theory	30	40	10	50	2
	Practical	15	30	00	30	1
	Project & Oral	15	00	20	20	1
Total		**60**	**70**	**30**	**100**	**4**

The students have to earn 4 credits during the Vth Semester by selecting add-on-self learning course either from online learning platforms such as MOOC / Swayam / NPTEL or by attending internship/training in the geology subject related industries. Or the candidate can select and attend any one add-on course of any stream of his/her choice published on the university's website to earn 4 credit points.**Besides these online self-learning add-on-courses, the students can also opt for the Certificate Course in Geoinformatics (CCG) to earn 4 credits.**

6. **It is compulsory to complete the add-on course before completion of B.Sc. III course. Without completing the add-on course, the student will not be declared a pass, and he/she will not get a degree certificate.**
7. Practical examination for add-on course will be conducted at the end of the Vth semester for 50 marks, of which university practical assessment carries 30 marks and 20 marks are allotted for internal practical assessment with oral and project completion.
8. The scheme of evaluation of the performance of candidates shall be based on University assessment and College internal assessment as given below. For B.Sc. Part-III Geology semester V & VI, the internal assessment will be based on Unit tests, Tutorials, Home assignment, Viva, Group discussion, attitude, sincerity, attendance, student seminars etc. A practical course examination of 100 marks for each course/paper shall be conducted at the end of the VIthsemester. The practical examination of total 400 marks shall also consist of 320 marks for University practical assessment and fieldwork and 80 marks for college internal practical assessment.
9. For University practical examination, both the examiners will be External and will be appointed by the university.
10. Scheme of Evaluation: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment (CA) of 20 marks and external assessment, University Assessment (UA) of 80 marks.

Semester – V
Theory: (100 marks)
University Examination (80 marks): No. of theory papers: 5 (1English + 4 Subjects)
Internal Continuous Assessment: (20 marks)
The 20 marks of College level Assessment (CA) may be distributed as 10 Marks for Internal Test and 10 Marks for Home Assignment/seminars/Viva/ Group discussion etc.

Add-on course (Certificate Course in Geoinformatics):
Theory: (50 marks)
University examination: 40 marks
Internal assessment: 10 marks
Practical: 50 marks
University Practical Examination: 30 marks
Internal practical assessment with oral and project: 20 marks

Semester –VI
Theory: (100 marks)
University Examination (80 marks): No. of theory papers: 5 (1English + 4 Subjects)
Internal Continuous Assessment: (30 marks)
The 20 marks of College level Assessment (CA) may be distributed as 10 Marks for Internal Test and 10 Marks for Home Assignment/seminars/Viva/Group discussion etc.
Practical Examination: (400 marks)
University Examination (320 marks): No. of practical course 4 (4 x 80 = 320 marks)
Internal Continuous Assessment: (80 marks)
Scheme of marking: 80 marks – Internal test on any four practicals (4 x 20 = 80 marks)
(Weightages for Lab. Journal /performance/attendance/sketching of diagrams related to syllabus.

11. **Passing Standard:** The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who scores less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for the respective course/paper. A student who failed in University Examination (theory) and passed in internal assessment of the same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who failed in internal evaluation and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination (theory) as well as internal assessment.

12. **Eligibility for admission to B.Sc. III semester V:**Candidate passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Geology examination and clearly passed in B.Sc. Part-I- Geology shall be permitted to enter the course of Semester V of B.Sc. III Geology.

SEMESTER – V
PAPER – IX
ECONOMIC GEOLOGY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, Critical, and essential minerals	**15**
II	Processes of formation of ore deposits; Magmatic, contact metasomatic, Supergene sulfide enrichment, hydrothermal, sedimentation, residual and mechanical concentration	**20**
III	Study of essential metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesitelimestone, clay, quartz, corundum, mica) Concerning geological occurrence and distribution in India.	**20**
IV	Fossil fuels: their occurrence, origin, and distribution of Coal, Petroleum, and Natural Gas deposits in India.	**05**

Course Learning Outcome: At the end of the course the student will acquire:

1. Knowledge of geological processes of formation of various ore deposits.
2. Applications of ore deposits and their distribution.
3. Understand environmental impact of mining, and the importance conservation of mineral resources.

Books Recommended:

1. Brown, C. and Dey, A.K.1955. Indian Mineral Wealth. Oxford Univ.
2. Gokhale, K.V.G.K. and Rao, T.C., 1983. Ore Deposits of India. East West Press Pvt. Ltd.
3. Jense, M.L. and Bateman A.M., 1981. Economic Mineral Deposits. John Wiley and Sons.
4. Krishnnaswamy, S., 1979. India's Minerals Resources. Oxford and IBH Publ.
5. Deb, S., 1980. Industrial minerals and Rocks of India. Allied Publishers Pvt. Ltd.
6. Umeshwar Prasad, 2003. Economic Geology. CBS Publishers and distributers.
7. Sharma, N.L. and Ram, K.V.S., 1972. Introduction to India's Economic Minerals, Dhanbad.
8. Laurence Robb, 2004. Introduction to Ore-Forming Processes. Wiley Eastern Ltd.
9. Chatterjee, K.K.; An Introduction to Mineral Economics; Willey Eastern Limited.
10. A.I. Lavorsen, A.I. -Geology of Petroleum, CBS Publishers and Distributers
11. Singh, R.D. 1997 Principles and Practices of Modern Coal Mining. New Age international Publishers

PAPER – X
HYDROGEOLOGY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Definition of hydrogeology, Hydrological cycle;	**05**
II	Hydrological parameters - Precipitation, evaporation, transpiration and infiltration, surface runoff, and their controlling factors	**05**
III	Origin of groundwater; Vertical distribution of groundwater; Types of aquifers; Water bearing properties of rocks - Porosity and Permeability, Intrinsic permeability, specific yield, specific retentions, and their controlling factors, Transmissivity and Specific yield.	**15**
IV	Surface and subsurface geophysical and geological methods of groundwater exploration. Surface exploration methods of groundwater. Basic principles of geophysical exploration methods for groundwater like- Resistivity Methods, Seismic methods, Magnetic Methods, Radioactive Method, Deep Penetration Radar Methods.Basics of sub-surface methods of groundwater exploration like- Well observations and drilling method.	**25**
V	Types of aquifers in Maharashtra. Definition of Watershed. Elements of the watershed. Geological aspects of Watershed development and management	**10**

Course Learning Outcome: At the end of the course the student will acquire:

1. Understand parameters, geological controls, and dynamics of surface and subsurface hydrology.
2. Understanding of exploration of groundwater.
3. Understanding of applicationsof various structures to recharge groundwater for sustainable resource.
4. Knowledge of environmental impact, conservation,and development of surface and subsurface water resources.

Books Recommended:

1. Karanth, K. R., 1989. Hydrogeology. Tata McGraw Hill Publ.
2. Raghunath, H. M., 1990. Groundwater. Wiley Eastern Ltd.
3. Subramaniam, V., 2000. Water-Kingston Publ. London.
4. Todd, D.K.; Groundwater; John Wiley and Sons.

PAPER – XI
APPLIED GEOLOGY – ENGINEERING GEOLOGY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Role of Engineering geologists in planning, design, and construction of major man-made structural features. Site investigation and characterization.	**15**
II	Engineering properties of rocks: Specific Gravity, Porosity, Compressive strength, Tensile strength, Elasticity of rocks, residual stress, and shear stress. Geo-mechanical classification of rock mass: RMR, RQD, and SMR. Soils' engineering properties: Classification, gradation, compressive and shear strength, Consolidation, and swelling of clays, soil and Soil groups of India.	**25**
III	Dams and reservoirs: Types, Geological conditions for selection of dam and reservoir sites and their environmental considerations; Geological problem of reservoirs	**10**
IV	Tunnels: geology, structure, seepage problem and role of the water table;	**05**
V	Landslides: classification, causes, and preventative measures.	**05**

Course Learning Outcome: On successful completion of the course:

1. The students understand the impact of natural dynamic geological processes on civil engineering structure.
2. The students will get acquainted with engineering properties of rocks and their uses in construction.
3. The students will know the significance of factors of geological consideration for the construction of large construction projects.
4. The students will get preliminary understanding of planning, design and execution stages of the structures in their professional life.

Books Recommended:

1. Krynine D.P. and Judd W.R., 1957. Principles of Engineering Geology & Geotechnics. McGraw-Hill Book
2. Kesavulu, N.C., 2009. A text book of engineering geology. Macmillan P publishing India Ltd.
3. Crozier. M.J., 1989. Landslides: causes, consequences and environment. Academic Press.
4. Readman, J.H., 1979. Techniques in Mineral exploration. Applied Science Publishres.
5. Bell, F.G., 1983. Fundamentals of Engineering Geology. Butterworth and Co.
6. Parbin Singh., 2013. Engineering and General Geology.S.K. Kataria& Sons;
7. BangarK.M., 2020. Principals of Engineering Geology. StandardPublishersDistri.

PAPER – XII
APPLIED GEOLOGY – PROSPECTING AND MINING GEOLOGY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Mineral exploration: geological and geophysical prospecting: Electrical methods, Magnetic Methods, Seismic Methods, and Gravity Methods. Geochemical prospecting; primary and secondary dispersion, Geochemical association, and pathfinders	**20**
II	Sampling methods- Random sampling, Grab sampling, Coning and Quartering, Pitting and Trenching	**15**
III	Elementary idea of mining – Winning, Shaft, Hanging Wall, Adit, Drift, Level, Crosscut, Tunnel, raise Winze, Ore Basin, Chute, Stope, Air Crossing; Opencast and Underground mining.	**15**
IV	Environmental considerations for mining.	**10**

Course Learning Outcome: At the end of the course the student will acquire:

1. Knowledge of various methods of minerals exploration by linking interdisciplinary subject knowledge.
2. Understand various mining methods both open cast and underground mining
3. Preliminary understanding of sampling methods for exploration and ability to collect and analyze data.
4. Fundamental understanding of environmental impact of mining on society and various methods to mitigations.

Books Recommended:

1. Clark, G.B. 1967. Elements of Mining. 3rd Ed. John Wiley & Sons.
2. Arogyaswami, R.P.N. 1996 Courses in Mining Geology. 4th Ed. Oxford-IBH.
3. Moon, C.J., Whateley, M.K.G., Evans, A.M., 2006, Introduction to Mineral Exploration,Blackwell Publishing.
4. Valdiya, K.S., 1987. Environmental Geology – Indian Context. Tata McGraw Hill.
5. Rajendran S., 2007. Mineral Exploration: Recent Strategies.
6. Dobrin, M.B. &Savit, CH., 1988. Introduction to Geophysical Prospecting, McGraw-Hill.
7. Parasins, D.S., 1997. Principles of applied geophysics. Chapman Hall.
8. McKinstry H.E., 1953. Mining Geology. The Prentice-Hallgeologyseries
9. Bhattacharya Jayanta., 2003. Principles of Mine Planning Allied Publ. New Delhi.

SEMESTER – VI
PAPER – XIII
PHOTOGEOLOGY AND REMOTE SENSING

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	The elementary idea about photogeology: types & geometry of aerial photographs; stereoscope and stereoscopic vision, Types and uses of aerial photographs. Taking aerial photographs: principles and errors in flying, factors affecting aerial photography; types of camera, film, and filters; factors affecting scale. Elements of photo-interpretation: fundamentals, geologic, geomorphic, structural geological, and water resource applications.	**10**
II	Concept, Definition, and fundamentals of remote sensing; remote sensing systems; electromagnetic spectrum; Energy interaction in the atmosphere and earth surface features; spectral reflectance curve of vegetation, soil, and water; resolutions: spatial, spectral, radiometric, and temporal remote sensing sensors; signatures of rocks, minerals, and soils. Application of remote sensing in geoscience and geomorphological studies	**20**
III	Spaceborne imaging systems of LANDSAT, IRS, SPOT, and high-resolution satellites and their characteristics – orbits, sensors, and resolution. Multispectral, Thermal, and hyperspectral sensing. Introduction to digital image processing and classification – fundamental steps in image processing – colour composites, NDVI, band combinations, rectification, restoration, enhancement, contrast manipulations; image classification – supervised and unsupervised classification. Applications – recognition of rock types and geological structures.	**20**
IV	Introduction to Geographic Information System (GIS) – Definition, components; components of GIS; Data models: vector data models, points, polylines and polygons, data structures and Raster data models, Grid cell data types, attribute data, and georeferencing.Integration of GIS with remote sensing.	**10**

Course Learning Outcome: At the end of the course, students will acquire:

1. Understand and define basic principles of photogeology and remote sensing.
2. Acquisition, recognition,analyze, and interpret various types of remote sensing data.
3. Get skill of preliminary digital image processing and classification of digital data.
4. Get skill of preparing geological maps on GIS platform.
5. Understand the various applications of remote sensing and GIS.

Books Recommended:

1. Bhatta, B., 2008. Remote Sensing and GIS. Oxford, New Delhi.
2. Gupta, R.P., 1990. Remote Sensing Geology. Springer Verlag.
3. Lillesand, T.M. and Kiffer, R.W., 1987. Remote Sensing and Image Interpretation. John Wiley.
4. Pandey, S.N., 1987. Principles and Application of Photogeology. Wiley Eastern, New Delhi.
5. Sabbins, F.F., 1985. Remote Sensing – Principles and Applications. Freeman.
6. Siegal, B.S. and Gillespie, A.R., 1980. Remote Sensing in Geology. John Wiley.
7. Rampal K.K. 1999. Hand book of aerial photography and interpretation. Concept publication

PAPER – XIV
GEOMORPHOLOGY AND GEOTECTONICS

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Basic principles of Geomorphology, weathering, and erosion geomorphological cycles, rejuvenation: static and eustatic, topographic evidence of rejuvenation; Geomorphic mapping- tools and techniques.	**10**
II	Epigene/exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Diastrophism and volcanism, Extraterrestrial processes; Geological work of wind, glacier, river, underground water, and ocean	**20**
III	Earth as a dynamic system. Elementary idea of continental drift, sea-floor spreading, and mid-oceanic ridges. Paleomagnetism and its application.	**20**
IV	Plate Tectonics: the concept, plate margins, orogeny, deep-sea trenches, island arcs, and volcanic arcs	**10**

Course Learning Outcome: At the end of the course the student will acquire:

1. Knowledge of natural forces that shapes the earth and formation of various surface features.
2. Understand the dynamism of earth's surface and effects of movements of mankind.
3. Skill of tools and techniques to prepare geomorphologic maps.

Books Recommended:

1. Allen, P., 1997. Earth Surface Processes. Blackwell
2. Bloom, A.L., 1998. Geomorphology: A systematic Analysis of Late Cenozoic Landforms (3rd Edition).
3. Pearson Education, Inc.
4. Keary, P. and Vine, F.J., 1997. Global Tectonics. Blackwell and crustal evolution. Butterworth-Heinemann.
5. Kale, V.S. and Gupta, A., 2001. Introduction to Geomorphology. Orient Longman Ltd.
6. Moores, E and Twiss. R.J., 1995. Tectonics. Freeman.
7. Patwardhan, A. M., 1999. The Dynamic Earth System. Prentice Hall.
8. Summerfied, M.A., 2000. Geomorphology and Global tectonic. Springer Verlag.
9. Valdia, K.S., 1988. Dynamic Himalaya. Universities Press, Hyderabad.
10. WD Thornbury, 2002. Principles of Geomorphology. CBS Publ. New Delhi.

PAPER – XV
ENVIRONMENTAL GEOLOGY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere, and Man; Earth Material.	**10**
II	Energy budget: Solar radiation; Global environments: coastal, riverine, desertic, tropical, cold, polar; Concept of global warming and climate change	**20**
III	Geological hazards: Earthquakes, volcanism, landslides, subsidence, avalanches, floods, droughts; Disaster management.	**20**
IV	Resource Management: Energy resources (Conventional and non-conventional).	**10**

Course Learning Outcome: At the end of the course the student will acquire:

1. Knowledge of interaction and energy exchange between earth's spheres.
2. Understand the earth's energy budget and impact of anthropological activities on environment.
3. Understand process of generation natural hazards and their impact on society.
4. Develop understanding of mitigate natural hazards by applying geological knowledge.

Books Recommended:

1. Verma, V.K., 1986. Geomorphology Earth surface processes and form. McGraw Hill.
2. Chorley, R. J., 1984. Geomorphology. Methuen.
3. Selby, M.J., 1996. Earth's Changing Surface. Oxford University Press UK.
4. Thornbury W. D., 1997. Principles of Geomorphology Wiley Eastern Ltd., New Delhi.
5. Valdiya, K. S., 1987. Environmental Geology - Indian Context. Tata McGraw Hill New Delhi.
6. Keller, E. A., 2000. Environmental Geology. Shales E. Merril Publishing Co., Columbus, Ohio.
7. Montgomery, C., 1984. Environmental Geology. John Wiley and Sons, London.
8. Bird, Eric, 2000. Coastal Geomorphology: An Introduction. John Wiley & Sons, Ltd. Singapore.
9. Liu, B.C., 1981. Earthquake Risk and Damage, Westview.

PAPER – XVI
GEOCHEMISTRY

Total Credit: 04 **Contact Hours: 60**

Unit	Content	Contact Hrs
I	Introduction to geochemistry: basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids; Elementary idea of Periodic Table.	**15**
II	Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles;	**10**
III	Gold Schmidt's geochemical classification of elements; Distribution of major, minor, and trace elements in igneous, metamorphic, and sedimentary rocks	**15**
IV	Elements of geochemical thermodynamics; Isomorphism and polymorphism; Fundamentals of Radioactive and Radiogenic Isotope Geochemistry. Geochronology: long-lived radioactive decay systems. Radiogenic Isotopic tracers: evolution of Mantle, Crust, and Sediments	**20**

Course Learning Outcome: At the end of the course the student will acquire:

1. Establish linkage between knowledge of geology and chemistry.
2. Understand geochemical activities since formation of the earth and migration of the elements.
3. Knowledge of isotopes and their applications in geology.
4. Geochemistry of solar system.

Books Recommended:

1. Hoefs, J., 1980. Stable Isotope Geochemistry. Springer-Verlag.
2. Klein, C. and Hurlbut, C.S., 1993. Manual of Mineralogy. John Wiley and Sons, New York.
3. Krauskopf, K.B., 1967. Introduction to Geochemistry. McGraw Hill.
4. Mason, B. and Moore, C.B., 1991. Introduction to Geochemistry. Wiley Eastern.
5. Rollinson, H.R., 1993. Using geochemical data: Evaluation, Presentation, and Interpretation. Longman.

PRACTICAL COURSE IN GEOLOGY

Credit: 16 **Contact Hours / week: 20**

Total Marks: UA – 320 + CA – 80 = 400

UNIT – I: DSE – 1: Laboratory Course in Economic Geology and Hydrology:

1. **Economic Geology**: Study of major ore, economic and industrial minerals in hand specimen; Preparation of maps showing the distribution of important metallic and non-metallic deposits studied in theory course and important coal and oil fields of India.
2. **Hydrology:** Study of hydro-geological models: Water table, Perched aquifer, Confined and unconfined aquifer, and leaky aquifer. Preparation and interpretation of water table maps. Groundwater exploration based on topographic features, rock types, satellite images based on tone, texture, lineaments, and vegetation cover.

UNIT – II: DSE – 2:Elements of Applied Geology:

1. **Engineering Geology:**Preparation of engineering geological maps (outcrop completion). Describing engineering properties of the area given in the map along the profile line and suggesting suitable sites for construction of dams and tunnels andreservoirs. Engineering properties and identification of building stones. Identification of various models of landslide, tunnel, and dam. Study of soil profiles.
2. **prospecting and mining Geology:** Completion of Outcrops from the available data (number of outcrops, dip & strike given). Bore Hole Problems to ascertain Dip, Strike, and Fault. Interpretation of Geophysical Resistivity survey data (VES).

UNIT – III: SEC – 1&2: Photogeology and Remote Sensing&Geomorphology and Geotectonics:

A. Photogeology and Remote Sensing:

Visual interpretation of Arial photographs and FCCs. Analysis of digital satellite imagery in GIS environment:

1. Identification and understanding of peripheral information printed on aerial photographs.
2. Determination of photo coverage- Forward and lateral overlap.
3. Study of Stereoscopes - Lens and mirror,
4. Study of Orientation of Photo pair - under stereoscope.
5. Recognition of Photo elements- study of aerial photographs characteristics: Relief, Tone, Size, Shape etc; and their significance
6. Terrain features identifications:
   i. Drainage - Drainage density, patterns and stream features and their significance
   ii. Landforms - mesa. butte. ridge and questa, hill etc.
   iii. Structures: strike and dip, fold, fault, joints etc.
   iv. Lineaments – Stream, Tonal contrast (structural) and Topographic contrast)
   v. Lithology and lithological contacts
   vi. Vegetation and land use pattern.
7. Tracing of lineaments, lithology, landforms, structures and drainages.

B. Geomorphology:

Identification and description of features from Toposheet:

1) Mesa 2) Butte 3) Ridge 4) Questa 5) Meander 6) Incised meander 7) Point bar 8) valleys 9) marking drainage basin boundary and identification of drainage patterns.

Reading longitudes, latitudes and projection system.
Study of geomorphological models of work of streams, glaciers, wind,underground water and ocean.

C. Drainage basin analysis:

Determination of 1) Stream Order (Strahler's method) 2) Stream number 3) Stream length, 4) Basin area, Derivation of a) Drainage density and b) Bifurcation ratio and their significance

UNIT – IV: SEC – 3 & 4: Environmental Geology and Geochemistry

1. **Environmental Geology:** Identification and preparation of Geological hazard maps (landslide and flood) using, toposheets, aerial photographs, and digital imageries. Study of map of seismic zones of India.
2. **Geochemistry:**Petrochemical calculations from given chemical analysis of rocks.
   - Determination of CIPW Norms (Over saturated rocks) and classification,
   - Determination of Niggli values up to quartz Values and classification
   - Determination of ACF and plotting on triangular diagrams (compare with standard diagram from Winkler)
   - Plotting of sedimentologic size analysis data on histogram and frequency curves, mode and mean, Folk and Ward's (1957) graphic measures mean, size and standard deviation.Significance of this analysis be compared with standard Table given by Krumbein and Sloss

Practical Examination Pattern

1. University practical examination will be conducted annually i.e. at the end of sixth semester only.
2. It will be conducted for total 320 marks
3. Two separate days for Two Practicals
4. Time – 5 hours per practical day

Geological excursion and field studies.

1. Geological fieldwork in selected areas as specified in theory papers for about 07 days under guidance is compulsory. The days allotted for geological excursion can be reduced by adding one short tour (at least two days) in the nearby areas for Deccan Trap studies and flow mapping. Short tours of 1 day or multiple may be considered equivalent, subject to the jurisdiction of Examiners as special case.
2. Submission of completed journal and field report along with individual collection of rock specimens at the time of practical examination is compulsory.
3. Field project: Related to geology like Well inventory and/or Resistivity survey in the nearby area or any other field work related to geology.
4. Visit to Geological laboratories / research institutes / mines / beneficiation or processing plants / geology-based establishments.

EQUIVALANCE

Sr. No.	New Syllabus w.e.f June, 2021	Old Syllabus w.e.f. June, 2018
1	P – IX Economic Geology	P – XIII Economic Geology and Prospecting
2	P – X Hydrogeology	P – XII Applied Geology – I
3	P – XI Applied Geology – Engineering Geology	P – XII Applied Geology – I
4	P – XII Applied Geology – Prospecting and Mining Geology	P – XIII Economic Geology and Prospecting
5	P – XIII Photogeology and Remote Sensing	P – XVI Applied Geology – II
6.	P – XIV Geomorphology and Geotectonics	P – IX Earths physics and dynamics P – X Geomorphology
7	P – XV Environmental Geology	P – XIV Environmental Geology
8	Geochemistry	--

Old syllabus of B.Sc. III (w.e.f. June, 2018) and New Syllabus (w.e.f., June, 2021) are equivalent

ANNEXURE – Add -on Course:

D.B.F. Dayanand College of Arts and Science, Solapur.

Affiliated to

NAAC Accredited-2015
'B' Grade (CGPA-2.62)

PunyashlokAhilyadeviHolkar
Solapur University, Solapur.

Name of Faculty: Science & Technology

(Choice Based Credit System)

Syllabus: Certificate course in Geoinformatics

Name of Course: B.Sc.-III (Sem.-V) Geology

(Syllabus to be implemented from w.e.f. June 2021)

SYLLABUS FOR
B.Sc.-III (Sem.-V)Geology Add-on Course
Certificate Course in Geoinformatics

Structure of the Course:

- Certificate Course in Geoinformatics will be implemented for **B.Sc.-III (Sem.-V)**by Geology department
- There will be one theory paper of **50 marks** and Practical of **50 marks**.
- The theory paper has **40 marks** for university external examination and **10 marks** for internal examination.
- At the end of Semester V, the practical examination will be conducted. The weightage of practical is of **30 marks** for university external practical examination and **20 marks** for project and oral internal examination.
-

Semester	**Paper**	**Total contact Hrs.**	**Examination**			**Total Credits**
			Univ. Exam.	**Internal Exam.**	**Total Marks**	
B.Sc.-III (Sem.-V)	Theory	30	40	10	50	2
	Practical	15	30	00	30	1
	Project & Oral	15	00	20	20	1
Total		**60**	**70**	**30**	**100**	**4**

- Duration of practical examination is of **one day**.
- Theory paper has **10 marks** for internal examination. There will be **05 marks** for unit test and **05 marks** for home assignment.
- Students should complete project (**20 marks**) based on analysis of satellite imageries, toposheet and GIS data in geoinformatics laboratory. Its report should be submitted at the time of university practical examination for 01 credit.
- It is University Affiliated course; hence the certificate of completion of course will be issued by University.

Syllabus for Theory Paper

(Total Credits:02 and Contact Hrs.30)

Unit	Content	Contact Hrs.
Unit – I	**AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY** • Introduction: Fundamentals of Aerial Photography: flight planning & execution Photogrammetry: Basic concepts of measurements of object height and length • Stereo Photogrammetry: Stereovision & Stereoscopes, Stereoscopic Parallax & Parallax Equations • Visual interpretation of aerial photographs, Elements of Image Interpretation	07
Unit – II	**FUNDAMENTALS OF REMOTE SENSING** • Remote Sensing: History, Development, Definition, Concept & Principles • Electromagnetic Radiation (EMR): Spectrum and its properties, Atmosphericwindows, Interaction of EMR with atmosphere & Earth's Surface • Spectral signatures & Resolutions: Spatial, Spectral, Radiometric and Temporal • Remote Sensing Systems: Platform, types of platforms & its characteristics • Sensor classification: Active and Passive, Optical-Mechanical Scanners & Push-broom scanners • Thermal Infrared: Introduction, Radiation Properties, Kinetic Heat, Temperature, Radiant Energy and Flux, methods of transferring heat • Thermal properties of terrain: Capacity, Conductivity, Inertia, Infrared • Microwave: Passive & Active Sensors, RADAR, Scatterometer	08
Unit – III	**INTRODUCTION TO GEOGRAPHICAL INFORMATION SYSTEM (GIS)** • Basic concepts: Definition and history • Components of GIS • Data structure and formats • Spatial data models - Raster and Vector • Data base design - editing and topology creation in GIS, Linkage between spatial and non spatial data • Data inputting in GIS	08

Unit – IV **GLOBAL POSITIONING SYSTEM (GPS)** **07**

- Fundamentals of GPS and its applications
- Geodesy
- Components of global positioning system
- Factors affecting GPS accuracy
- GPS surveying methods and accuracy
- Reference station, reference equipment and radios

Total = 30

Syllabus for Practical Paper

(Total Credits: 01 and Contact Hrs. 15)

PRACTICAL IN GEOINFORMATICS

1. AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY

- Reading peripheral information.
- Test of Stereo Vision, Orientation of Stereo pair
- Measurement of scale of aerial photograph
- Parallax bar handling and height measurements
- Interpretation of aerial photographs with stereo pair, visual interpretation of physical features (Settlement, waterbody, forest, agriculture, barren/open land, rocky outcrops and others if present.)

2. FUNDAMENTALS OF REMOTE SENSING

- Introduction to remote sensing data
- Data Downloading
- Introduction to Digital Software (ERDAS Imagine)
- Data import in ERDAS Imagine
- Generation of FCC
- Geometric correction of satellite data

3. INTRODUCTION TO GIS

- Introduction to GIS software (ArcGIS)
- Data models: Raster and Vector
- Introduction to SOI topographical Maps: Numbering, Scales, grid reference, signs and symbols and interpretation
- Registration of topographical maps in GIS software
- Onscreen digitization (Database generation)
- Topology creation (error estimations), Spatial and attribute data input, various measurements, attribute data linking to spatial features.
- Generation of GIS based Maps

4. GPS

- GPS data collection in field
- GPS survey
- Importing GPS data in to google

PROJECT

(Credit – 1 Contact Hrs. – 15)

The project will be based on theory and practical syllabus.

REFERENCE BOOKS

1. George Joseph, (2004) "Fundamentals of remote sensing", Universities press (India) Pte Ltd., Hyderabad.
2. Gupta, K. K. Tyagi, (1992): Working with maps, Survey of India Publication, DST, New Delhi
3. Jensen, J.R., (2006) "Remote Sensing of the Environment - An EarthResources Perspective", Pearson Education, Inc. (Singapore) Pte. Ltd., Indian edition, Delhi.
4. Leica. A., (2003), GPS Satellite Surveying, John Wiley & Sons, use. New York
5. Lillesand, Thomas M. and Kiefer, Ralph, W., (2007) "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York
6. N.K.Agrawal , (2004) ,Essentials of GPS, Spatial Network Pvt. Ltd
7. Ramamurthy, K. (1982): Map Interpretation, Rex Printers, Madras
8. Rampal, K.K., (1999) Handbook of Aerial Photography and Interpretation, Concept Publishing Company, New Delhi
9. Reeves, Robert G. (1991), "Manual of Remote Sensing, Vol. I, American Society of Photogrammetry and Remote Sensing, Falls Church, Virginia, USA
10. Sabins, F.F. Jr., (2007) Edition. „Remote Sensing - Principles and Interpretation", W.H. Freeman & Co.
11. Sathish Gopi , (2000), GPS and Surveying using GPS
12. Singh, R. L. (1979): Elements of Practical Geography, Kalyani Publishers, New Delhi 2.
13. Tamaskar, B. G., Deshmukh, V. M. (1974): Geographical Interpretation of Indian Topographical Maps, Orient Longman Ltd., Bombay
14. Terry-Karen Steede, (2002), Integrating GIS and the Global Positioning System, ESRI Press
15. Understanding Map Projection (2003-2004): GIS by ESRI, Redlands
16. Vaidyanadhan, R. (1968): Index to a set of sixty Topographic Maps: Illustrating Specified Physiographic Features from India, Council of Scientific and Industrial Research, Ministry of Education, Government of India

Nature of Question Paper
Certificate course in Geoinformatics

Time: 2 hr **Total Marks: 40**

Q. 1. Choose the **most correct** alternative for the following and rewrite the sentence 08

1) ----------

a) b) c) d)

2)
3)
4)
5)
6)
7)
8)

Q. 2. Answer ***any four*** of the followings. 08

i)
ii)
iii)
iv)
v)

Q. 3. Answer ***any two*** of the followings. 08

i)
ii)
iii)

Q. 4. Write note on ***any two***of the following. 08

i)
ii)
iii)

Q. 5. Answer ***any one*** of the followings. 08

i)
ii)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Computer Science

Name of the Course: B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for B.Sc. Part – III (CBCS Semester Pattern)

Computer Science (W.E.F. June 2021)

Name and Type of the Paper		Title of Paper	Hrs/Wee		Total Marks per paper	UA	CA	Credits
Type	**Name**		**L**	**P**				
B.Sc.- III Semester - V								
English (Business English)	English (Business English)		4	-	50	40	10	2.0
DSE 1 A	Paper IX	Visual Programming Using C#	4	-	100	80	20	4.0
DSE 2 A	Paper X	Core Java	4	-	100	80	20	4.0
DSE 3 A	Paper XI	Operating System	4	-	100	80	20	4.0
DSE 4 A	Paper XII	Python	4	-	100	80	20	4.0
SEC 3	Paper XIII	Linux	4	-	100	80	20	4.0
	Total (Theory)		**24**	**-**	**550**	**440**	**110**	**22.0**
B.Sc.- III Semester - VI								
English (Business English)	English (Business English)		4	-	50	40	10	2.0
DSE 1 B	Paper XIV	Web Technology	4	-	100	80	20	4.0
DSE 2 B	Paper XV	Advanced Java	4	-	100	80	20	4.0
DSE 3 B	Paper XVI	Data Communication and Networking	4	-	100	80	20	4.0
DSE 4 B	Paper XVII	Advance Python	4	-	100	80	20	4.0
SEC 4	Paper XVIII	Software Testing	4	-	100	80	20	4.0
	Total (Theory)		**24**	**-**	**550**	**440**	**110**	**22.0**
Practical								
DSE 1A &1B	Practical IV	Practical On C# and Asp.Net	-	5	100	80	20	4.0
DSE 2A &2B	Practical V	Practical on Core Java and Advanced Java	-	5	100	80	20	4.0
DSE 4A &4B	Practical VI	Practical on Python and Advance Python	-	5	100	80	20	4.0
	Practical VII	Project	-	5	100	80	20	4.0
	Total (Practical)		**-**	**20**	**400**	**320**	**80**	**16.0**
Grand Total			**48**	**20**	**1500**	**1200**	**300**	**60.0**

Note:

1. Practical IV, Practical V, Practical VI and Practical VII are as per guidelines of Science Faculty.
2. Nature of internal examination, passing standard, ATKT and the conversion of marks into grades and credits are as per guidelines of Science Faculty Credit and Grading System

Equivalence papers for B.Sc.-III Sem V and VI (Computer Science)

Sr. No	Old Paper	New Paper
B.Sc.- III Semester - V		
1	Visual Programming Using C#	Visual Programming Using C# (Sem-V)
2	Core Java	Core Java (Sem-V)
3	Operating System	Operating System (Sem-V)
4	Python	Python (Sem-V)
5	Software Testing	Software Testing (Sem-VI)
B.Sc.- III Semester - V		
6	Web Technology	Web Technology (Sem-VI)
7	Advanced Java	Advanced Java (Sem-VI)
8	Data Communication and Networking	Data Communication and Networking (Sem-VI)
9	AngularJS	**No Equivalence**
10	Linux Operating System	Linux Operating System (Sem-V)

Semester – V

Paper IX: -Visual Programming Using C#

Objectives: -

Students will try to learn:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To understand how to design GUI base windows application using C#.

Unit 1: Introduction to NET and C# (10)

Block diagram of .net framework, The Common Language Runtime, Advantages of Managed Code, A Closer Look at Intermediate Language & Assemblies-Support for Object Orientation and Interfaces, Distinct Value and Reference Types, Strong Data Typing, Garbage Collection, Compiling and Running the Program, Variables, Data Types, Flow Control, Enumerations, Namespaces-The using Statement, Namespace Aliases, The Main() Method-Multiple Main() Methods, defining & using functions & its scope, Passing Arguments to Main(), Parameter passing technique.

Unit 2: Object oriented programming in C# (10)

Classes and Structs, Class Members- Data Members, Function Members read-only Fields, properties and indexer, The Object Class-System, Object Methods, The ToString() Method

Inheritance and Polymorphism: Introduction-Types of Inheritance, Implementation Inheritance-Abstract Classes and Functions, Sealed Classes and Functions, Constructors and its types, Destructor, Interfaces-Defining and Implementing Interfaces, Derived Interfaces, Polymorphism - Method overloading, Operator overloading.

Unit 3:- Exception, Threading, Delegate and IO (15)

Exception Handling:-Try, catch, and throw, finally, Nested try, Custom exception

Threading:-Introduction- Applications with Multiple Threads, Thread Priorities, Synchronization, Life Cycle.

Delegate and Events:- Delegeates, Types of delegates- single cast, multicast and anonymous delegates, Event

IO and Collection Classes:- Stream Classes, Console I/O, File Stream and Byte-Oriented File I/O, Character based File I/O.

Unit 4:- Windows Applications (10)

Controls: Common control Group, Data control Group, Dialog control Group, Container control Group, Menus and Context Menus: Menu Strip, Toolbar Strip, SDI and MDI Applications

Outcomes:-

Students will be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity using Java.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem in Java.
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Able to develop windows applications using C#.

Reference books:

1. Professional C# - Wrox Publication by Simon Robinson, Christain Nagel, Karli Watson, Jay Glynn, Morgan Skinner, Bill Evjen.
2. Inside C# - Microsoft Press by Tom Archer, Andrew Whitechapel.
3. Programming Microsoft Visual C# 2005 - The Language (Microsoft Press) by Donis Marshall

Paper X:-Core Java

Objectives:-

Students will try to learn:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To understand how to develop GUI applications using Swing technology

Unit 1: Introduction to Java Programming (10)

Overview of Java, Features of Java as programming language /Platform, JDK Environment and Tools

Java Programming Fundaments:-Data types, Variables, Operators, Keywords, Naming Conventions, Structure of Java Program, Flow Control- Decision, Iterations, Arrays,

Unit 2: Object oriented programming in Java (10)

Class – Members access control, Objects, Constructors, Use of 'this' keyword, Static, non-static data members and methods., public, private & protected data members

Inheritance & Polymorphism-Access/Scope specifiers protected, Super, extends, single, multiple inheritance, Method overriding, Abstract classes & ADT, 'final' keyword, Extending interfaces

Unit 3: Exception Handling, Threading and Collection framework (15)

Exceptions and Types, try..catch, finally block, throw & throws statement, user-defined exceptions, Java I/O package, byte & character stream, reader & writer, file reader & writer

Threading-Java thread lifecycle, Thread class & run able interface Thread priorities & synchronization, Usage of

wait & notify

Collection framework :- Collection overview, Collection interfaces, Collection classes Vector, Array list, Hash map, Hash table, Tree map, Tree set, Hash set, Properties, Stack

Unit 4: Swing and event handling: (10)

Introduction to swing, difference between AWT and swing, hierarchy of Swing classes, Swing controls: - JButton, JTextfield, JLabel, JCheckBox, JRadionButton, JFame, Jtable, JList, JoptionPane, JMenuitem and JMenu ,etc

Outcomes:-

Students will be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity using Java.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem in Java.
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Able to develop GUI applications using Swing technology.

Reference Books:

1. Java 2 for professional developers by Michael Morgen
2. Core Java Vol 1 and vol 2 by Cay. S. Horstmann, Gray Cornell.
3. Java by Nutshell
4. Java The complete Reference by Herbert Schildt
5. Thinking in java by Brucel

Paper XI:-Operating System

Objective:-

Students will try to learn:

1. To understand the main components of an OS & their functions.
2. To study the process management and scheduling.
3. To understand the concepts and implementation Memory management policies and virtual memory.
4. To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS

Unit 1: Introduction Operating System:- **(10)**

Definition Operating systems, Types of Operating Systems-Batch, Multiprogramming, Time-Sharing, Real-Time, Distributed, Parallel., OS Service, System components, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine

Unit 2: Process Management: - **(10)**

Concept of Process, Process states, Process Control Block, Context switching, Operations on Process, Co-operating Process, Threads – Types of threads, Benefits of threads.

Concept of Process Scheduling- Types of Schedulers, Scheduling criteria, Scheduling algorithms-Preemptive and Non-pre emptive , FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queu Scheduling, Multilevel- feedback Queue Scheduling.

Unit 3: Process Synchronization and Deadlocks: - (10)

The Producer Consumer Problem, Race Conditions, Critical Section Problem, Semaphores, Classical Problems of Synchronization: Reader-Writer Problem, Dinning Philosopher Problem, Critical Regions.

Definition, System Model, Dead Lock Characterization, Resource Allocation Graph, Methods of Handling Dead Locks- Deadlock Prevention, Deadlock Avoidance -banker's algorithm, resource request algorithm, Deadlock detection and Recovery.

Unit 4: Storage Management **(15)**

Memory Management: - Basic Hardware Address Binding, Logical and Physical address Space, Dynamic Loading, Overlays, Swapping,

Memory allocation: Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction, Paging, Segmentation. Basics of Virtual Memory,

demand paging, Page fault, Page Replacement policies: Optimal (OPT), First in First Out (FIFO), Least Recently used (LRU), Thrashing.

Storage Management:- File Management: File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free space management (bit vector, linked list, grouping).

Disk Management: disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

Outcomes:-

Students will able to:

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU
3. Evaluate the requirement for process synchronization and coordination handled by operating system
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.

Reference Books:

1. System programming and O.S. By D.M. Dhamdhere.
2. Modern O.S. By Andrews Tanenbaum.
3. Operating System Concepts By Siberchatz and Galvin.
4. Operating System(Unix) By Bach

Paper XII:-Python

Objectives:-

Students will try to learn:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. Regular expression for pattern matching

Unit 1:- Introduction to Python: (10)

Features/Characteristics of Python, Installation and Working with Python, Structure of a Python Program, Writing simple python program, Executing python program using command line window and IDLE graphics window, Python Virtual Machine, Identifiers and Keywords, Operators (Arithmetic operators, Relational operators, Logical or Boolean operators, Assignment Operators, Bit wise operators, Membership operators, Identity operators), Operator Precedence and Associativity

Python Data Types: -Python Variables, Data types in python, Built-in Datatypes, Bool datatype , Sequences in python, Sets, Literals in python, User Defined Datatypes, Constants in python, Type conversion, Input and Output Statements, Command line arguments

Control Statements:-Conditional Statements: if, if-else, nested if –else, Looping: for, while, nested loops, Loop manipulation using pass, continue, break, assert and else suite

Unit 2:- Strings, Collection Lists, Tuples, Dictionaries, Functions and, Modules: (10)

Strings: Introduction to String, String Manipulation., Collection List: Introduction to List, Manipulating list., Tuples: Introduction to Tuples, Manipulating Tuples., Dictionaries: Concept of Dictionary, Techniques to create, update & delete dictionary items.

Functions, Modules :- Difference between a Function and a Method, Functions:- Defining a function, Calling a function, Advantages of functions, Types of functions, Function parameters:- Formal parameters, Actual parameters, Anonymous functions, Global and Local variables, Modules:- Importing module, Creating & exploring modules, Math module, Random module, Time module

Unit 3:- Object Oriented Programming (6) (15)

Features, Concept of Class & Objects, Constructor, Types of Variables, Namespaces, Types of Methods, Inner Classes, Constructors in Inheritance, Overriding Super Class Constructors and

Methods, Types of Inheritance, Abstract Classes and Interfaces, The Super() Method, Operator Overloading, Method Overloading, Method Overriding

Unit 4: Regular Expressions, Exception Handling and File (10)

Introduction to Regular Expression, Advantages & Operations, Sequence characters in Regular Expression, Powerful pattern matching and searching, Password, email, url validation using regular expression, Pattern finding programs using regular expression

Exception :- Errors in a Program, Exceptions, Exception handling, Types of Exceptions, User-defined Exceptions

Python File Operation:- Types of File, Opening and Closing a File, Reading and writing to files, Manipulating directories

Outcomes:-

Students will be able to:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision Making statements and Functions
3. Interpret Object oriented programming in Python
4. Understand and summarize different File handling operations
5. Understand Regular expression and implement for pattern matching.

Reference Books

1. Beginning Python by Magnus Lie Hetland-Apress
2. Python Programming for the Absolute Beginner by Michael Dawson-Cengage Learning
3. Python for Everybody: Exploring Data in Python 3 by Charles Severance-CreateSpace Independent Publishing Platform
4. Introducing Python: Modern Computing in Simple Packages by Bill Lubanovic-O'Reilly Media
5. Python Programming for Beginners: An Introduction to the Python Computer by Jason Cannon- CreateSpace Independent Publishing Platform
6. Python for Beginners by Harsh Bhasin

Paper XIII:-Linux

Objectives:-

Students will try to learn:

1. To introduce Basic Linux general purpose Commands
2. To learn different editor
3. To learn shell script concepts.
4. To learn file management and permission advance commands.
5. To learn awk, grap, perl scripts.

Unit 1: Introduction of Linux:- **(10)**

History of Linux, Architecture of Linux system & features, Kernel, Shell & its type, Difference between Windows and Linux. Linux Distributions, Working environments: KDE, GNOME, Xface4, Hardware requirement, Installation procedure of Linux, Create partitions, Configuration of X system Users & Groups Management:- Create Users, Create groups, Special groups, Assigning permissions to users and Groups, File and Directory permissions- chmod, chown, chgrp.

Linux File System:-Hierarchy of File system, File System parts- Boot Block, Super Block, Inode Block, Data Block, File types, Devices and Drives in Linux, Mounting devices (CD/DVD, usb, hard drive partition), file system

Unit 2: Linux Command **(15)**

Linux commands File and directory Management Commands:-mkdir, rmdir, cd and pwd, file, ls, cat, more, less, File and Directory Operations: find, cp, mv, rm, ln etc, Printing the files - lpr, lpq, lprm etc.

Filter Commands & Editor:- Filters: head, tail , pr, cut, paste, sort, uniq, tr, grep, egrep, fgrep, sed.

Communication commands:- mesg, talk, write, wall, mail.

Text Editors- vi, vim, Archive and File compression commands

Shell Programming:- Shell Variables, Meta characters, Shell Scripts – Control and Loop structure, I/O and Redirection, Piping,

Unit 3: Linux System Management (10)

Process Management: Shell process, Parent and children, Process status, System process, Multiple jobs in background and foreground, Changing process priority with nice. Listing processes, ps, kill, premature termination of process.

Disk management and System Administration:-Disk Partitioning- RAID, LVM etc., disk related Management Tools- Fdisk, Parted etc. , Boot Loaders- GRUB, LILO, Custom Loaders

Unit 4:-Linux System and Network Administration (10)

System administration – Role of system administrator, identifying administrative tasks & files, Configuration and log files, Chkconfig, Security Enhanced Linux, Installing and removing packages with rpm command

Understanding various Servers:- DHCP, DNS, Squid, Apache, Telnet, FTP, Samba.

Outcomes:-

Students will be able to:

1. Identify the basic Linux general purpose commands.
2. Apply and change the ownership and file permissions using advance Linux commands.
3. Use the awk, grep, perl scripts.
4. Implement shell scripts.
5. Apply basic of administrative task.

Reference Books :

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. UNIX for programmers and users by Graham Glass & King Ables, Pearson Education
3. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India
4. Red Hat Linux Bible by Cristopher Negus, Wiley Dreamtech India
5. UNIX Shell Programming by Yeswant Kanethkar, BPB

Semester – VI

Paper XIV:- Web Technology

Objectives:-

Students will try to learn:

1. To understand basic of ASP.Net
2. To understand different server controls used in ASP.Net for web application.
3. To understand master page concept
4. To learn how to maintain state and security in web application.
5. To understand database connectivity with web application.

Unit 1: Introduction to ASP.Net (10)

Introduction to Web Architecture Model, Introduction to Visual Studio for Web Application, historical development of ASP.Net

Application and Page Frameworks

Application Location Options, Built-In Web Server, IIS,FTP, Web Site Requiring FrontPage, Extensions, The ASP.NET Page Life Cycle, The ASP.NET Page Structure Options, Inline Coding, New Code-Behind Pages, ASP.NET 2.0 Page Directives, @Page, @Master, @Control, @Import, @Implements, @Register, @Assembly, @PreviousPageType, @MasterType, @OutputCache, @Reference. ASP.NET Page Events, Dealing with PostBacks, Cross-Page Posting, ASP.NET Application Folders, \App_Code Folder, \App_Data Folder, \App_Themes Folder, \App_GlobalResources Folder, \App_LocalResources, \App_WebReferences, \App_Browsers, Compilation, Global.asax

Unit 2: ASP.NET Server Controls and Validation Controls (10)

ASP.Net Server Controls, Understanding Validation, Client-Side versus Server-Side, Validation, ASP.NET Validation Server Controls, Validation Causes, The Required Field Validator Server Control, The CompareValidator Server Control, The RangeValidator Server Control, The RegularExpressionValidator Server Control, The CustomValidator Server Control, The ValidationSummary Server Control, Turning Off Client-Side Validation, Using Images and Sounds for Error Notifications, Working with Validation Groups

Master Pages:- Introduction of Master Pages- The Basics of Master Pages, Coding a Master Page, Coding a Content Page, Mixing Page Types and Languages, Specifying Which Master Page to Use, Working with the Page Title, Working with Controls and Properties from the Master Page,

Specifying Default Content in the Master Page, Programmatically Assigning the Master Page, Nesting Master Pages, Master Page Events, Themes and Skins

Unit 3: ASP.Net State Management, Navigation and Security (15)

Application State, Session State, Client & server storing, View state, Cache, Hidden Variable, Session object, Profiles, Overview of HTTP Handler & Modules

Site Navigation:- Site Navigation technique, SiteMap file, SiteMapPath, TreeView and MenuView control, Using XML file

ASP.NET web security:- Authentication & Authorization, Windows & forms, User.identity, User.IsInRoles, Using Data Adapter, Debugging & error Handling, ASP.Net tracing, Page Level, Application Level, Debugging, Start Debugging session, Client side debugging, Exception Handling, On page, HTTP status code,

Unit 4: ADO.Net and AJAX (10)

Data Access with ADO.NET:- ADO.NET Overview, Using Database Connections, Executing Commands, Calling Stored Procedures, Fast Data Access: The Data Reader, Data Adapter

Introduction to AJAX:- Introduction to AJAX and Need of AJAX, Server side and client side architecture ScriptManager, UpdatePanel, Timer control.

Outcomes:-

Students will be able to:

1. Understand basic of ASP.Net and web application.
2. Use different ASP.Net web server control to develop web application.
3. Use master page for interactive design
4. Maintain state and security in web application.
5. Connect any database with web application.

Reference Books:

1. Professional ASP.NET– Wrox Publication by Bill Evjen, Scott Hanselman, Farhan Muhammed, Sirnivasa Sivakumar, Devin Rader.
2. Microsoft ASP.NET Step by Step - Microsoft Press by George Shepherd.

Paper XV:- Advanced Java

Objectives:-

Students will try to learn:

1. To understand database connectivity using JDBC.
2. To learn how to develop web applications using servlet.
3. How to develop web applications using JSP.
4. To Understand concept of hibernate and struts.

Unit -1:-JDBC (10)

Introducing JDBC: Describing Components of JDBC, Features of JDBC, JDBC Architecture: Types of Divers:Advantages and disadvantages of Drives, Use of Drivers, JDBC Statement and Methods:-Statement, PreparedStatement, CallableStatement, execute(), executeQuery(), executeUpdate(), Working with Resultset interface,Working with Resultset and MetaData.

Unit -2:-Servlet (15)

Introducing CGI, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Introducing Servlet API, Javax.servlet package, Javax.servlet.http package, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Servlet life Cycle, Init(), Service(), Destroy(), Working with GenericServlet and HttpServlet, RequestDispatcher interface, Include() and forward(), Use of RequestDispatcher, Session in Servlet, Introducing session, Session tracking mechanism, Cookies, Advantages & disadvantages, use of cookies, Hidden form filed, Advantages & disadvantages, use of Hidden form filed, URL rewritten, disadvantages, use of URL rewritten, HttpSession, Advantages & disadvantages,use of URL HttpSession

Unit -3:- JSP (10)

Introduction to JSP, Advantages of JSP over Servlet, JSP architecture, JSP life cycle, Implicit objects in JSP- request, response, out, page, pageContext, application, session, config, exception, JSP tag elements- Declarative, Declaration, scriplet, expression, action., Java Bean- Advantages & Disadvantages, useBean tag- setProperty and getProperty, Bean In Jsp, JSTL core tag: General purpose tag, conditional tag, networking tag, JSTL SQL tags, Custom tag: empty tag, body content tag, iteration tag, simple tag

Unit -4:- Hibernate and Struts (10)

Introduction Hibernate(HB), Architecture of HB, Generator classes, Steps to create application of HB:- HB with annotation, Insert ,Delete,update,retrive records from database in HB, HB web application

Struts:- Introduction to struts, What is struts, Use of struts, Features of Struts, Architecture of struts, Steps to create application of struts

Outcomes:-

Students will be able to:

1. Use database connectivity using JDBC.
2. Develop web applications using servlet.
3. Develop web applications using JSP.
4. To use the concept of hibernate and struts.

Reference Books

1. Java The complete Reference by Herbert Schildt
2. Java Servlet Programming by Jasan Hunter
3. Beginning Java EE5 from Novice to Professionals by K. Makhar & C. Zelenk
4. Java Server Programming by Bayross & Shah
5. Thinking in java by Brucel

Paper XVI:-Data Communication and Networking

Objective: -

Students will try to learn:

1. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
3. Study Session layer design issues, Transport layer services, and protocols.
4. Study data link layer concepts, design issues, and protocols.
5. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Unit 1. Introduction to Data Communication & Networking (10)

Data Communication: Components, Data Flow, Protocols & Standards, Design Issues of Layers, Connection oriented and connection less services, Network models :- ISO-OSI reference model, TCP/IP reference model.

Unit 2. Physical layer (10)

Signals: Analog & Digital Signals, Period, Frequency, Phase, Amplitude, Bandwidth, Bit Rate, Bit Length, Fourier analysis. Transmission Impairment: Attenuation, Distortion, Noise, Nyquiest Theorem, Shannon Capacity Theorem.

Transmission Media:-Guided Media-Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optic Cable,

Unguided Media:- Wireless- Radio Waves, Microwaves, Infrared, Satellite Communication

Digital Transmission: Manchester & Differential Manchester Coding, Pulse Code Modulation

Modulation:- Amplitude Modulation, Frequency Modulation, Phase Modulation

Transmission Mode: Parallel, Serial, Synchronous Transmission, Asynchronous Transmission.

Multiplexing- Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing.

Switching- Circuit Switching, Message Switching, Packet Switching.

Unit 3. Data link layer (15)

Error Detection & Correction: Types of Errors, Hamming Distance, Error Detection: Parity Check, Cyclic Redundancy Check, Checksum Check, hamming code

Data Link Control: Framing, Flow & Error Control,

Protocols: Simplex, Stop and Wait, Stop and Wait ARQ, Go Back N ARQ, Selective repeat ARQ,

HDLC, Point to Point protocol.

Multiple Access Protocol: ALOHA, CSMA, CSMA/CD,

CSMA/CA Channelization, FDMA, TDMA, CDMA

Unit 4. Network layer , Transport, Session, Presentation & Application layers (10)

Network layer Design issues, Routing Algorithm: Optimality Principle, Shortest Path Routing, Distance Vector Routing, Link State Routing.

Congestion Control Algorithm: General principle of congestion control, Congestion prevention policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets

Network Devices-Hubs, Switches, Repeaters, Bridges, Routers, Gateways

Transport, Session, Presentation & Application layers (5)

TCP/IP protocol suite :- UDP,TCP,SCTP, IP, RTP, FTP, DNS, TELNET, SMTP, POP, HTTP, WWW, SNMP,ARP, RARP.

Data Compression:-Audio Compression, Video Compression

Outcomes:-

Students will able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer and Transport layer.
4. Describe the functions of data link layer and explain the protocols.
5. Explain the types of transmission media with real time applications

Reference Books:

1. Computer Networking by Tannenbaum.
2. Data communication and networking by William Stallings
3. Data communication and networking by B A Forouzan
4. Data communication and networking by Jain

Paper XVII:- Advance Python

Objective:-

Students will try to learn:

1. Windows application development in python using Tkinter.
2. MySql open source database.
3. Web application development using Django framework.
4. Concept of XML in python and network programming in Python

Unit – I:- Windows Applications using Tkinter (10)

GUI Programming GUI in Python, Advantages of GUI, Introduction to GUI library, Basic Operations using Tkinter, Root Window, Working with Containers: Frame, Canvas Layout Management, Events and Bindings, Font, Colors, drawing on Canvas (line, oval, rectangle, etc.) Widgets: Label, Button, Checkbutton, Entry, Listbox, Message, Radiobutton, Text, Spinbox, Scrollbar, Menu etc. Writing Python Programs for GUI applications

Unit – II:- Database Connectivity using MySQL (10)

Installation of MySQL Database Software, Installing MySQL Connector, Steps for Database Connectivity, Working with MySQL Database : Inserting, Retrieving, Deleting and Updating the data Working with Stored Procedure

Unit – III:- Web Application using Django (15)

What Is a Web Framework? The MVC Design Pattern, Django's History, Advantages of Django, Understanding Django environment, Installing Django, Setting Up a Database

Django architecture, The Development Server, Django Commands Overview, Starting a Project, Django apps, Difference between app and project, The Project Structure, Setting Up Your Project, Create an Application

Migration, Admin Panel. Views in Django, URL Routing, Template in Django, Models in Django, Forms in Django.

Unit – IV- XML and Networking (10)

Introduction to XML, XML Parser Architecture and API's, Parsing XML with SAX API's, Parsing XML with DOM API's

Network Programming:- Introduction to Sockets Programming, Server Socket Methods, Client Socket Methods, IP Address, URL, TCP/IP Server, TCP/IP Client, Sending E-mail Application

Outcomes:-

Students will able to:

1. Develop windows application in python using Tkinter library.
2. Basic and advance concept of MySql open source database.
3. Develop web application and web project using Django framework.
4. Understand Concept of XML in python and network programming in Python

Reference Books:

1. MySQL for Python: Database Access Made Easy- A. Lukaszewski
2. Beginning Django: Web Application Development and Deployment with Python-Daniel Rubio-Apress
3. Django Unleashed- Andrew Pinkham-SAMS
4. Practical Django Projects- James Bennett-Apress
5. Python GUI Programming with Tkinter- Alan D. Moore-Packt
6. Tkinter GUI Application Development H TSHOT - Bhaskar Chaudhary -Packt

Paper XVIII:- Software Testing

Objective:-

Students will try to learn:

1. Basic software debugging methods.
2. White box testing methods and techniques.
3. Black Box testing methods and techniques.
4. Designing test plans.
5. Different testing tools (familiar with open source tools)

Unit 1:-Introduction To Software Testing: (10)

What is Software Testing?, Use or need of software testing. ,Software Development Life Cycle (SDLC) :- Water Fall Model, Spiral Model, V- Model, Prototype Model, Hybrid Model

Unit- 2 White Box and Black Box Testing: (10)

Introduction to White box testing, Advantages and Disadvantages of White box testing, Loop Testing, Path Testing , Condition testing , Memory Testing , Performance Testing

Black Box Testing:

Introduction to black box testing , Advantages and Disadvantages of black box testing , unctional Testing- Integration Testing (Incremental Integration Testing) ,Top Down Incremental Integration Testing , Bottom Up Incremental Integration Testing , Non Incremental Integration Testing , System Testing , Acceptance Testing , Smoke Testing , Exploratory Testing , Adhoc Testing , Performance Testing – Load Testing, Stress Testing, Volume Testing, Soak Testing, Regression Testing-Unit Regression Testing/Retest, Regional Regression Testing, Full Regression Testing

Unit- 3 Test cases and its design Techniques: (15)

Introduction to Test Case , Characteristics Of Good Test Case , Test Case Template, How To Write A Test Case, How To Ensure The Test Coverage Is Good , How To Identify whether It Is a Good Test Case Or Not, Review Process/Peer Review , Preparing Review Report, Examples On Writing Test Cases, Test Cases Design Techniques-Error Guessing, Equivalence Partitioning, Boundary Value Analysis

Unit- 4 Software Test Life cycle and Defect Life Cycle: (10)

Software Test Life Cycle-Writing Test Plan, Preparing Traceability Matrix, Writing Test Execution Report, Summary Report, Retrospect Meeting /Triage Meetings, Defect Life Cycle-Concept of Defect life cycle, Difference between Bug, Defect, Failure, Error

Outcomes:-

Students will able to:

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning.
4. Manage the test process
5. Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

Reference Books:

1. The art of Software Testing– Glenford J. Myers
2. Lessons learned in Software Testing – CemKaner, James Bach, Bret Pettichord
3. A Practitioner's Guide to Software Test Design- Lee Copeland
4. Software Testing Techniques, 2nd edition- Boris Beizer
5. How to Break Software: A Practical Guide to Testing- James Whittaker

Sample Assignments on Visual Programming

1. Write a menu driven of a] Face value b]Armstrong c]Palindrome.
2. Write a program that implement features of cross language support.
3. Write a program to overload method
4. Write a program that method should return object, Array.
5. Write a program for static class and partial class.
6. Write a program for static property.
7. Write a program for indexer.
8. Write a program to implement inheritance.
9. Write a program to overloading operator.
10. Write a program that implement interface.
11. Write a program that implement hash table.
12. Write a program that implement arraylist by using windows application.
13. Write a program that implement data structure by using windows application.
14. Write a program for delegate and event.
15. Write a program for Reading/Writing file by using byte stream class.
16. Write a program for copy one file to another file.
17. Write a program creating files & directories & display the following attribute- 1] Name 2] Size 3] Getcreationtime by using windows application.
18. Write a program for thread.
19. Design windows application which demonstrate common controls.
20. Design windows application which demonstrate Dialog group.

Sample Assignment on Java Practical

1. To find the factorial of a given number
2. To learn use of single dimensional array by defining the array dynamically.
3. To check if a number is prime or not, by taking the number as input from the keyboard
4. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(), setLength(), append(), insert(), concat()and equals().
5. Write a program to create a "distance" class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
6. Modify the "distance" class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
7. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
8. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
9. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
10. Write a program to create a multilevel package and creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
11. Write a program "Divide by Zero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
12. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
13. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
14. Write a program to demonstrate priorities among multiple threads.
15. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

16. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
17. Write a program to demonstrate different keyboard handling events.
18. Write a program to demonstrate the use of push buttons.
19. Write a program to demonstrate collection classes.
20. Write a program to implement interface.

Sample Assignment on Python

1. Write a program to print strings, numbers and perform simple mathematical calculations.
2. Write a program to implement command line arguments.
3. Write a program to implements conditional statements -if, if-else, nested if.
4. Write a program to implement loops.
5. Write a program which demonstrate random module.
6. Write a program which create file and the content of file will be DNA sequence created by random module.
7. Write a program to demonstrate date related module.
8. Write a program to manipulate strings like string copy, string concatenation, string comparison, string length, string reverse etc.
9. Write program to show use of Lists and Tuples.
10. Write program which uses dictionaries
11. Write program to implement functions & Modules
12. Write program to implement Package.
13. Write a program to implement Constructors.
14. Write a program to implement types of Inheritance and Interfaces.
15. Write a program to implement Method Overloading and Method Overriding.
16. Write a program to implement Operator Overloading.
17. Write a program in to read and write contents in a file.
18. Write a program to demonstrate Exception handling
19. Write a program to demonstrate user defined exception.
20. Write a program to demonstrate the use of regular expressions

Sample Assignment on Web technology

1. Write a JavaScript for Addition, Subtraction, Division, and Multiplication of two numbers.
2. Design Webpage for employee registration form using all HTML controls and CSS.
3. Design web page for simple calculator By using class. Command name property. Button event.
4. Design web page of online shopping form which used textbox, label, buttons, and all type list controls.
5. Design Application for cross page posting.
6. Design This year calendar with all holidays in red color.
7. Design web page for image map by using Both method.
8. Design Advertisement web page.
9. Design web page which uses Multiview & View control. Wizard control. File upload control
10. Design web page for all validation control & validation Groups.
11. Create nested master pages.
12. Design web site which uses all site navigation Control.
13. Design web page which shows list of employees in selected dept.
14. Create XML & it's styles Sheet file.
15. Create Master Detail Form.
16. Create web page demonstrate insert, update, delete and select record.
17. Create web page demonstrate insert record and find sum of sal using stored procedure.
18. Design web page for grid view control.
19. Design web page which shows 10 events in calendar control.
20. Design web page which demonstrate wizard control.

Sample Assignments on Advanced Java

1. Write a java socket programming in which client sends a text and server receives it.
2. Write a program to demonstrate URL class.
3. Write a program to demonstrate InetAddress class.
4. Write a program to demonstrate use of Datagram Socket.
5. Write a program to create Student registration form using Swing Component.
6. Write the following program using Swing component. An Election is conducted between 3 candidates. There are N number of voters. By clicking Next Voter Button textboxes and RadioButtons need to be cleared. By clicking Results, the votes obtained by each candidate and the winner candidate to be displayed in text area. Exit button should exit program.
7. Write a program for inserting data into table using PreparedStatement.
8. Write a program for updating data into table using PreparedStatement.
9. Write a program for deleting data into table using PreparedStatement.
10. Write a program to demonstrate callable statement.
11. Write a Servlet program to check that life cycle methods are called by web container.
12. Write a program to create simple servlet for displaying welcome message.
13. Write a program to create servlet for session management using cookies.
14. Write a program to create servlet for session management using Hidden Form Field.
15. Write a program to create servlet for session management using URL Rewriting.
16. Write a simple program of authenticating user using filter.
17. Write a simple program to demonstrate the use of request dispatcher.
18. Write a simple program to demonstrate the use of Send Redirect.
19. Write a JSP program to count number of visitors.
20. Write a program for communication between HTML & JSP.

Sample Assignment on Advance Python

1. Write a program to draw different shapes
2. Write a program to develop GUI applications
3. Write a program to show database connectivity using MySQL to perform Insert, update and delete operations.
4. Write a program to implement Thread Synchronization.
5. Write a program to demonstrate use of XML file
6. Write a program to create simple Django app
7. Write a program to create simple Django project.
8. Write a program to create Django project which add, delete, update records.
9. Write windows application which demonstrate all layouts used in Tkinter.
10. Write windows application which demonstrate any 10 Tkinter controls.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Statistics

Name of the Course: B. Sc. Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

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CBCS Pattern Syllabus
B.Sc. Part III (Semester V and VI)
STATISTICS
w.e.f. 2021-22

Subject/ Core Course	**Name and Type of the Paper**		**No. of papers/ Practical**	**Hrs/week**			**Total Marks Per Paper**	**UA**	**CA**	**Credits**
	Type	**Name**		**L**	**T**	**P**				
Class :	**B.Sc.- III Semester - V**									
Ability Enhancement Course(AECC)		English (Business English)	Paper II Part A	4	--	--	50	40	10	2.0
Core		CC 1 A Statistical Inference -I	Paper IX	4	--	--	100	80	20	4.0
Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. III		CC 2 A Probability Distributions	Paper X	4	--	--	100	80	20	4.0
		CC 3A Sampling Techniques	Paper XI	4	--	--	100	80	20	4.0
		DSE 4 A Operations Research	Paper XII	4	--	--	100	80	20	4.0
		OR								
		DSE 4A Regression Analysis	Paper XII	4	--	--	100	80	20	4.0
		SEC 3	MS-EXCEL	4	--	--	100	80	20	4.0
Grand Total				**24**	**--**	**--**	**550**	**440**	**110**	**22**

THEORY

Class :	**B.Sc.- III Semester -VI**								
Ability Enhancement Course(AECC)	English (Business English)	Paper II Part B	4	--	--	50	40	10	2.0
Core (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. III	CC 1 B Statistical Inference -II	Paper XIII	4	--	--	100	80	20	4.0
	CC 2B Probability Theory	Paper XIV	4	--	--	100	80	20	4.0
	CC 3B Designs of Experiments	Paper XV	4	--	--	100	80	20	4.0
	DSE 4B Quality Management and Reliability	Paper XVI	4	--	--	100	80	20	4.0
		OR							
	DSE 4B Time Series Analysis	Paper XVI	4	--	--	100	80	20	4.0
	SEC 4	R SOFTWARE	4	--	--	100	80	20	4.0
Total (Theory)			**24**	**--**	**--**	**550**	**440**	**110**	**22**
Core	CC 1A &1B	Practical IV	--	--	5	100	80	20	4.0
	CC 2A & 2B	Practical V	--	--	5	100	80	20	4.0
	CC 3A & 3B	Practical VI	--	--	5	100	80	20	4.0
	DSE 4A & 4B	Practical VII	--	--	5	100	80	20	4.0
Total (Practical's)					**20**	**400**	**320**	**80**	**16**
Grand Total			**48**		**20**	**1500**	**1200**	**300**	**60**

Summary of the Structure of B.Sc. Programme
As per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-I	I	450	18	--	--	18
	II	450	18	400	16	34
B.Sc.-II	III	500	20	--	--	20
	IV	500	20	300	12	32
B.Sc.-III	V	550	22	--	--	22
	VI	550	22	400	16	38
Total		3000	120	1100	44	164

B.Sc. Programme:

Total Marks:Theory + Practical's= 3000 +1100 =4100
Credits : Theory + Practical's= 120+44 =164
Numbers of Papers Theory: Ability EnhancementCourse(AECC) 04
Theory: Discipline Specific ElectivePaper(DSE) 08
Theory:DSC 14
SkillEnhancement Courses 04
Total :TheoryPapers 30
:PracticalPapers 11

Abbreviations:

L: Lectures
T: Tutorials
P: Practical's
UA: University Assessment
CA: College Assessment CC: Core Course
AEC: Ability Enhancement Course
DSE: Discipline Specific Elective Paper
SEC: Skill Enhancement Course
GE: Generic Elective

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CBCS Pattern SyllabusB.Sc. Part III (Semester V and VI)

STATISTICS
w. e. f. June 2021
PRACTICAL

Practical	Paper No	Title of the Paper	U.A.				C.A.	Paper
			Marks	Journal	Oral	Total	Marks	Total
CC-1A & 1B	IV	Statistical Inference	60	5	5	70	20	90
CC-2A & 2B	V	Probability Distributions and R- Software	60	5	5	70	20	90
CC-3A	VI	Designs of Experiments and Sampling	60	5	5	70	20	90

& 3B		Techniques						
DSE4A &4B	VII	Operations Research , QMR	60	5	5	70	20	90
OR								
DSE 4A &4B	VII	Regression And Time SeriesAnalysis	60	5	5	70	20	90
Project Report and Viva-Voce						40	-	40
							Total	400

SCHEME OF TEACHING:

Sr. No.	Paper	Teaching Hours / Week		
		L	P	Total
1.	IX and XIII	3	5	8
2.	X and XIV	3	5	8
3.	XI and XV	3	5	8
4.	XII and XVI	3	5	8
Total		12	20	32

Note:

(I) Total teaching periods for each theory papers in each semester are Three per week.

(II) Teaching periods for practical paper-IV to paper-VII are five periods per paper per week per batch 12 students.

(III) Scheme of evaluation:

As per the norms of the grading system of evaluation, out of 100 Marks, the candidatehas to appear for College internal assessment of 20 marks and external evaluation(University Assessment) of 80 marks. Assessment scheme is given below.

Semester - V:

Theory: (100 marks)

University Examination (80 Marks):

No. of Theory papers: 4 Papers/Subject and

CompulsoryEnglish (Total 5 Papers)

Internal Continuous Assessment (20 Marks):

Scheme of Marking:

10 Marks: Internal Test

10 Marks: Home assignment/Tutorials/Seminars/ Group discussion/ Viva/ Field visit/Industrial visit.

(IV)Duration of University Examinations:

1) For each theory paper, duration is of two and half hours.

2) For practical paper-I V to paper-VII, three hours for a batch of 12 students annually.

(V)**NatureofProject**

(i) Identificationofproblemwherestatisticaltechniquescanbeused.

(ii) Planningand execution ofdatacollection.

(iii) TheMarkingsystemfortheprojectworkisasfollows:

- Data Collection :10Marks
- Analysis of Data :10Marks
- Conclusion : 10Marks
- Viva on Project :10Marks

(iv)ProjectinB.Sc.IIIwillbeconducted in a groupof5to6students.

2) Objectives -The main objective of this course is to develop the advanced statistical skills to the students, which covers concepts of statistical inference, design of experiment, sampling techniques, distribution theory, operation research, S.Q.C., regression analysis, time series analysis and R programming. Also the students are expected to conduct a project work which includes data collection and analysis of data using various statistical tools. By the end of course students are expect to-

Course outcomes

1. Distinguish between point estimation and interval estimation
2. Understand and solve testing of hypothesis problems
3. Work out the design of experiments.
4. Utilize various sampling techniques.
5. Know various probability distributions, concept of truncation and their applications toreal life situations.
6. Understand the concepts of stochastic process, queuing theory, and reliability theory.
7. Understand concept of operation research, SQC, sampling plans.
8. Use of R software
9. Know the utility of time series analysis and regression analysis.
10. To conduct project work to understand data collection methods, analysis and interpretation

3.NatureofQuestionpapers(Theory):

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NatureofTheory Question Paper

w. e. f. June 2021

Time: $2\frac{1}{2}$ hrs. **Total Marks-80**

Q.1) Multiple choice questions. **(16)**

i) ----------

a) b) c) d)

ii)
iii)
iv)
v)
vi)
vii)
viii)
ix)
x)
xi)
xii)
xiii)
xiv)

Q.2) Answer any Eight from the following **(16)**

a)
b)
c)
d)
e)
f)
g)
h)
i)

Q.3) A) Answer any Two from the following **(10)**

a)
b)
c)

Q.3)B) **(6)**

Q.4)Attempt any Two from the following **(16)**

A)
B)
C)

Q.5) Attempt any Two from the following **(16)**

A)
B)
C)

4. Natureofpracticalpapers:

(i) EachPracticalQuestionpapermustcontain**Four**questions of 30**marks each**.

(ii) EachquestionshouldcontainTwobitsfromdifferentunits of **15 marks each** respectively.

(iii) Studentshould attempt Any**Two**questions.
iv)Eachquestionbitto bedistributedaccordingto followingPoints:

(a) AimoftheExperiment	2Marks
(b) Statisticalformulae	2Marks
(c) ObservationTables	5Marks
(d) Calculations	4Marks
(e) Conclusion/result oftheexperiment	2Marks.

5.Instructions:

1. While attempting questions based on R-software students have to write the commands of R-software on their Answer-book. Final result should be shown to the examiner online or the printout may be attached.
2. Durationofeachpracticalpapershouldbeofthreehours.
3. Student can use MS-Excel or electronic calculators for other practical.

6. Requirements:

1. Thereshouldbetwosubjectexpertsatthetimeofpracticalexamination.
2. Laboratoryshouldbewellequippedwith20 computers/Laptops,2printers withsufficientbackupfacility(UPS/Inverter/Generator).

CBCS Pattern Syllabus: CC - 1A

B.Sc.IIIStatistics Semester-VPaper-IX

StatisticalInference-I

Course Outcomes: The students will able to understand

a) Importance and application of inferential aspect of point estimation.
b) Concept of various important properties of estimator.
c) Concept and application of Fisher information and CR inequality.

Unit-1: Point Estimation (15)

1.1: Notion of a parameter, parameter space, general problem of estimation, estimating anunknown parameter
by point and interval estimation.

1.2: Point estimation: Definition of an estimator (statistic) & its S.E., distinction between estimatorand estimate,Illustrative examples.

1.3: Properties of estimator: Unbiased estimator, biased estimator, positive and negative bias,examples of unbiased and biased estimators. Proofs of the following results regarding theunbiased estimators:

(a) Two distinct unbiased estimators of $\varphi(\theta)$ give rise to infinitely many unbiased estimators of $\varphi(\theta)$.

(b) If T is unbiased estimator of θ then $\varphi(T)$ is an unbiased estimator of $\varphi(\theta)$ provided $\varphi(.)$ is alinear function.

(c) Sample variance is a biased estimator of the population variance.

Illustration of unbiased estimator for the parameter and parametric function.

1.4: Relative efficiency of T1 with respect to T2, where T1 and T2 are unbiased estimators.Use of mean square
error to modify the above definition for biased estimator. MinimumVariance Unbiased Estimator (MVUE) and Uniformly Minimum Variance UnbiasedEstimator (UMVUE), uniqueness of UMVUE whenever it exists. Illustrative examples.

1.5: Consistency: Definition, proof of the following:

(a) Sufficient condition for consistency,

(b) If T is consistent for θ and $\varphi(.)$ is a continuous function then $\varphi(T)$ is consistent for $\varphi(\theta)$.

Illustrative examples

Unit-2: Likelihood and Sufficiency(12)

2.1: Definition of likelihood function as a function of the parameter θ for a random sample from discrete and continuous distributions. Illustrative examples.

2.2: Sufficiency: Concept of sufficiency, definition of sufficient statistic through conditionaldistribution and Neyman factorization criterion. Pitman - Koopman form and sufficient statistic.

Proof of the following properties of sufficient statistic:

(a) If T is sufficient for θ then $\varphi(T)$ is also sufficient for θ provided $\varphi(.)$ is a one-to-one and on-to function.

(b) If T is sufficient for θ then T is sufficient for $\varphi(\theta)$.

2.3: Fisher information function: Definition of information function, amount of informationcontained in a sample. Statement regarding equality of the information in $(x_1,x_2,.....,x_n)$ and ina sufficient statistic T, concept of minimal sufficient statistic with illustrations to exponentialfamily.

2.4: Illustrative examples.

Unit-3 Cramer – Rao inequality **(7)**

Statement and proof of Cramer – Rao inequality. Definition of Minimum Variance Bound Unbiased Estimator (MVBUE) of $\varphi(\theta)$. Proof of the following results:

(i) If MVBUE exists for θ then MVBUE exists for $\varphi(\theta)$, if $\varphi(.)$ is a linear function.

(ii) If T is MVBUE for θ then T is sufficient for θ.

(iii) Examples and problems.

Unit-4: Methods of Estimation **(11)**

4.1: Method of maximum likelihood, derivation of maximum likelihood estimators for parameters of standard
distributions. Use of iterative procedure to derive MLE of location parameter μ of Cauchy distribution, invariance property of MLE, relation between MLE and sufficient statistic. Illustrative examples.

4.2: Method of moments: Derivation of moment estimators for standard distributionsIllustrations of situations.
where MLE and moment estimators are distinct and their comparison using mean square error (for uniform distribution). Illustrative examples.

4.3: Method of minimum chi-square : Definition, derivation of minimum chi-square estimator for the parameter. Illustrative examples.

Books Recommended

1. Kale, B. K.: A first Course on Parametric Inference
2. Rohatgi, V. K.: Statistical Inference
3. Rohatgi, V. K.: An introduction to Probability Theory and Mathematical Statistics
4. SaxenaH. C. and Surenderan : Statistical Inference
5. Kendall M. G. and Stuart A.: An advanced Theory of Statistics
6. Lindgren, B. W.: Statistical Theory
7. Lehmann, E. L.: Theory of Point Estimation
8. Rao,C.R.: Linear Statistical Inference
9. DudewiczC.J.and Mishra S.N.: Modern Mathematical Statistics
10. Fergusson,T.S.:Mathematical statistics.
11. Zacks,S.:Theory of Statistical Inference.
12. Cramer,H.:Mathematical Methods of Statistics.
13. CasselaG.and Berger R.L.: Statistical Inference.
14. Siegel, S.: Non-parametric Methods for the Behavioral Sciences.
15. Dr. P. G. Dixit, Dr. (Mrs.) V. R. Prayag, S. M. Patil, N. J. Subandh: Statistical Inference: Estimation, NiraliPrakashan, Pune

CBCS PatternSyllabus: CC - 2A

B.Sc.IIIStatistics Semester-VPaper -X

ProbabilityDistributions

Course Outcomes: The students will able to understand

a) Importance and application of univariate distributions such as Laplace, Cauchy, Lognormal, Weibull, Logistic, Pareto, Power Series Distribution.
b)Concept of Bivariate Normal Distribution.
c) Concept and application of Truncated Distributions.

Unit-1:UnivariateContinuousProbabilityDistributions (15)

1.1 **Laplace (DoubleExponential)Distribution:**P.d.f.withparameters(μ, λ), Natureoftheprobabilitycurve,Distributionfunction, quartiles, m.g.f., mean,variance, moments,β_1,β_2,$\gamma_1$andγ_2, Laplacedistributionasthedistributionofthedifferenceoftwoi.i.d.exponentialvariableswithparameterθ, examplesandproblems.

1.2 LognormalDistribution: P.d.f.with parameters(μ,σ^2), Nature of the probability curve, mean, variance, median, mode,moments, $\beta_1,\beta_2,\gamma_1$and$\gamma_2$coefficients, Relation with$N(\mu,\sigma^2)$, examplesandproblems.

1.3 CauchyDistribution:P.d.f.withparameters (μ,λ),natureoftheprobability curve,distribution function, quartiles, non-existence ofmoments, additive property fortwoindependent Cauchy variables (statementonly), statement of distribution of the samplemean, relationshipwithuniformandStudents 't'distribution,distributionof$\frac{X}{Y}$whereXand Yarei.i.d.N(0,1),examplesandproblems.

1.4 Weibull Distribution: p.d.f.with parameters (α, β), distribution function, quartiles, mean and variance, coefficient ofvariation, relation with gamma and exponential distribution, examples and problems.

Unit-2:UnivariateandMultivariateProbabilityDistributions
(12)

2.1 Logisticdistribution:p.d.f.withparameters(μ, σ),c.d.f.,mean,mode,variance, skewness usingmode, applications.

2.2 Pareto distribution: p. d .f. withparameters(α,β),mean, variance, mode, skewnessusingmode,applications.

2.3 Powerseriesdistribution:p.m.f.mean,mode,variance,Binomial, Poisson,Geometric andnegativebinomialdistributionasparticularcasesofpowerseriesdistribution.

Unit-3:TruncatedDistributions (8)

3.1 Truncateddistributionasconditionaldistribution,truncationtotheright,leftandonboth sides.

3.2 BinomialdistributionB (n,p)lefttruncatedatX=0(valuezeronotobservable),itsp.m.f,mean,variance.

3.3 PoissondistributionP(m),lefttruncatedatX=0(valuezeronotobservable),itsp.m.f.,meanandvariance.

3.4 Normaldistribution$N(\mu,\sigma^2)$truncatedi) totheleftbelowa, ii) totherightaboveb, iii) totheleftbelowaandtotherightaboveb,itsp.d.f.andmean.

3.5 Exponentialdistributionwithparameterθlefttruncatedbelowa, its p.d.f.,meanandvariance.

3.6 Examplesandproblems.

Unit-4: Bivariate Normal Distribution (10)

4.1 P.d.f.ofa bivariatenormaldistribution, $BN(\mu_1,\mu_2,\sigma_1^2,\sigma_2^2,\rho)$,Marginaland conditionaldistributions,identificationof parameters,conditionalexpectationand conditional variance,regression of Y on X and of Xon Y., independence and uncorrelatednessimplyeachother,m.g.f andmoments.DistributionofaX+bY+c, wherea,bandcarerealnumbers.

4.2 CauchydistributionasthedistributionofZ=X/Ywhere, $(X,Y)\sim BN(0,0,\sigma_1^2,\sigma_2^2,\rho)$

4.3 Examplesandproblems.

BooksRecommended:

1. CramerH.:MathematicalMethodsofStatistics,AsiaPublishingHouse,Mumbai.
2. Mood,A.M.,GraybillK,Bose.D.C.:IntroductiontoTheoryofStatistics.(Thirdedition) Mc-GrawHiilSeries.

3. Lindgren B. W.: Statistical Theory (Third Edition),CollierMacmillan International Edition,Macmillan Publishing Co.Inc.NewYork.
4. Hogg,R.V.andCraigA.T.: IntroductiontoMathematicalStatistics(Third Edition), Macmillan Publishing Company,Inc.866,34dAvenue,NewYork,10022.
5. SanjayAroraandBansiLal:NewMathematicalStatistics(FirstEdition),SatyaPrakashan, 16/17698,NewMarket,NewDelhi,5(1989).
6. GuptaS.CandKapoorV.K.:FundamentalsofMathematicalStatistics,SultanChand andSons,88,Daryaganj,NewDelhi.
7. RohatgiV.K.:AnIntroductiontoProbabilityTheoryandMathematical Statistics, Wiley EasternLtd.,NewDelhi.
8. Feller.W.:AnIntroductionofProbabilityTheoryanditsApplications,WileyEastern Ltd.Mumbai.
9. JhonsonandKotz:ContinuousUnivariateDistributionsIandII:DiscreteDistributions: MultivariateDistributions
10. BhatB.R.:ModernProbabilityTheory.NewAgeInternational.

CBCS PatternSyllabus: CC – 3A
B. Sc.III(Statistics) Semester-VIPaper-XI
SamplingTechniques

Course Outcomes: The students will able to understand

a)An idea of conducting sample surveys and selecting appropriate sampling techniques.
b) Concept of comparing various sampling techniques and its use for various situations.
c) Use of auxiliary information to conduct sample survey.

Unit–1: BasicTerminologyandSimpleRandomSampling(15)

1.1:BasicTerminology:

Conceptof distinguishableelementaryunits,samplingunits,samplingframe,random sampling and non-random sampling. Advantages of sampling method over census method,objectivesofa samplesurvey,designinga questionnaire,Characteristicsofa goodquestionnaire,

Conceptofsamplingandnon-sampling errors.Handlingofnon- responsecases.

1.2: Simplerandomsamplingforattributes:

i. Samplingfordichotomousattributes. Estimationof populationproportion, Sample proportion(p)asanestimatorofpopulationproportion(P), derivationof itsexpectation,standarderrorandestimatorofstandarderrorusingSRSWOR.
ii. Npas anestimatorof totalnumberofunitsinthepopulationpossessingtheattributeof interest,derivationofitsexpectation, standarderrorandestimatorofstandarderror.

1.3: Determinationofthesamplesize:

Determinationofthesamplesize(n)forthegiven:

i. Marginoferrorandconfidencecoefficient
ii. Coefficientofvariationoftheestimatorandconfidencecoefficient.

Unit–2:StratifiedSampling (15)

i. Reallifesituationswherestratificationcanbeused.
ii. Description of stratified sampling method where sample is drawn from individual stratumusingSRSWORmethod.
iii. (a) $\bar{y}_{st}$ asanestimatorofpopulationmean $\bar{Y}$,derivationofitsexpectation,standard errorandestimatorofstandarderror.
(b) $N\bar{y}_{st}$ asanestimatorofpopulationtotal,derivationofitsexpectation,standarderror andestimatorofstandarderror.
iv. Problemof allocation:Proportionalallocation,Neyman'sallocationandoptimum allocation,derivationoftheexpressionsforthestandarderrorsof theaboveestimators whentheseallocationsareused.
v. ComparisonamongstSRSWOR,stratificationwithproportionalallocationand stratificationwithoptimumallocation
vi. Cost and variance analysis in stratified random sampling, minimization of variance for fixed cost, minimization of cost for fixed variance, optimum allocation as a particular case of optimization in cost and variance analysis.

Unit-3: Other Sampling Methods(10)

3.1:SystematicSampling:

i. Reallifesituationswheresystematicsamplingisappropriate. Techniqueofdrawingasampleusing systematicsampling.
ii. Estimationofpopulationmeanandpopulationtotal,standarderroroftheseestimators.
iii. ComparisonofsystematicsamplingwithSRSWOR.
iv. ComparisonofsystematicsamplingwithSRSWORandstratifiedsamplinginthe presenceoflineartrend.
v. IdeaofCircularSystematicSampling.

3.2: ClusterSampling

i. Reallifesituationswhereclustersamplingisappropriate.Techniqueof drawing sample usingclustersampling.
ii. Estimationofpopulationmeanandpopulationtotal(withequalsizeclusters),standard erroroftheseestimators.
iii. Systematicsamplingasaparticularcaseofclustersampling.

3.3: TwoStageandMultiStageSampling

Ideaoftwo-stageandmultistagesampling.

Unit-4:SamplingMethodsusingAuxiliaryvariables(5)

4.1: Ratio Method:

i. Concept of auxiliary variable and its use in estimation ii. Situations where Ratio method is appropriate.
ii. Ratioestimatorsofthepopulationmeanandpopulationtotalandtheirstandard errors(withoutderivations),estimatorsofthesestandarderrors.
iii. Relativeefficiencyofratioestimatorswiththatof SRSWOR.

4.2:RegressionMethod

i. Situationswhere Regressionmethodisappropriate.
ii. Regressionestimatorsofthepopulationmeanandpopulationtotalandtheirstandard errors(withoutderivations),estimatorsofthesestandarderrors.
iii. Commentsregardingbiasinestimation
iv. Relativeefficiencyofregression estimatorswiththatof a) SRSWOR, b)Ratioestimator.

BooksRecommended

1. Cochran,W.G:SamplingTechniques,WileyEasternLtd.,NewDelhi.
2. Sukhatme,P.V.andSukhatme,B.V.:SamplingTheoryofSurveyswithApplications, IndianSocietyofAgriculturalStatistics,NewDelhi.
3. DesRaj:SamplingTheory.
4. DarogaSinghandChoudharyF.S. :TheoryandAnalysisofSampleSurveyDesigns, WileyEasternLtd.,NewDelhi.
5. Murthy,M.N:SamplingMethods,IndianStatisticalInstitute,Kolkata.
6. Mukhopadhay,Parimal:TheoryandMethodsofSurveySampling,PrenticeHall.

CBCS PatternSyllabus: DSE 4A
B.Sc.III(Statistics) Semester-VPaper-XII
OperationsResearch

Course Outcomes: The students will able to understand

a) Concept of Linear programming problem and its application to real life problems.
b) Importance of Transportation, Assignment and Sequencing problems.
c) Use of decision theory in solving complex problems.
d) Importance of simulation techniques in every aspects of Statistical theory.

Unit-1: Linearprogramming (15)

1.1: Basicconcepts:

Statementof theLinearProgrammingProblem(LPP),formulationof problem asL.P. problem.Definition of(i)aslackvariable, (ii)asurplusvariable.L.P. problemin (i) canonicalform,(ii)standardform.Definitionof(i)asolution,(ii)afeasiblesolution, (iii)basicvariableandnon-basicvariable,(iv) a basicfeasiblesolution,(v)a degenerate andanon-degeneratesolution,(vi)anoptimalsolution.

1.2: SolutionofL.P.P.:

i. Graphical Method: Solution space, obtaining an optimal solution, unique and non- unique optimal solutions.
ii. Simplex Method:
(a) Initial basic feasible solution (IBFS) is readily available :obtaining an IBFS, criteria for deciding whether obtained solution is optimal, criteria for unbounded solution, more than one optimal solutions.
(b)IBFS not readily available: introduction of artificial variable, Big-M method, modified objective function, modifications and applications of simplex method to L.P.P., criterion for no solution.
iii. Examples and problems.

1.3:DualityTheory:

i. Writing dual of a primal problem, solution of L.P.P. with artificial variable.
ii. Examples and problems.

Unit-2: TransportationandAssignmentProblems (12)

2.1:Transportationproblem:

i. Transportation problem (T.P.), statement of T.P., balanced and unbalanced T.P.
ii. Methods of obtaining initial basic feasible solution of T.P. (a) North West corner rule (b) Method of matrix minima (least cost method), (c) Vogel's approximation (VAM).
iii. MODI method of obtaining Optimalsolution of T.P, uniqueness and non-uniqueness of optimal solutions, degenerate solution.
iv. Examples and problems.

2.2:AssignmentProblem:

i. Statement of an assignment problem, balanced and unbalanced assignment problem, relation with T.P, optimal solution of an assignment problem using Hungarian method.
ii. Examples and problems.

2.3: SequencingProblem:

i. Introduction. Statement of problem.
ii. Procedure of processing n jobs on two machines.
iii. Procedure of processing n jobs on three machines and m machines. Computations of elapsed time and idle times.
iv. Examples and problems.

Unit-3: DecisionTheory(8)

i. Introduction, steps in decision theory approach. ii. Type of decision making environments.
ii. Decision making under uncertainty: Criteria of optimism, criteria of pessimism, equally likely decision criterion, criterion of regret.

iii. Decision making under risk: Expected monetary value, expected opportunity loss, expected value of perfect information.
iv. Examples and problems.

Unit.4: SimulationTechniques(10)

Meaningof simulation,MonteCarlosimulation,advantagesanddisadvantagesof simulation,definitionandpropertiesof randomnumbers,generationofpseudorandom numbers,Techniquesofgeneratingrandomnumbersfromuniformdistribution,Testsfor randomness anduniformity, random variategeneration using inverse c. d. f.method,random Variate generationfrom Bernoulli,Binomial,Poisson,Geometric, Exponentialand Normaldistributions.

BookRecommended

1.GassE.:LinearProgrammingMethodandApplications,NarosaPublishing House, NewDelhi.
2.ShrinathL.S.:LinearProgramming.
3.TahaH.A.:Operationresearch–AnIntroduction,FifthEdition,PrenticeHallofIndia, NewDelhi.
4.Saceini,Yaspan,Friedman:OperationsResearchMethodandProblems, WileyInternationalEdition.
5.Shrinath,L.S.:LinearProgramming,AffiliatedEast-WestPressPvt.Ltd., NewDelhi.
6.Phillips,D.T.,Ravindra,A.,Solberg,J.:OperationsResearchPrinciplesandPractice,JohnWileyandSonsInc.
7.Sharma,J.K.:MathematicalModelsinOperationsResearch,TauMcGrawHillPublishingCompanyLtd.,NewDelhi.
8.Kapoor,V.K.: OperationsResearch,SultanChandandSons,NewDelhi.
9.Gupta,P.K.andHiraD.S.:OperationsResearch,S.ChandandCompany Ltd.,NewDelhi.
10.LucDevroye:Non-UniformRandomVariateGeneration,Springer–Verlag,NewYork.
11.Gentle,J.E.:RandomNumberGenerationandMonteCarloMethods,Springer- Verlag.
12.Robert,C.P.andCasella,G.:MonteCarloStatisticalmethods,Springer-Verlag.
13.Rubinstien,R.Y.:SimulationandMonteCarloMethod,JohnWiley,NewYork

CBCS PatternSyllabus: DSE 4A
B.Sc.III(Statistics) Semester-VPaper-XII
Regression Analysis

Course Outcomes: The students will able to understand

a)Concept and application of regression analysis.
b) Real life application of logistic regression.
c) Importance of least square techniques in the context of regression analysis.

Unit.1: Simple linear regression model (16)

i. Review of simple linear regression model : $Y = \beta_0 + \beta_1 X + \epsilon$, where ϵ is a continuous random variable

with E(ϵ) = 0 and V(ϵ) = σ^2 .

ii. Estimation of $\beta_0$and β_1, by the method of least squares. Properties of theestimators $\beta_0$and β_1,Properties of estimators of β_0 and β_1. Estimation of σ^2, Assumption of normality of ϵ .
Tests of hypothesis of β_1. Interval estimation in simple regression model, Coefficient of determination.

iii. Residual analysis. Standardised residuals, Studentized residuals, residual plot, Detection and treatment of outliers.

Unit.2: Review of multiple Regression Model (20)

i. Review of multiple linear regression model : Y = $\beta_0 + \beta_1 X_1 + \ldots + \beta_p Xp + \epsilon$, where ϵ is a continuous random variable with E(ϵ) = 0 and V(ϵ) = σ^2.

ii. Estimation of regression parameters$\beta_0, \beta_1, \ldots, \beta_p$ by method of least square, obtaining normal equation Estimation of σ^2, Assumption of normality of ϵ .Tests of hypothesis of regression parameters.

iii. Variable selection and model building, Residual diagnostics and corrective measures such astransformation response variable, weighted least squares method.

Unit.3: Logistic Regression Model (9)

Binary response variable, logit transform estimation and interpretation of parameters
Tests of hypotheses of model parameters, model deviance, LR test.

BookRecommended

1) Montgomery D.C., Peak E.A. , And Vining G.G. (2003). Introduction to Linear Regression Analysis(Wile
2) Hosmer D.W. And Lemeshow, S. (1989). Applied Logistic Regression (Wiley)
3) Manisha Sane, Regression Analysis :NiraliPrakashan

CBCS PatternSyllabus: SEC 3
B.Sc.III(Statistics) Semester-V
MS-EXCEL

- **Course outcomes**

1. To enable student to understand importance of MS-Excel in day-to-day life.
2. To motivate student to judiciously use MS-Excel for facilitation for their own development and development of the society.

3. To help student to construct knowledge using MS-Excel and become a lifelong learner.
4. To empower student to become responsible citizens of the modern technology-based world.

Unit -1 Microsoft Excel: Introduction to MS-EXCEL. (5)

Unit-2 Data manipulation using EXCEL: sort and filter, find and replace,

text to columns. (06)

Unit-3 Charts and Diagrams (10)

Unit-4 Built-in mathematical and statistical functions for obtaining descriptive statistics, computing PMF/PDF, CDF and quantiles of the well-known distributions, rand function (10)

Unit-5 Logical functions: if, true, false, and, or, not etc (06)

Unit-6 Excel add-ins: analysis tool pack. Pivot tables and charts. (08)

- **References:**
  1. Help manual of EXCEL.

CBCS PatternSyllabus : CC - 1B
B.Sc.III (Statistics)Semester–VIPaper -XIII
StatisticalInference-II

Course Outcomes: The students will able to understand

a)Concept and application of interval estimation.
b) Difference between parametric and non parametric tests.
c) Importance of sequential test procedure.

Unit-1:IntervalEstimation (11)

1.1: Notionofintervalestimation,definitionofconfidenceinterval,lengthofconfidence interval,confidence bounds.DefinitionofPivotalquantityanditsusein obtainingconfidenceintervalsandbounds.

1.2: Intervalestimationforthefollowingcases:

i. Mean μ of normal distribution (σ^2 known and σ^2 unknown).
ii. Variance σ^2 of normal distribution (μ known and μ unknown).
iii. Difference between two means μ_1-μ_2, (a) for a sample from Bivariate normal population, (b) for samples from two independent normal populations.
iv. Ratio of variances for samples from two independent normal populations.
v. Mean of exponential distribution.
vi. Population proportion and difference of two population proportions of two independent large samples.
vii. Population median using order statistics. Illustrative examples.

Unit-2: ParametricTests (13)

2.1: Statisticalhypothesis,problemsoftestingofhypothesis,definitionsandillustrationsof (i)simplehypothesis(ii)compositehypothesis,criticalregion,typeI andtypeIIerror, probabilitiesoftypeI &typeIIerrors.Powerofatest,p-value,sizeofatest,levelof significance,problemofcontrollingprobabilitiesoftypeI&typeIIerrors.

2.2: DefinitionofMostPowerful(MP)test.Statementandproof(sufficientpart)ofNeyman-Pearson(NP)lemmafor simplenullhypothesisagainstsimplealternativehypothesis forconstructionofMPtest.ExamplesofconstructionofMPtestoflevel α.

2.3: Powerfunctionofatest,powercurve,definitionofuniformlymostpowerful(UMP)levelαtest.Useof NPlemmaforconstructingUMPlevelα testfor one-sided alternative.Illustrativeexamples.

2.4: LikelihoodRatioTest:Procedureoflikelihood ratiotest,statement and itsproperties,LikelihoodRatiotestinvolvingmeanandvarianceofnormalpopulation.

Unit-3:SequentialTests(9)

Generaltheoryof sequentialanalysisanditscomparisonwithfixedsampleprocedure. Wald'sSPRTof strength(α,β),forsimplenullhypothesisagainstsimplealternative hypothesis.Illustrationsforstandarddistributionslikebinomial,Poisson,exponential andnormal.Graphicalandtabularprocedure forcarryingout the test.Illustrativeexamples.

Unit-4:Non-parametricTest(12)

Notionofnon-parametricstatisticalinference(test)anditscomparisonwithparametric statisticalinference.Conceptof distribution freestatistic.

Testprocedureof:

i. Run test for one sample (i.e. test for randomness) and run test for two independent sample problems.
ii. Sign test for one sample and two sample pairedobservations
iii. Wilcoxon's signed rank test for one sample and two sample paired observations.
iv. Mann- Whitney U- test (two independent samples)
v. Median test
vi. KolmogorovSmirnovtestforoneandfortwoindependentsamples.

BooksRecommended

1. Kale,B.K.:AfirstCourseonParametricInference
2. Rohatgi,V.K.: StatisticalInference
3. Rohatgi,V.K.: AnintroductiontoProbabilityTheoryandMathematical Statistics
4. SaxenaH.C.andSurenderan:StatisticalInference
5. KendallM.G.andStuartA.:An AdvancedTheoryofStatistics
6. Lindgren,B.W.:StatisticalTheory
7. CasselaG.andBergerR.L.:StatisticalInference
8. Lehmann,E.L:TestingofStatisticalHypothesis
9. Rao,C.R.:LinearStatisticalInference
10. DudewiczC.J.andMishraS.N.:ModernMathematicalStatistics
11. Fergusson,T.S.:Mathematical Statistics.
12. Zacks,S.:TheoryofStatisticalInference.
13. Cramer,H.:MathematicalMethodsofStatistics.
14. Gibbons,J.D.:Non-parametricStatisticalInference.
15. Doniel:AppliedNon-parametricStatistics
16. Siegel,S.: Non-parametricMethodsforthebehavioralsciences.
17. Kunte,S.;Purophit, S.G.andWanjale, S.K.:LecturenotesonNon-parametricTests.

CBCS PatternSyllabus: CC -2B
B.Sc.III (Statistics)Semester-VIPaper -XIV
ProbabilityTheory

Course Outcomes: The students will able to understand

a) Idea behind order statistics and its use.
b) Concept of different modes of convergence of random variables.
c) Concept and real life application of Markov chain.

Unit-1:OrderStatistics (10)

i. Order statistics for arandom sample of size n from a continuous distribution, Joint distribution,definition,derivationofdistributionfunctionand density functionoftheithorderstatistic,particularcasesfori=1andi=n.
ii. Derivationofjointp.d.f.ofithandjthorderstatistics,statementofdistributionof thesamplerange.
iii. Distributionofthesamplemedianwhenn is odd.
iv. ExamplesandProblems

Unit-2:ConvergenceandLimitTheorem (12)

2.1:Convergence:

i. Definition ofconvergenceofsequenceofrandomvariables(a)inprobability,(b)in distribution, (c)inquadraticmean.
ii. If$X_n \xrightarrow{P} X$theng$(X_n) \xrightarrow{P} g(X)$whereg(.)iscontinuousfunction (without proof.)
iii. Examples and problems.

2.2: WeakLawofLargeNumbers

i. Weak law of large numbers (WLLN) statement and proof for i.i.d. random variables with finite variance.
ii. Simple examples based on Bernoulli, binomial, Poisson , chi-squareetcdistributions

Unit-3:FiniteMarkovChains (12)

3.1: Basicconcepts:

Definitionandexamplesof stochastic process,classificationofgeneralstochasticprocess intodiscrete–continuous time, discrete –continuous state space, type ofstochastic process,Examplesandproblems.

3.2:Markovchain:

Definition and examples of Markovchain, stochastic matrix, transition probability matrix,Chapman-Kolmogorovequation(statementonly),n steptransitionprobability matrix,classificationof states,simpleproblems.Stationaryprobabilitydistribution, applications.Examplesandproblems.

3.3:ContinuousMarkovchain:

i. Purebirthprocess,Poissonprocess,birthand deathprocess(Derivationsnotexpected).
ii. Examplesandproblems.

Unit-4:QueuingTheory(11)

i. Introduction, essentialfeaturesofqueuingsystem,inputsource,queueconfiguration, queuediscipline,servicemechanism.

ii. Operating characteristics of queuing system, transient-stateandsteady state, queue length,generalrelationshipamongsystemcharacteristics.

iii. Probabilitydistributions in queuingsystem:Distributionofarrival,distributionofinter arrivaltime,distributionofdepartureanddistributionofservicetime(Derivationsare notexpected).

iv. Typesofqueuingmodels.

v. SolutionofqueuingModel:M/M/1,usingFCFSqueuediscipline.

vi. Examplesandproblems.

BooksRecommended

1. CramerH.:MathematicalMethodsofStatistics,AsiaPublishingHouse,Mumbai.
2. LindgrenB.W.:StatisticalTheory(ThirdEdition),CollierMacmillan InternationalEdition,MacmillanPublishingCo.Inc.NewYork.
3. Hogg,R.V.andCraigA.T.:Introduction toMathematical Statistics(ThirdEdition), MacmillanPublishingCompany,Inc.866,34dAvenue,NewYork,10022.
4. SanjayAroraandBansiLal:NewMathematicalStatistics(FirstEdition),SatyaPrakashan16/17698,NewMarket,NewDelhi,5(1989).
5. GuptaS.CandKapoorV.K.:FundamentalsofMathematicalStatistics,SultanChandand Sons,88,Daryaganj,NewDelhi2.
6. RohatgiV.K.:AnIntroductiontoProbabilityTheoryandMathematicalStatistics,Wiley EasternLtd.,NewDelhi.
7. MedhiJ:StochasticProcesses.Wiley EasternLtd.NewDelhi.
8. Hoel,PortandStone:IntroductiontoStochasticProcesses,HoughtonMifflin.
9. Feller.W.:AnIntroduction to Probability TheoryanditsApplications.WileyEastern Ltd.Mumbai.
10. BhatB.R.:ModernProbabilityTheory.
11. KarlinandTaylor:StochasticProcess.
12. RossS:ProbabilityTheory
13. Bhat B. R. : Stochastic Models : Analysis and Applications. New Age International.
14. Zacks S.: Introduction to Reliability Analysis, Probability Models and Statistical Methods,SpringerVerlag.
15. TahaH.A.:Operationresearch–AnIntroduction,Fifthedition,PrenticeHallofIndia, NewDelhi.
16. BarlowR.E.andProschanFrank:StatisticalTheoryofReliabilityandLifeTesting.Holt.RinebartandWinstonInc.,NewYark
17. SinhaS.K.:ReliabilityandLifeTesting,SecondEdition,WileyEastern Publishers, NewDelhi.
18. Trivedi R. S.:Probability and Statisticswith Reliability and Computer Science Application,Prentice–HallofIndiaPvt.Ltd.,NewDelhi.
19. ParimalMukhopadhyaya:AnIntroductiontotheTheoryofProbability.WorldScientific Publishing.

CBCS PatternSyllabus: CC – 3B
B.Sc.III(Statistics) Semester -V Paper -XV
DesignsofExperiments

Course Outcomes: The students will able to understand

a) Basic terminology involved in designing of experiment.
b) Concept and use of different experimental designs.
c) Concept and real life application of factorial experiment.

Unit–1:SimpleDesignsofExperiments I:(10)

1.1: BasicConcepts:

i. Basic terms in design of experiments: Experimental unit, treatment, layout of an experiment.
ii. Basic principles of design of experiments: Replication, randomization and local control.
iii. Choice of size and shape of a plot for uniformity trials, the empirical formula for the variance per unit area of plots.

1.2: CompletelyRandomizedDesign (CRD)

i. Application of the principles of design of experiments in CRD, layout, model, assumptions and interpretations:
ii. Estimation of parameters, expected values of mean sum of squares, components of variance.
iii. Break up of total sum of squares into components.
iv. Technique of one way analysis of variance (ANOVA) and it's applications to CRD.
v. Testing for equality for treatment effects and it's interpretation. F-test for testing H_0, test for equality of two specified treatment effects.

Unit-2:SimpleDesignofExperimentsII:(15)

2.1: RandomizedBlockDesign(RBD):

i. Application of the principles of design of experiments in RBD, layout, model, assumptions and interpretations:
ii. Estimation of parameters, expected values of mean sum of squares, components of variance.
iii. Breakup of total sum of squares into components.
iv. Technique of two way analysis of variance (ANOVA) and its applications to RBD.
v. Tests and their interpretations, test for equality of two specified treatment effects, comparison of treatment effects using critical difference (C.D.).
vi. Idea of missing plot technique.
vii. Situations where missing plot technique is applicable.
viii. Analysis of RBD with single missing observation.

2.2 LatinSquareDesign (LSD):

i. Application of the principles of design of experiments in LSD, layout, model, assumptionsand interpretations:
ii.Breakupoftotalsum of squaresintocomponents.
iii.Estimationofparameters,expectedvaluesofmeansumofsquares, componentsof

variance.Preparationofanalysisofvariance(ANOVA)table.

iv.Tests andtheirinterpretations,testforequalityoftwospecified treatment effects, comparisonoftreatmenteffectsusingcriticaldifference(C.D.).

v.AnalysisofLSD withsinglemissingobservation.

vi.IdentificationofreallifesituationswhereCRD,RBD and LSD are used.

Unit–3:Efficiencyofdesign andANOCOVA (10)

3.1 Efficiencyofdesign:

i. Concept and definition of efficiency of a design.
ii. Efficiency of RBD over CRD.
iii. Efficiency of LSD over CRD and LSD over RBD.

3.2 AnalysisofCovariance(ANOCOVA) withoneconcomitantvariable:

i. Purpose of analysis of covariance.
ii. Practical situations where analysis of covariance is applicable.
iii. Model for analysis of covariance in CRD and RBD. Estimation of parameters (derivations are not expected).
iv. Preparation of analysis of covariance (ANOCOVA) table, test for $\beta=0$, test for equality of treatment effects (computational technique only).

Note: Forgiven data,irrespectiveoftheoutcomeofthetestofregressioncoefficient(β), ANOCOVAshouldbecarriedout.

Unit–4: FactorialExperiments (10)

i. General description of factorial experiments, 2^2 and 2^3 factorial experiments arranged in RBD.
ii. Definitions of main effects and interaction effects in 2^2 and 2^3 factorial experiments.
iii. Model, assumptions and its interpretation.
iv. Preparation of ANOVA table by Yate's procedure, test for main effects and interaction effects.
v. General idea and purpose of confounding in factorial experiments.
vi. Total confounding (Confounding only one interaction): ANOVA table, testing main effects and interaction effects.
vii. Partial Confounding (Confounding only one interaction per replicate): ANOVA table, testing main effects and interaction effects.
viii. Construction of layout in total confounding and partial confounding in 2^3 factorial experiment.

BooksRecommended

1.Federer,W.T.:ExperimentalDesign,OxfordandIBHpublishingCompany,NewDelhi.
2.Cochran,W.G.andCox,G.M.:ExperimentalDesign,JohnWileyandSons,Inc.,NewYork.
3.Montgomery,D.C.:DesignandAnalysisofExperiments,WileyEasternLtd.,NewDelhi.
4. Das, M. N. and Giri, N. C. : Design and Analysis of Experiments, Wiley Eastern Ltd., New Delhi.
5.Goulden,G.H.:MethodsofStatisticalAnalysis,AsiaPublishingHouse,Mumbai.
6.Kempthrone,O.:DesignandAnalysisofExperiments,WileyEasternLtd.,NewDelhi.
7.Snedecor,G.W.andCochran,W.G.:StatisticalMethods,AffiliatedEast-WestPress,New Delhi.
8.Goon,Gupta,Dasgupta:FundamentalofStatistics,Vol.IandII,TheWorldPressPvt. Ltd.Kolkata.
9.Gupta,S.C.andKapoor,V.K.:Fundamentals ofAppliedStatistics,S.Chand&Sons, NewDelhi.

10.C.F.JeffWu,MichaelHamada:Experiments,PlanningAnalysisandParameterDesign Optimization.

CBCS PatternSyllabus: DSE 4B
B.Sc.III(Statistics) SemesterVIPaperXVI
QualityManagementandReliabilityTheory

Course Outcomes: The students will able to understand

a) Meaning and dimensions of quality and its importance in real life and in manufacturing industry.
b) Different tools and techniques involved in process and product control.
c) Concept and real life application of reliability theory.

Unit.1:QualityTools:
(10)

Meaninganddimensions ofquality,qualityphilosophy, Magnificenttoolsofquality: Histogram, Checksheet,Paretodiagram, causeandeffectdiagram, scatterdiagram, controlchart,flowchart.Deming'sPDCAcyclefor continuousimprovementsandits applications.

Unit2:ProcessControl:
(12)

CUSUMchart,tabularform,useof thesechartsformonitoringprocessmean.Moving averageandexponentiallyweightedmovingaveragecharts.Introductionto six-sigma methodology,DMAICcycleandcasestudies.

Unit3:ProductControl (13)

SamplingInspectionplans forattributeinspection:ConceptofAQL,LTPD, Consumer'srisk,producer'srisk,AOQ,AOQL,OC,ASNandATI.Description of Singleanddoublesamplingplanswithdeterminationofaboveconstants.

Unit-4:ReliabilityTheory. (10)

i. Binary system: Block diagram, definition of binary coherent structure and illustrations. Coherent system of component (at most three)- a) Series b) Parallel c) 2 out of 3 system.
ii. Minimal cut, minimal path representation of system. Reliability of binary system: reliability of above systems h(p),when components are independent and identically distributed with common probability p of operating. 'S' shaped ness property of h (p) without proof.
iii. Ageing Properties: Definitions, Hazard rate, hazard function, survival function, concept of distributions with increasing and decreasing failure rate(IFR, DFR).
iv. Relationship between survival function and hazard function, density function and hazard rate, derivations of the results a) Hazard rate of a series system of components having independent lifetimes is summation of component hazard rates. b) Lifetime of series system of independent components with independent IFR life times is IFR. vi) Examples on exponential and Weibull distributions.

Books Recommended

1. IntroductiontoqualityControl–MontgomeryD.C.
2. QualityControlandIndustrialstatistics- DuncanAJ
3. StatisticalQualityControl- ELGrant
4. Zacks S.: Introduction to Reliability Analysis, Probability Models
5. Barlow, R.E. and Proschan Frank: Statistical Theory of Reliability and Life Testing,HoltRinebart and Winston Inc., New York.

6. Sinha S.K.: Reliability and Life Testing, Second Edition, Wiley Eastern Ltd. New Delhi.
7. Trivedi R.S.: Probability and Statistics with Reliability and Computer Science Application, Prentice – Hall of India Pvt. Ltd., New Delhi.
8.Dr. B.G. Kore and Dr. P. G. Dixit: Statistical Methods-II, 4th Edition,December, 2017, NiraliPrakashan, Pune.

CBCS PatternSyllabus: DSE 4B
B.Sc.III(Statistics) SemesterVIPaperXVI

Time Series Analysis

Course Outcomes: The students will able to understand

a) Concept behind features of time series data.
b) Tools and techniques involved to understand trend in time series analysis.
c) Impact of trend, seasonality on time series data.

Unit 1:Features of time series data (10)

Meaning and need of time series analysis.Components of time series –Secular trend, Seasonal variation, Cyclical variations, Irregular (random) variation. Additive and Multiplicative model for time series. Utility of time series. Studying a given series by plots and Historigrams. Test of randomness of a series against trend and seasonality.

Unit 2: Methods of trend estimation and smoothing(18)

Moving average method, Progressive average method,Least square method, Exponential smoothing, Forecasting based on smoothing, Double exponential smoothing, Choosing parameters for smoothing and forecasting, Estimating mean square error of forecasting, Prediction intervals based on normality assumption.

Unit 3: Measurement Seasonal variations (8)

Method of simple averages, Ratio to trend method, Ratio to moving average method Link Relative Method. Measurement of cyclic variation- Harmonic analysis.

Unit 4: Detailed study of stationary process (9)

4.1. Definition of Stationary Time Series, Auto-Covariance, Auto-Correlation. Properties of Auto-covariance function (Statement only). Illustrative examples.

4.2. MA(q) Process: Auto-covariance function, Auto-correlation function. Estimation of parameters (For MA(1)
and MA(2) process only). Illustrative examples.

4.3. AR(p) Process: Auto-covariance function, Auto-correlation function. Estimation of parameters (For AR(1)
and AR(2) process only). Illustrative examples.

Books Recommended

1. Montgomery, D.C. and Johnson L.A. (1976): Forecasting and Time series Analysis, McGraw Hill.
2. The Analysis of Time Series An Introduction Sixth Edition: Chris Chatfield CRC press Taylor and Francis Group, A Chapman And Hall Book
3. Farmum, N. R. and Stantorr, L.W. (1989). Quantitative Forecasting Methods, PWS-Kent Publishing Company, Boston.
5. Dr. B.G. Kore and Dr. P. G. Dixit: Statistical Methods-I, NiraliPrakashan, Pune.

CBCS Pattern Syllabus: SEC 4
B.Sc. III (Statistics) Semester VI

Introduction to R Software

Course Outcomes: The students will able to understand

a) Various Graphical representation and interpretation of data.
b) Automated reports giving detailed descriptive statistics.
c) Understanding data and fitting suitable distribution.
d) How to perform Testing of hypothesis, p-value and confidence interval.
e) Idea behind generation of random number and sampling procedures.
f) Importing data, Code editing in R and flow controls if (), for (), while ()

UNIT 1: Installation and Basic data types in R software (6)

Installation of R. Introduction to R Interface. Basic data types, import and export of data. Learn how to load data. Different Packages and libraries in R.

UNIT 2: Descriptive **Statistics using R software (14)**

Generate automated reports giving detailed descriptive statistics, scatter plot, plot a graph: bar-plot, pie-chart, and box plot, stem-leaf, histograms (equal class intervals and unequal class intervals), frequency polygon, ogives with graphical summaries of data.; correlation and lines of regression.

UNIT 3: Looping and fitting using R software (10)

Introduction to flow control: if (), for () and while () loop; Random number generation and sampling procedures. Application problems based on fitting of suitable distribution, Q-Q plot, Multiple Regression.

UNIT 4: Inferential Statistics using R software (15)

Basics of statistical inference in order to understand hypothesis testing, compute p-values and confidence intervals. Simple analysis and create and manage statistical analysis projects, import data, code editing.

Books Recommended

1. Braun, W. J., and Murdoch, D. J. (2007). A First Course in Statistical Programming

with R. Cambridge University Press. New York.

2. Gardener, M. (2012). Beginning R: The Statistical Programming Language, Wiley Publications.

3. Sudha G. Purohit, Sharad D. Gore and Shailaja R. Deshmukh: Statistics Using R.
4. Verzani: Using R for introductory Statistics.
5. V. R. Pawagi: Staistical Computing Using R Software

CBCS PatternSyllabus: B.Sc.III(Statistics)
PracticalPaper IV
ProbabilityDistributions andR-Software

1) ModelsamplingfromLaplacedistribution.
2) Modelsamplingfrom Paretodistribution
3) Model Sampling from Cauchy distribution
4) ModelsamplingfromtruncatedBinomialand Poisondistributions.
5) Modelsamplingfromtruncated Normaland Exponentialdistributions.
6) Modelsamplingfrom Bivariate Normaldistribution.
7) Fittingoftruncated Binomialdistribution.
8) Fittingoftruncated Poissondistribution.
9) ApplicationofBivariate Normaldistribution I.
10) Applicationof Bivariate Normaldistribution.II.
11) Datainput/output,diagrammaticandgraphicalrepresentationofdatausingR-Software.
12) ComputationofprobabilitiesoftypeIandtypeIIerrorsandpowerofa test usingR- Software.
13) ModelsamplingfromlogͲnormalandWeibulldistributionsusingR-Software.
14) ModelsamplingfromlogisticdistributionusingR-Software.
15) FittingofBinomialandPoissondistributions usingR-Software.
16) FittingofNormaldistribution usingR-Software.
17) Fittingof Log-NormaldistributionusingR-Software.
18) AnalysisofCompletelyRandomizedDesign(CRD) usingR-Software.
AnalysisofRandomizedBlockDesign(RBD) usingR-Software.

CBCS PatternSyllabus :B.Sc.III(Statistics)

PracticalPaper V

StatisticalInference

1. Pointestimationbymethodofmomentsfordiscretedistributions.
2. Pointestimationbymethodofmomentforcontinuousdistributions.
3. Pointestimationbymethodofmaximumlikelihood(oneparameter).
4. Pointestimationbymethodofmaximumlikelihood(twoparameters).
5. Pointestimationbymethodofminimumchi-square.
6. Intervalestimationoflocation andscaleparametersofnormaldistribution(single sample).
7. Intervalestimationofdifferenceoflocationandratioofscaleparametersofnormal distribution(twosamples).
8. Intervalestimationforpopulationproportionanddifferencebetweentwopopulation proportions.
9. Intervalestimationforpopulationmedianusingorderstatistics.
10. ConstructionofMPtest.
11. ConstructionofUMPtest.
12. ConstructionofSPRTfor Binomial,Poissondistributions, Graphical representationof procedure.
13. Constructionof SPRTfor exponential andnormaldistribution,graphical representation ofprocedure.
14. NPtest—Runtest(foroneandtwoindependentsamples).
15. NPtest–SigntestandWilcoxon'ssignedranktest(foroneandtwo samplespairedobservation).
16. NP test-Mann-whitneyU-test(fortwoindependentsamples).
17. NPtest–Mediantest(fortwolargeindependentsamples)
18. NPtest—Kolmogorov-smirnovtest(foroneandtwoindependentsamples).

CBCS PatternSyllabus: B.Sc.III(Statistics)

PracticalPaperVI

DesignofExperimentsand SamplingTechniques

1. AnalysisofCRDandRBD.
2. AnalysisofLatinSquareDesign(LSD).
3. MissingPlotTechniqueforRBDandLSDwithonemissingobservation.
4. Efficiencyofi)RBDoverCRDandii)LSDoverCRDandRBD.
5. AnalysisofCovarianceinCRD.
6. AnalysisofCovarianceinRBD.
7. Analysisof2^2 and2^3FactorialExperiment.
8. TotalConfounding.
9. PartialConfounding.
10. SimpleRandomSamplingforAttributes.
11. DeterminationofSampleSizeinSRSforVariablesandAttributes.
12. StratifiedRandomSampling–I
13. StratifiedRandomSampling–II
14. RatioMethodofEstimation.

15. RegressionMethodofEstimation.
16. SystematicSampling.
17. ClusterSampling.
18. TwoStageandMultiStageSampling.

CBCS PatternSyllabus: B.Sc.III(Statistics)
PracticalPaper-VII
OperationsResearch, QualityManagementandReliability Theory

1.L.P.P.bysimplexmethodI(Slackvariable)
2.L.P.P.bysimplexmethodII(BigMmethod)
3.Transformationproblem-I.
4.Transformationproblem-II.(Degeneracy)
5.Assignmentproblem.
6.SequencingProblem.
7.DecisionTheory.
8.SimulationI(Discretedistribution)
9.SimulationII(Continuousdistribution)
10.EWMA-Chart.
11.CUSUM chart.
12.Sixsigmalimitsformean.
13.Singlesamplingplan-I(Smallsample).
14.Singlesamplingplan-II(Largesample).
15.Doublesamplingplan-I(Smallsample).
16.Doublesamplingplan-II(Largesample).
17.ReliabilityTheory- I (Block diagram, Structure function, Minimal cut, Minimal path, Reliability)
18.ReliabilityTheory- II (Hazard rate, Hazard function, Survival function, IFR, DFR, Examples on Exponential and Weibull distributions)

CBCS PatternSyllabus :B.Sc.III(Statistics)
PracticalPaperVII
Regression Analysis And Time Series Analysis

1) Estimation of $\beta_0$and β_1, by the method of least squares in simple regression model.
2) Estimation of σ^2 in simple regression model
3) Tests of hypothesis of β_1 under Assumption of normality of ϵ, in simple regression model
4) Interval estimation in simple regression model
5) Residual Analysis. Standardised residuals, Studentized residuals, residual plot in simple regression model
6) Estimation of regression parameters $\beta_0, \beta_1, \ldots, \beta_p$ by method of least square, obtaining normal equations, in multiple regression model
7) Estimation of σ^2 in multiple regression model
8) Tests of hypothesis of regression parameters, in multiple regression model.
9) Tests of hypotheses of model parameters, model deviance, LR test in multiple regression model.
10) Study of time series : plots and histogram
11) Test of randomness of a series against trend and seasonality
12) Trend estimation using moving average
13) Curve fitting by least square method

14) Trend estimation using smoothing
15) Measurement of seasonal variation by Simple average method
16) Measurement of seasonal variation by ratio to moving average method.
17) Fitting of trend by AR(1) mode
18) Fitting of trend by AR(1) model

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Entrepreneurship

Name of the Course: B.Sc. III (Sem.– V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

(w.e.f. June 2021-22)

- **Title of the Course:** B.Sc. Part-III
- **Subject: Entrepreneurship**

Preamble:

India is becoming one of the top mounting economies in the world and therefore it has become crucial that new and innovative business ideas get developed to fuel this growth. Entrepreneurship in the recent times is gaining importance. It is considered to be a solution for creating wealth, generating employment and providing new goods and services. Entrepreneurship, therefore, has become one of the most promising career options for students. Punyashlok Ahilyadevi Holkar Solapur University, Solapur have taken up an initiative to promote entrepreneurship as a distinct discipline by conducting a degree programme namely B.Sc. Entrepreneurship. P.A.H. Solapur University is the only university in the state of Maharashtra to run the B. Sc. Entrepreneurship entire course since 2008. Entrepreneurship is the interdisciplinary course conducted under faculty of science in which science interconnected subjects are taught along with commerce and management subjects. Under science subjects Chemistry, Biotechnology and Microbiology are taught focusing mostly the industrial aspects. Aspects of commerce and management have been practiced to design and develop a comprehensive business plan to start a small business. Basic concepts as well as laws of various managements and commerce are provided to make successful entrepreneur. Under this special incubator managerial skill, marketing skill, policy document preparation, human resources development, balance sheet, cost, profit as well as loss statement are acquired by the students to become global leaders. Many of the students are well established entrepreneurs and achieved success and respect enabling them to serve the society also in better way.

Objectives of Course:

1. Prepare entrepreneurs with the tools and encouragement they need to start and nurture a successful business.
2. Provide networking opportunities and community building among entrepreneurs.
3. Advocate the importance of innovation in technology and its role in improving the Indian economy.
4. Understand the entrepreneurial decision making process from business model design to the launch of the new venture.
5. Develop a wide range of strategic, financial and human resource planning skills necessary to the new venture planning process.
6. Provide an atmosphere in which course participants can apply entrepreneurial and teamwork skills in finding, evaluating and beginning the process of implementing new venture concepts.
7. Sharpen the presentation skills necessary to effectively communicate new venture ideas to potential investors.
8. Apply the scientific, commercial and management skills for Startup new business in the field of industrial chemistry, Industrial Microbiology and Industrial Biotechnology.

The Credit and Grading System:

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Punyashlok Ahilyadevi Holkar Solapur University, Solapur has implemented Credit and grading system of Evaluation at Undergraduate level. Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. As per present norms, there are 3 contact hours per paper (subject) per week which works out to be 45 contact hours per paper (subject) per semester.

In Punyashlok Ahilyadevi Holkar Solapur University, Solapur, for B.Sc.-III Entrepreneurship, there are 4 papers and Compulsory English. For B.Sc.-III Entrepreneurship, there are 4 contact hours per paper (subject) per week for each paper and Compulsory English carry 4 contact hours per week.

Therefore, total contact hours per week are 20. Each paper has 60 contact hours, which are transformed into 4 credits.

Moreover, the grading system of evaluation is introduced for B.Sc. course where in process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks. It is 80+20 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

Conversion of marks into Grades:

A table for the conversion of the marks obtained by a student in each paper (out of 100) to grade and grade point is as given below:

Sr. No.	Range of Marks	Grade	Grade Point
1	80-100	O	10
2	70-80	A+	9
3	60-69	A	8
4	55-59	B+	7
5	50-54	B	6
6	45-49	C+	5
7	40-44	C	4
8	<39	FC	0 (Failed in Term Exam)
9	<39	FR	0 (Failed in Internal Assessment)

1. **Grade Point Average at the end of the Semester (SGPA)**

$$SGPA = \frac{(G_1 \times C_1) + (G_2 \times C_2) + \ldots\ldots\ldots\ldots..}{\Sigma Ci}$$

(Σ Ci= The total number of credits offered by the student during a semester)

2. **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{(G_1 \times C_1) + (G_2 \times C_2) + \ldots\ldots\ldots\ldots..}{\Sigma Ci}$$

(Σ Ci= The total number of credits offered by the student upto and including the semester for which CGPA is calculated.)

3. **Final Grade Point Average (FGPA)**

It will be calculated in the similar manner for the total number of credits offered for the completion of the said course. Where:

C_i = Credits allocated for the i_{th} course.

G_i = Grade point scored in the i_{th} paper (subject)

4. **Conversion of average grade points into grades:**

SGPA/CGPA/FGPA	Letter Grade
9.5 – 10	O
8.5 – 9.49	A+
7.5 – 8.49	A
6.5 – 7.49	B+
5.5 – 6.49	B
4.5 – 5.49	C+
4.0 – 4.49	C

<3.99	FC / F
	FR

Syllabus Structure:

1. The University follows semester system.
2. An academic year shall consist of two semesters.
3. Each B.Sc. course shall consist of three years i.e. six semesters.
4. B.Sc. Part-III Entrepreneurship shall consist of two semesters: Semester V and Semester VI. In semester V, there will be four papers of 100 marks for each with compulsory English 50 marks. Similarly in Semester VI there will be four papers of 100 marks for each with compulsory English 50 marks.

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below. For B.Sc. Part-III Entrepreneurship semester V & VI the internal assessment will be based on Unit tests, Home assignment, viva, practicals, project work etc. as given below. Practical course examination of 100 marks for each course shall be conducted at the end of VI semester. The practical examination of 100 marks shall also consist of 80 marks for University practical assessment and 20 marks for college internal assessment. For University practical examination both the examiners will be External and will be appointed by the University. The internal practical assessment shall be done as per scheme given below.

Scheme of Evaluation:

As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 30 marks and external evaluation (University assessment) of 70 marks. The respective B.O.S. may decide the nature of college internal assessment after referring to scheme given below or may be used as it is.

Semester – V

Theory: (100 marks)

University Examination (80/40 marks): No. of theory papers: 4/1

Internal Continuous Assessment: (20 marks)

Scheme of marking: 10 marks – Internal test

10 marks – Home assignment / tutorials / seminars / group discussion / viva / field visit / industry visit.

Semester – VI

Theory: (100 marks)

University Examination (80/40 marks): No. of theory papers: 4/1

Internal Continuous Assessment: (20 marks)

Scheme of marking: 10 marks – Internal test

10 marks – Home assignment / tutorials / seminars /viva / industry visit.

Practical Examination: (100 marks)

University Examination (80 marks): No. of practical course 4 (3 + 1 Project Work)

Internal Continuous Assessment: (20 marks)

Scheme of marking: 10 marks – Internal test on any four practicals

10 marks- Lab Journal / Viva, attendance, attitude etc.

In addition, the students shall have to complete a project work on a topic (Management course related topic) chosen by him/her in consultation with the project coordinator because this course is providing science and management related knowledge. The project report should be submitted before practical examination and presented at the time of practical examination. This project work carries 100 marks.

Thus the course shall be of total 1400 marks including English.

7. Passing Standard:

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who

secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same 80 marks of external examination and his performance shall be scaled to 100 marks.

8. ATKT Candidate passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Entrepreneurship examination and clearly passed in B.Sc. Part-I Biotechnology shall be permitted to enter upon the course of Semester V of B.Sc. III Entrepreneurship.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B. Sc. Entrepreneurship Part - III (Semester V & VI) Syllabus
(CBCS system)
(W.e.f. from 2021-22)

Subject / Core Course	Name and Type of the Paper		No. of Papers / Practical	Hrs / Week			Total Marks / Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class:	**B.Sc. III Semester V Theory (Entrepreneurship)**									
	AECC 4	English (Business English)	Paper II A	4	0	0	50	40	10	2
	DSE 1 A	Business Finance	Paper IX	4	0	0	100	80	20	4
	DSE 2 A	Human Resource Management	Paper X	4	0	0	100	80	20	4
	DSE 3 A	Spectroscopic Methods	Paper XI	4	0	0	100	80	20	4
	DSE 4 A	Advances in Fermentation Technology	Paper XII	4	0	0	100	80	20	4
	SEC 3	Wine Technology		4	0	0	100	80	20	4
		(Add-on-self learning)- MOOC/SWAYAM COURSE/INTERNSHIP/INDUSTRAIL TRAINING/ Courses offered* by College	For syllabus see the last pages	-	-	-	-	-	-	4
			Semester Total	**24**	**0**	**0**	**550**	**440**	**110**	**22**
Class:	**B.Sc. III Semester VI Theory (Entrepreneurship)**									
	AECC 5	English (Business English)	Paper II B	4	0	0	50	40	10	2
	DSE 1 B	International Business	Paper XIII	4	0	0	100	80	20	4
	DSE 2 B	Organizational Behavior	Paper XIV	4	0	0	100	80	20	4
	DSE 3 B	Techniques in Industrial Chemistry	Paper XV	4	0	0	100	80	20	4
	DSE 4 B	Genetic Engineering	Paper XVI	4	0	0	100	80	20	4
	SEC 4	Techniques in Tissue Culture		4	0	0	100	80	20	4
			Semester Total	**24**	**0**	**0**	**550**	**440**	**110**	**22**
Class:	**B.Sc. III Annual Practical (Entrepreneurship)**									
	DSE 1A & 1B	Practical IV		0	0	5	100	80	20	4
	DSE 2A & 2B	Practical V		0	0	5	100	80	20	4
	DSE 3A & 3B	Practical VI		0	0	5	100	80	20	4
	DSE 4A & 4B	Practical VII		0	0	5	100	80	20	4
			Practical Total	**0**	**0**	**20**	**400**	**320**	**80**	**16**
			Grand Total	**48**	**0**	**20**	**1500**	**1200**	**300**	**60**

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-I	I	450	18	--	--	18
	II	450	18	400	16	34
B.Sc.-II	III	500	20	--	--	20
	IV	500	20	300	12	32
B.Sc.-III	V	550	22	--	--	22
	VI	550	22	400	16	38
Total		3000	120	1100	44	164

B.Sc. Programme :

Total Marks : Theory + Practicals = 3000 +1100 =4100
Credits : Theory + Practicals = 120 + 44 = 164

Numbers of Papers Theory: Ability Enhancement Course (AECC) 04
Theory: Discipline Specific Elective Paper (DSE) 08
Theory: DSC 14
Skill Enhancement Courses 04
Total : Theory Papers 30
: Practical Papers 11

Abbreviations:

L: Lectures
T: Tutorials
P: Practical
UA : University Assessment
CA : College Assessment
CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective

B.Sc. III (Semester V)

Theory

DSE 1 A: Business Finance Paper IX

Unit	Content	Lectures
I	**Introduction to Business Finance:** Concept, Nature, Scope, Objective and Importance. **Sources of Business Finance :** Long term equity shares, Preference shares, Debentures, Bonds, Loan from banks, Public deposits, Sources of working capital finance **New Dimensions in Business Finance:** Lease financing, Meaning, Importance, Types of lease financing, Lease V/s Buy decision, Problems and Prospects of leasing in India. **Venture Capital:** Concepts, Process of Investment and exit route, venture capital in India.	**10 L**
II	**Reserve Bank of India:** and Commercial Bank Organization, management and functions; Credit creation and credit control; monetary policy. **Commercial Bank:** Meanings, functions, management and investment policies of commercial banks, Present structure; **E-banking and e trading:** Recent developments in commercial banking. – State and National Level Financial Institutions -MFIs **International Finance:** International finance, International finance environment, Global capital structure Types of instruments – International equity markets: Market structure, trading in international equities, cross listing of equities, GDRs, ADRs, IDRs, Global registered shares.	**12 L**
III	**Foreign exchange:** Functions and structure of Forex market; Forex market participants, foreign exchange spot rates, forward, futures, options and swap market; Foreign Exchange rate determinants. Foreign Exchange Management Act (FEMA) **Marketing of Securities:** Issue of securities, Public issue, Steps in public issue, Right issue and private placement. **Stock Exchange:** Definition, Functions, Stock exchange in India, BSE and NSE and their working, Trading on stock exchange, Online trading. Securities Exchange Board of India (SEBI)	**10 L**
IV	**Financial planning:** Concept of financial plan, Objective of financial planning, types & steps in financial planning, **Capital budgeting:** Concept of capital budgeting, methods of ranking project – payback period method, internal rate of return, present value method.	**08 L**

Books for Reference:

1. Essential of Business Finance - Dr.R. Shrivastav
2. Business Finance - P.V. Kulkarni
3. Corporation Finance - S.C. Kuchal
4. Investment and securities market in India - V.A. Audhani
5. Corporate Finance Policy - Guthmann & Dougall.
6. Stock exchange in India - K.C. Gupta
7. Indian banking - S.Natarajan & Dr. R.Parameswaran
8. Indian Financial System - S Gurusamy

DSE 2 A: Human Resource Management Paper X

Unit	Content	Lectures
I	**Nature and Scope of Human Resource Management:-** Meaning, Definitions, Objectives, Functions and Importance of Human Resource Ma Role of Human Resource Management **Recruitment:-** Definition, Objectives, External & Internal sources of recruitment, Job Analysis, Job description, Job Specification.	**9L**
II	**Selection process:-** Introduction of selection, Meaning of selection, Concept of selection, Essential of Selection procedure, Steps in selection procedure, recent trends in selection, Job satisfaction. **Training & Development:-** Meaning of training, importance of training, Need & Objectives of training, mdvantage of training, Training Method, Meaning of development, Principles of development.	**11L**
III	**Internal & External mobility:** Internal mobility:- need & purpose. Promotion: meaning, types, purpose, Transfer: Meaning, types, reasons, benefits, problems. Demotions: reasons & principles. External Mobility:- meaning & types **Career Planning & Developments** Meaning succession planning. Elements of career development programme, Steps in career development system, advantage& limitations	**11L**
IV	**Employee Benefits:-** Provident Fund, Gratuity, E.S.I. Maintenance Allowance, Convenience Allowance, Employee Health and Safety, Accident prevention. **Performance appraisal:-** Meaning, purpose, Need of performance appraisal, methods of P. A., Use of P. A., and Problems of P.A.Who will appraise?	**9L**

References:

1. Personnel & HRM - P.Subha Rao
2. Managing Human Resources - Arun Monappa
3. Human Resource and Personnel Management - K. Ashwathappa
4. Management of Human Resource - R.S. Dwivedi
5. Human Resource Management - Biswajeet Patanayale
6. Human Resource Management - Ian Beardwen & Len Holden

DSE 3 A: Spectroscopic Methods Paper XI

Unit	Content	Lectures
I	Ultra -Violet absorption: Spectroscopy: Introduction, Beer - Lambert Law, Types of electronic transitions, Terms, used in U V spectroscopy: Chromospheres, Auxochrome, Batho chromic, Hypsochromic, Hyper chromic and Hypo chromic shifts, Effect of conjugation on position of UV bands, Calculation of max by Woodard - Fieser rules of conjugated dienes and enones. Applications of UV spectroscopy: Determination of structure and stereochemistry (cis and trans).	**10L**
II	Infrared Spectroscopy : Introduction, Principle of I spectroscopy, Fundamental modes of vibration, Types of vibration Hooke's law, conditions for absorption of radiation and selection rule, Fundamental group regions of I R spectrum, Functional group region, Finger print region, Characteristic absorption of various functional groups, Applications of I R spectroscopy : Determination of structure, Identification of functional groups simple spectral problems based on I.R.	**10L**
III	NMR Spectroscopy: Introduction, proton magnetic resonance H spectroscopy, principles of PMR spectroscopy, magnetic and non-magnetic nuclei, Theory of PMR - spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematic model nuclear resonance. NMR instrument - schematic diagram shielding and dishelding, chemical shift, measurement of chemical shift by delta scale and tau scale, TMS as reference, Advantages of TMS, peak area (Integration) spin-spin splitting (ntl rule) definition of coupling constant J value of first order coupling. PMR spectra of ethanol, acetaldehyde,1,1,2-tribromoethane, ethyl compounds using PMR spectroscopic data (supporting I R & U V data to be given)	**10L**
IV	Mass spectroscopy. Introduction, Theory of mass spectroscopy, Mass spectrometer - schematic diagram, formation of ions by ionization, types of ions with at least one example. Applications of mass spectroscopy. i) Determination of molecular weight. ii) Determination of molecular formula.	**10L**

References:

1. Spectroscopy of Organic Compounds - P.S. Kalsi.
2. Elementary Organic Absorption Spectroscopy - Y.R. Sharma
3. Spectroscopy - V.M. Parikh.

DSE 4 A: Advances in Fermentation Technology Paper XII

Unit	Content	Lectures
I	**Quality Assurance and Validation:** Good manufacturing practices and safety- Quality management, personal, premises and equipment, documentation, production, quality control, contract manufacturing and analysis, complaints and product recall, self-inspection. Introduction to GLP and its principles, Test for sterility, pyrogenicity, allergy, carcinogenicity, toxicity for Pharmaceutical and health care and food products. **IPR and Patents:** Understanding of Intellectual Property Rights- Introduction, History of Patent Protection, Rationale behind Patent System, WTO, TRIPS and WIPO, An Overview of the IPR Regime- Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indication, Semiconductor Circuits & Layout Design, Plant Variety & Farmer's Right Act, Undisclosed Information - Trade Secrets.	**14**
II	**Bioethics and Biosafety:** Biosafety guidelines: Risk and risk assessment: Biosafety levels, laboratory biosecurity concepts: Pre-clinical and clinical trials, Basics of bioethics principles, international codes and guidelines in India, Ethics in post-genomic era.	**10**
III	**Recombinant fermentation products:** Production of vaccines: subunit vaccines, peptide vaccine, Attenuated vaccines, Vector vaccines directed against viruses and bacteria, Preparation of toxoid from a toxin, Recombinant proteins production: Insulin, Interferon, Cultivation of Mushroom, Vinegar production.	**8**
IV	**Fermentation products & bioprocesses:** Bio products and other Processes: Natural Biopreservatives (Bacteriocin/Nisin), and Biopolymers (Pullulan/Xanthan Gum and PHB), Genetic Engineering in Microbes: Microbial biosynthesis of Rubber, Production of Solvents: Acetone-Butanol and Glycerol.	**8**

References:

1. Casida L. E. (1991). Industrial Microbiology, New Age international Ltd.
2. Crueger W. and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition.Panima Publishing Co. New Delhi.
3. Patel A. H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
4. Stanbury P. F, Whitaker A. and Hall S. J. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
5. Peppler H.J., Perlman D. (2004). Microbial technology-Fermentation Technology, second edition, Volume I and II, Academic Press.

SEC 3: Wine Technology

Unit	Content	Lectures
I	**History and Introduction:** Wine history, Grape varieties, Physiology of matured grapes, Wine classification, Quality of wine, Chemical constituents of Grapes and Wine, Importance of Grapes and wine, Wine and Health, Wine Laws and Authentications, Alcoholic beverage and health: Effects on the human health, Status of Indian brewing, winemaking and alcohol.	**10**
II	**Basic Procedures of Wine Production:** Pre-fermentation Practices- Destemming, Sorting, Crushing, Supraextraction, Maceration (Skin Contact), Dejuicing, Pressing, Must Clarification, Adjustments to Juice and Must, Alcoholic Fermentation- Fermentors, Fermentation, Biochemistry of Alcoholic Fermentation, Yeasts, Environmental Factors Affecting Fermentation, Automation in wine industry: Importance of automation operation in wine industries, New concept in wine production – organic wine and biodynamic wine.	**10**
III	**Post-fermentation Treatments and Related Topics:** Wine Adjustments- Acidity and pH Adjustment, Sweetening, Dealcoholization, Flavor Enhancement, *Sur lies* Maturation, Color Adjustment, Blending, Stabilization , Fining, Clarification, Aging, Effects of Aging, Factors Affecting Aging, Anatomical and chemical constituents of oak and liberation of oak flavors from the barrel in beer and alcohol, Rejuvenation of Old Wines, Aging Potential, In-barrel Fermentation, Advantages and Disadvantages of Oak Cooperage, Cork Bottle Closures, cork Faults, Alternative Bottle Closures, Cork Insertion, Bottles and Other Containers, Glass Bottles, Bag-in-box Containers.	**10**
IV	**Sensory Perception and Wine Assessment:** Visual Sensations, Color, Clarity, Viscosity, Spritz (Effervescence), Tears, Taste and Mouth-feel, Taste, Factors Influencing Taste Perception, Mouth-feel, Taste and Mouth-feel Sensations in Wine Tasting, Odor, The Olfactory System- Odorants and Olfactory Stimulation, Sensations from the Trigeminal Nerve, Odor Perception, Factors Affecting Olfactory Perception, Odor Assessment in Wine Tasting, Off-odors, Wine Assessment and Sensory Analysis, Conditions for Sensory Analysis, Wine Score Cards, Tasters.	**10**

References:

1. Wine Science: Principles and Applications, 3rd ed, Ronald S. Jackson, Academic Press
2. Introduction to Wine Laboratory: Practices and Procedures, Jean L. Jacobson, Springer.
3. Principles and practice of winemaking Boltan R. B. (1996) Chapman and Hall.
4. Wine microbiology Science and Technology. GlaudioDelfins& Formica J. V. (2001)
5. Home Winemaking, Young J.O. (1980) Washington State University, Pullman, Washington.
6. Principles of Weed Science, Rao V.S. (1994) Oxford & IBH Pub.Co.Pvt.Ltd.
7. Australian Wine from the wine to the glass. Patric II & Peter Gago (1997) South Australia.
8. The art & science of Wine, James Halliday and Hough Johnson. (1992) Mitchell Beazley International Ltd. London.
9. Handbook of Enology I & II , Pascal Ribereau, Denis Dubourdieu et.al (2000). John Wiley and Sons, Ltd., New York.

B.Sc. III (Semester VI)

Theory

DSE 1 B: International Business Paper XIII

Unit	Content	Lectures
I	**International Business:** Definition, Evaluation, Nature of International Business, International Business approaches. **Theories of International Business**: Absolute cost advantage, comparative cost advantage, and comparative cost advantage with money. Problems of International Business. **Foreign Trade Procedures:** Export/Import procedure, documentation, Financing technique, Export promotion. **Balance of payment:** Introduction, Components of balance of payment, Disequilibrium in Balance of payment	**10L**
II	**International Economic Environment**:- International Trade Policy and Relations, Tariffs, Subsidies, Import Quota, Voluntary Export restraints. Administrative policies and International law and Business firms. **Globalisation** Emerging global economy. Drivers of Globalisation, Globalisation Debates: Advantages & Disadvantages of Globalisation, Globalisation in India **Multinational Corporation** Definition, concept, factors that contributed for the Growth of MNCs, Advantages & Disadvantages of MNCs, Role of MNC's Economic Development	**10L**
III	**Modes of entering in International Business :** Modes of entry, Exporting, Licensing, Franchising, Contracts, Turnkey Projects, Mergers, Acquisitions and Joint Venture. **World Trade Organization:** History, objectives, Functions, Ministerial Conferences of WTO. **Trade Blocks Economic Integrations:** Free Trade Area, Custom unions common markets, Economic Unions, GATT, EEC, ASEAN, SAARC, SAFTA	**10L**
IV	**International Financial Institutions -** IMF, World Bank and ADB – functions and role in economic development. **Getting started on Basic SAP R/3 Elements:** The client or SAP customer, the clients representative, the SAP consultant, the SAP R/3 business application software architecture, financial accounting and controlling (FI/CO) modules, the sales and distribution (SD) module, the materials management (MM) modules, the plant maintenance (PM) and service management, the production planning (PP) module, the project system (PS) module, the human resources (HR) module, the SAP retail model, industry solutions (IS) modules, the ASAP roadmap.	**10L**

References:

1. Frame works International II edition - Rajer Benneet, Financial Times Management - Pitmen Publishing Landon
2. International Business : Test & Cases By P.Subba Rao - Himalaya Publishing House
3. Global Marketing : S.A. Sherlekar & V.S. Sherlekar.
4. E-business - Kittel Amer
5. E-commerce - David Whitely

DSE 2 B: Organizational Behavior Paper XIV

Unit	Content	Lectures
I	**Introduction to Organization Behavior:** Definition, Historical, Evolution of O.B., Nature & Scope, Learning Organization, Types of Learning Organization. **Individual & Organization Behavior:** Individual Differences & their uses in industries, Individual process, thinking memory, leaving, emotion, intelligence and ability. **Group Dynamics:** Nature of groups, Type of group, Why do people join group, Group development, usefulness of group in organization, Determinants of group behaviour, Group Structure ,Individual and Inter Personal behavior, job satisfaction, time management .	**11L**
II	**Power & Political Behavior** Power Dynamics, Sources of power, the effective use of power, Power tactics, Politics- Essence of politics, Types of political activity, Ethics of power & politics **Personality:** Nature of Personality, Types of personality, Theories of personality-trait theory, social learning theory, Maslos theory, personality & O. B. **Perceptions**: Perceptions- Meaning & Definitions, Factors influencing perceptions, perceptual process, perception & O.B.	**10L**
III	**Motivation:** Nature of motivation, Importance of motivation, Theories of Motivation- Maslews theory, Hereberg theory, Expectancy theory, Goal setting theory **Work Stress:** What is stress, the stress experience, work stress model-Stressors, sources of stress, individual level of stressors, group level stressors, Coping the stress.	**10L**
IV	**Electronic commerce environment and opportunities:** Background, the electronic commerce environment, electronic market Place technologies, conclusion. **Modes of Electronic commerce:** Overview, Electronic data interchange, Migration of open EDI, Electronic commerce with WWW / internet, Commerce Net Advocacy, Web commerce going forward. **Electronic cash and Electronic payment:** Internet monetary payment and security requirements, payment and purchase order process, online electronic cash.	**9L**

References:

1. Organizational Behavior - Meshane, (Tata Mcgraw Hill)
2. Organizational Behavior - Luthan
3. Human Behavior at Work - Keith Devis
4. Organizational Behavior - Robins (Prentice Hall)
5. Organizational Behavior - Baron & Greenberg (Prentice Hall)
6. Organizational Behavior - Suja Nair (Himalaya Publisher)
7. Organizational Behavior - K. Ashwathappa (Himalaya Publisher)

DSE 3 B: Techniques in Industrial Chemistry Paper XV

Unit	Content	Lectures
I	**Chromatography:** Introduction, General Principle, Classification, Paper Chromatography, Column chromatography, Thin Layer Chromatography, Gas Chromatography, High pressure liquid chromatography.	**10L**
II	**Distillation:** Fraction distillation, steam distillation, vacuum distillation, Batch distillation distillation, continuous distillation, fractionating column, spinning cone	**10L**
III	**Green Chemistry:** Introduction, twelve principles of green chemistry zeolites - Friedel craft's alkylation and acylation, oxidation of benzene to phenol and benzoquione, Reduction of benzoquinone to hydroquinone, Biocatalytic reactions, hydroxylation and oxidation using enzymes microwave assisted reactions.	**10L**
IV	**Fire Hazards** Types of fires - class A, class B, class C & class D, Fire extinguishers Classification water and water base extinguishers. i) Portable fire extinguishers, ii) Soda acid extinguishers, iii) Antifreeze extinguishers, iv) Foam, v) Dry Chemicals, CO2, and Halon-1301.	**10L**

References:

1. Basic Concepts of Analytical Chemistry - S.M.Khopkar, Wiley Eastern Ltd. Mumbai
2. Advanced Organic Chemistry - B.S. Bahl and Arun Bahl, S.Chand Comp. Delhi.
3. A Text book of Engineering Chemistry - Shashi Chawala.
4. A Text book of Engineering Chemistry - Jain & Jain.
5. Industrial Chemistry - B.K. Sharma
6. Distillation :Fndamental and Principles– Andrez Gorak and Hartmut Schoenmakers
7. Distillation : Operation and Applications – Andrez Gorak and Hartmut Schoenmakers
8. University General Chemistry - C.N.R Rao. Macmillan.
9. Physical Chemistry - R.A. Albery, Wiley Eastern Ltd.
10. Principles of Physical Chemistry - S.H. Maron, C.H. Prutton 4th Edition.
11. Instrumental of Molecular Spectroscopy - C.. Banwell - Tata McGraw Hill
12. Text Book of Physical Chemistry - S.Glasstone, Macmillan India Ltd.
13. Element of Physical Chemistry - D.Lewis and S.Glassure (Macmillan)
14. .Essential of Physical Chemistry - Bahl and Tuli (S.Chand)

DSE 4 B: Genetic Engineering Paper XVI

Unit	Content	Lectures
I	**Tools for Genetic Engineering:** Cloning Tools: Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering, DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases, phosphatases, and DNA ligases, Cloning Vectors: Definition and Properties, Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, Use of linkers and adaptors, Expression vectors: *E.coli* lac and T7 promoter-based vectors, yeast Yip vectors, Baculovirus based vectors, mammalian SV40-based expression vectors.	**12**
II	**Gene Transformation and Transfection:** Transformation of DNA: Chemical method, Electroporation, Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral mediated delivery, *Agrobacterium* - mediated delivery, DNA, RNA and Protein analysis: Agarose gel electrophoresis, Southern- and Northern– blotting techniques, dot blot, DNA microarray analysis, SDS-PAGE and Western blotting.	**10**
III	**Amplification, sequencing, construction and screening of cDNA:** Probes: Genomic DNA probes, cDNA probes, synthetic oligonucleiotide probes, RNA probes, methods of labeling probes. PCR: Basics of PCR technology, Sanger's method of DNA Sequencing: traditional and automated sequencing, shotgun sequencing, Genomic and cDNA libraries: Preparation and uses, Screening of libraries: Molecular markers: DNA Fingerprinting, RFLP, RAPD, AFLP, basic PCR and types.	**10**
IV	**Applications:** Products of recombinant DNA technology: Products of human therapeutic interest - insulin, hGH, antisense molecules. Bt transgenic - cotton, brinjal, Gene therapy, recombinant vaccines, protein engineering and site directed mutagenesis, Modification of food plants taste (Sweetness), plant as bioreactor for polymers, plant as edible vaccines, Microbial synthesis of Rubber.	**8**

References:

1. Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford,U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
3. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
4. Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press
5. Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
6. Brown TA. (2007). Genomes-3. Garland Science Publishers
7. Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.

8. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 3rd Edition, B.R. Glick and J.J. Pasternak, ASM Press (2007)

SEC 4: Techniques in Tissue Culture

Unit	Content	Lectures
I	**Introduction to Animal tissue culture:** History, Laboratory design, Characteristics of animal cell in culture, Culture media: Natural media, synthetic media – serum containing media, serum free media, balanced salt solution, and complete media. Physicochemical properties of media, Sterilization of media.	**10**
II	**Animal Culture techniques:** Primary cell culture: Cell Separation-Mechanical, Enzymatic. Criteria for subculture, Types of organs culture, Cell synchronization- Cell separation by physical means and chemical blockade. Establishment of cell lines- Cell lines selection and routine maintenance of cell lines, Cell counting and monitoring.	**10**
III	**Plant tissue Culture Techniques:** Concepts of Cell theory & Cellular totipotency, Landmarks in plant tissue culture. Organization of plant tissue culture laboratory – General laboratory & Inoculation room, Culture room, different work areas, equipment & instruments required. Media preparation & Aseptic techniques – Nutritional requirements of explant, Preparation of media & its sterilization, Washing, packing & sterilization of glassware, surface sterilization, Aseptic work station, precautions to maintain aseptic conditions. Culture Medium: Nutritional requirements of the explants, PGRs and their applications. Callus Culture: Introduction, Principle, Protocol, Factors affecting, Morphology and Internal structures, Genetic variation, Application and limitations. Suspension Culture: Introduction, Principle, Protocol, Types, Growth and measurement, Synchronization, Applications and limitations, Protoplast culture: Introduction, Principle, Protocol and methods of protoplast fusion, applications.	**10**
IV	**Plant Organ Culture:** Introduction, Principle, Protocol, Factors affecting applications & limitations with reference to root tip culture, Leaf Culture, Shoot tip. Concept of Haploid production & its applications, Concept of embryo and endosperm culture & its applications, Anther and Pollen Culture: Introduction, Protocol, Factor affecting, Applications & limitations. Ovule Culture: Introduction, Protocol, Factor affecting, Applications & limitations. Micro Propagation: Introduction, Stages of Micro propagation, Factors affecting, Applications & limitations, Somaclonal variations.	**10**

References

1. Animal Tissue culture : J. Paul
2. Culture of animal cell 3rd edition-R Ian Freshney
3. Animal cell culture- R.W.Masters
4. Plant tissue culture-Kalyankumar Dey
5. Biotechnology- B.D. Singh
6. A text book of Biotechnology- R.C. Dubey
7. Biotechnology- H.S. Chawla
8. Animal biotechnology-M.M.Ranga
9. Animal biotechnology-R.Sasidhara
10. Animal cell culture technique-Ed. Martin Clynes Springer
11. Cell growth & division a practical approach-Ed. R. B. Sega&R.L.Press
12. Introduction to plant tissue culture- M.K. Razda
13. Plant tissue culture-Theory & practice-S. S. Bhojwani& M.K. Razdan

B.Sc. III Annual

Practical

DSE 1A & 1B: Practical IV

Sr. No.	Name of Practical
1	To study problems of International Business by visiting a global export unit.
2	To study any two Mergers and Strategic alliance.
3	To study any two franchising and Turnkey Projects.
4	To study recent Policies of GATT, ASEAN, SAARC, SAFTA.
5	To study Role of any two multinational corporations in development of India.
6	To collect cuttings from news-papers relating to business finance.
7	To study sources of working capital finance.
8	To visit stock exchange and collect information.
9	To study problems and prospects of leasing in India by visiting organization.
10	To study venture capital.
11	To study role of H.R. Manager, Interactions with two H.R. Mangers.
12	To study training methods for employees in an organization.
13	To study motivation and disciplinary policy of any organization.
14	To prepare questionnaires for testing job satisfaction and conduct interview of Employees of any two industries.
15	To study Health & Safety provisions for employees in any organization.
16	To study, How to learn Organization.
17	A) To study individual differences and their suitability for jobs in any Organization. To study I.Q. its chart and collect information.
18	To study time management schedule of employees in any organization.
19	To study the stress and suggest remedies to the working people.
20	To study organization culture and its development in any organization.

DSE 2A & 2B: Practical V

Project Work

The project reports are to be prepared by the students on the subjects in consultation with the Project coordinator in the year. The project work is carried out in group of maximum 2-3 students or individually. The coordinator will guide the students in selecting the topic of the project. The report shall be signed by the coordinator and shall be submitted to the University at the time of the University Practical examination of B.Sc. Part III. The student should visit any industry related to syllabus and submit the report of their visit at the time of practical examination in practical course Ent Pr.302: Project Work. The report should be duly certified by the Head of the Department. The Project Work carries 100 marks.

DSE 3A & 3B: Practical VI

Sr.	Name of Practical
1	To estimate the amount of acetone from given sample iodeometrically.
2	To estimate the amount of nitro group form the given solution of m-nitro aniline ($SnCl_2$ reduction method)
3	To determine the amount of acid & ester in the given mixture of acid & ester.
4	To estimate the amount of acid and amide from the given mixture of acid and amide.
5	Preparation of benzene azo B-napthol from B-napthaol.
6	Preparation of Benzoic acid from Benzamide.
7	To estimate Fe^{3+} ions by thicoyanate method using colorimeter.
8	To estimate Fe^{3+} ions by Salicylate methd.
9	To determine the normality of strong acid by titrating it against given strong alkali by potentiometric method.
10	To determine the dissociation constant of monobasic acid (acetic acid) by conductometrically.
11	To determine the normality of the given weak acid by titrating it against the strong alkali conductiometrically.
12	Determination of titrable acidity in the given sample of milk or Lassi using supplied sodium hydroxide (standard oxalic acid solution to be prepared to standardize the given sodium hydroxide solution.)
13	Determination of percentage of magnesium in the given sample of talcum powder using given solution of EDTA.
14	Preparation of Sodium cuprous thiosulphate.
15	Determination of % purity of a sample containing Ferrous Ammonium Sulphate using given solution of Potassium dichromate.
16	Preparation of Potassium tris-oxalato aluminate.
17	Determination of % purity of a sample containing Tetramine copper (II) sulphate by using given solution of Sodium thiosulphate.

DSE 4A & 4B: Practical VII

Sr.	Name of Practical
1	Protein estimation of mushroom
2	Vinegar production
3	Estimation of sugar from fruit juice
4	Estimate pH and titratable acidity of fruit juice
5	Estimation of alcohol percentage in the wine
	Identification of off odors in wine.
6	Isolation of yeast/bacterial/plant genomic DNA
7	Calculation of molecular weight of digested DNA
8	Study Southern Blotting
9	Perform the SDS-PAGE of mixed protein sample
10	Introduction to tissue culture laboratory
11	Aseptic Manipulation- Washing, Capping, Packing & sterilization, Laminar air flow Operation & General Precautions
12	Preparation of Plant and Animal Tissue Culture Media
13	Isolation of plant explants using aseptic techniques
14	Establishment of Callus culture
15	Aseptic seed germination
16	Establishment of suspension culture
17	Establishment of Anther culture
18	Establishment of Ovule culture
19	Enumeration of animal cells using hemocytometer
20	Establishment of Micropropagation-subculturing/multiplication/rooting

Examination Pattern

The examination for theory papers are conducted semester wise while for practical conducted annually once as per University Time Table.

A) Theory Examination: Nature of Theory question paper for each theory paper.

Equivalence of Subjects I Sem V for B. Sc. III Entrepreneurship CBCS syllabus

Sr. No.	Name of the old paper		Name of the new paper	
	Code	**Name**	**Code**	**Name**
1	**AECC-4 (English)**	Paper-III	AECC 4	English (Business English)
2	**DSE-1-A**	Ent 501: Business Finance	DSE 1 A	Business Finance
3	**DSE-2-A**	Ent 502: Human Resource Management	DSE 2 A	Human Resource Management
4	**DSE-3-A**	Ent 503: Spectroscopic methods	DSE 3 A	Spectroscopic Methods
5	**SEC-1**	Ent 504: Advances in Fermentation Technology	DSE 4 A	Advances in Fermentation Technology
	OR			
6	**SEC-1**	Ent 504: Wine Technology	SEC 3	Wine Technology

Equivalence of Subjects I Sem VI for B.Sc. III Entrepreneurship CBCS syllabus

Sr. No.	Name of the old paper		Name of the new paper	
	Code	**Name**	**Code**	**Name**
1	**AECC-5 (English)**	Paper-IV	AECC 5	English (Business English)
2	**DSE-1-B**	Ent 601: International Business	DSE 1 B	International Business
3	**DSE-2-B**	Ent 602: Organizational Behavior	DSE 2 B	Organizational Behavior
4	**DSE-3-B**	Ent 603: Techniques in Industrial Chemistry	DSE 3 B	Techniques in Industrial Chemistry
5	**SEC-3**	Ent 604: Genetic Engineering	DSE 4 B	Genetic Engineering
	OR			
6	**SEC-4**	Ent 604: Techniques in Plant Tissue Culture	SEC 4	Techniques in Tissue Culture

Equivalence of Practical course for B.Sc. III Entrepreneurship CBCS syllabus

Sr. No.	Name of the old paper		Name of the new paper	
	Code	**Name**	**Code**	**Name**
1	Ent Lab-301	Practicals in Entrepreneurship	DSE 1A & 1B	Practical IV
2	Ent Lab-302	Project Work	DSE 2A & 2B	Practical V
3	Ent Lab-303	Practicals in Industrial Chemistry	DSE 3A & 3B	Practical VI
4	Ent Lab-304	Practicals in Industrial Microbiology, Wine technology and plant tissue culture	DSE 4A & 4B	Practical VII

B) **Practical Examination**

a) The practical examination will be conducted on four (4) consecutive days for not less than 6 hours on each day of the practical examination.

b) Each candidate must produce a certificate from the Head of the department in his/her college stating that he/she has completed in a satisfactory manner the practical course on the guidelines laid down from time to time by Academic council on the recommendation of Board of studies and has been recorded in his/her observation in the laboratory journal and written a report on each exercise performed. Every journal is to be checked and signed periodically by a member teaching staff and certified by the Head of the department at the end of the year. Candidate is to produce their journal at the time of practical examination. Candidate has to visit two places of Biotechnological interest (Pharmaceutical industry, Dairy, Research institutes, Food Processing industry, Botanical or Zoological place etc.) and submit the visit report dully signed by tour in-charge and duly certified by Head of the department at the time of practical examination in practical course DSEA & 4B: Practical VII

Distribution of Marks for practical examination: for

(DSE 1A & 1B: Practical IV, DSE 3A & 3B: Practical VI and DSE 4A & 4B: Practical VII)

1) Two major experiment: 40 marks (i.e. 20 marks each)
2) Two minor experiment: 20 marks (i.e. 10 marks each)
3) Viva voce: 10 marks
4) Journal: 10 marks

Total marks 80 marks

Distribution of Marks for Project Work DSE 2A & 2B: Practical V

The report shall be examined by the External examiners (appointed by the University) who will assign marks out of 50 for project work as follows:

1) Selection of the project topic - 15 marks
2) Project methodology - 15 marks
3) Project Writing - 15 marks
4) Oral presentation and Viva - 15 marks
5) Total: 60 marks
6) Tour report: 20 marks

Total marks 80 marks

Total Marks: 400 marks

Theory and practical shall form separate heads of passing. The candidate shall be declared to have successfully completed the three year degree course only on passing in all the heads of passing of B.Sc. Part I, II and III.

PAHSOLAPUR UNIVERSITY, SOLAPUR
FERMENTATION TECHONOLOGY

SYLLABUS
2021

Fermentation Technology Syllabus		
	Paper I: Industrial Microbiology	**40**
	Section I	
UNIT I	Definition and Scope of Industrial Microbiology. Basic Concepts of Fermentations. a) Fermentations Introductions b) Fermenter design - parts & their functions c) Types of fermenter - batch, Continuous, Dual and Multiple d) Design of fermentation media- water, carbon and nitrogen source, Growth factors, precursors, aeration and antifoam agents. e) Factors affecting fermentation process.	10
UNIT II	Selection & Preservation of Industrial microorganisms a) Primary and Secondary Screening b) Strain Improvement c) Scale up of Fermentation d) Preservation of Industrially important microorganisms e) Microbiological assays	10
	Section II	
UNIT III	Specific Fermentations a.Penicillin b. Alcohol c.Amylase d.Vinegar e.Vit B 12	10
UNIT IV	Production of SCP with respect to Saccharomyces cerevisiae - Criteria for selection of microbe, substrate utilized etc. Biogas Production- Microorganisms used substrates, Different types of digesters and their working, Mechanism of biogas production Biofertilizer: Production and applications: Azotobacter, Rhizobium and PSB. Biopesticides: Use of B. thuringenesis as biopesticides, its production and applications	10

Fermentation Technology		
	Paper II Fermentation Technology	**40**
	Section I	
UNIT I	Food and diary Microbiology A)Food as a substrate for microorganisms B) Food Fermentations -i) Idli ii) Bread C) Fermented dairy products: i) Cheese ii)Curd iii)Butter iv) Kefir v) Yogurt D)Industrial Microbiology	10
UNIT II	A: Industrial production of alcoholic beverages Grape wine- Defination, Types, Production of dry white table wine, Red table wine, Sparkling wine-champagne, California sherry, Microbial and non microbial spoilage of wine, Defects in wine. B) Beer-Definition, types. production of larger beer and Ales Beer C.Industrial production of-Streptomycin, Lysine, Biopolymers: Glucan and Dextrans Immunoactive product- toxoids, sera, vaccines rDNA product -Insulin, Interferon	10
	Section II	
UNIT III	Quality control in fermentation industry: A. Test of sterility, pyrogenicity, allergy, carcinogenicity, toxicity for pharmaceutical and health care and food products B.Downstream processing: C.Filtration, cross flow filtration, flocculation, whole broth processing,solvent extraction, concentration, Centrifugation, crystallization ,distillation.Adsorption, elution, Precipitation & chromatography.	10
UNIT IV	A) Good manufacturing practices in fermentation industry B) Computer application in fermentation technology C) Fermentation economies	10

	PRACTICAL COURSE	
	A Food and diary Microbiology	
	1 .Examination of milk i) DMC ii) phosphatase	
	2.Quantitative analysis of milk by SPC (using nutrient agar)	
	3. Enumeration of coliform bacteria in milk by using glucose tryptose yeast extract agar. **B Industrial Microbiology**	
	4.Bioassay of Vitamin B12	
	5.Bioassay of Penicillin	
	6. Production of wine by using Jaggery medium/ Grape juice by S. cerevisiae.examination of pH. colour, taste.	
	7. Estimation of alcohol by using K3Cr0	
	8. Sterility testing of dry powder by direct inoculation on Soyabean casein.digest medium	
	9. Sterility testing of media.	
	10. Immobilization of enzyme by using Sodium alginate.	
	12.Thing layer chromatography	
	13. Demonstration of crude recovery of amylase enzyme. **C. Soil & Water Microbiology**	
	14.Isolation of nicroorganisms from soi, reporting and identification	
	15. Isoiation of Rhizobium spp. irom root nodules.	
	16. Isolation of phosphate solubilising bacteria from soil.	
	17.SPC of market biofertilizers	
	18.Vermicomposting of vegetabie waste	
	19.Estimatuon of avauiable nitrogen irom soil.	
	20.Estimation of available phosphorous from soil (Stannous chloride method)	
	21.Estimation of Calcium and Magnesium from soil (EDTA method)	
	22.Determination of organic carbon contents of soil (Walkley and Black method)	
	23. Isolation of Actinomycetes/bacteria/ fungi from soil and identification as per Bergey's manual.	
	24. Study of eutrophication	
	25. Study of fresh water flora.	
	26. Analysis of potable water; TPC of bacteria, presumptive, confirmatory, and completed test and determination of faecal Streptococci.	
	27. Determination of coliform count of water by MPN.	
	28.Waste water analysis : physical (total solids), chemical (COD), biological (BOD)	
	29.Quantitative study of raw and treated sewage (nutrient agar and Mac Conkey's agar)	
	30. Determination of sedimentation rate of air flora	
	Nature 0f Theory and Practical Question Paper is as prescribed in Certificate course in fermentation Technology	

PAHSOLAPUR UNIVERSITY, SOLAPUR
WINE TECHNOLOGY SYLLABUS

SYLLABUS
2021
WINE TECHNOLOGY SYLLABUS

	Paper I :Fundamentals of Fermentation Technology	**40**
	Section I	
UNIT I	History and Scope of Fermentation Technology : Development of Fermentation technology The era of the discovery of Antibiotics, The discovery of anaerobic life The Micro organisms and Biotechnology	10
UNIT II	General Characteristics of Bacteria, Algae, Actinomycetes, Fungi and Viruses Cytology, physiology. growth and reproduction in yeasts Cultivation of yeasts	10
	Section II	
UNIT III	A. Tools in Fermentation Technology 1. Microscopy-Compound Microseopy & Election microscopy. Instruments - Basic principles & usage - pH meter, Autoclave, Hot air oven Centrifuge. Seitz filter, Glass distillation, Incubator. Colorimeter Spectrophotometer B: Techniques in fermentation Industry- Sterilization and preparation of media, Methods of isolation Microorganisms. Screening techniques, preservation of microorganisms - serial subculture, overlaying with mineral oil, lyophilisation, storage under liquid nitrogen and soil culture, Preparation of inoculums. Chromatographic techniques -paper and thin layer Strain improvement-mutation, genetic recombination and genetic engineering Selection techniques for mutants. replica plate technique scope of Genetic engineering	10
UNIT IV	Entrepreneurship Development: Importance of entrepreneurship & its Relevance in Career growth, coverage of the subject and its scope. Entrepreneurs, Enterprise Concept & its role in development. Characteristics of Entrepreneurs, Developing Entrepreneurial competencies	10

	Paper II: Fundamentals of Wine Technology	40
	Section I	
UNIT I	Introduction Winemaking: Introduction to winemaking, definition and terminologies. Viticulture: Introduction to viticulture, definition and terminologies. History of to winemaking and viticulture, Wine producing regions of the World and different practices of winemaking and viticulture, Status of Indian winemaking and viticulture	10
UNIT II	Introduction to grapevine and concept of Terrior: Grapevine: Classification, anatomy and function of various parts of grapevine. Cultivars and development of varieties of grapevine. Introduction to soil and influence on the grapevine, structure of soil and Growth of grapevine roots and shoots system. Effect of climatic conditions on the cultivation of grapevine (sunlight Temperature, wind, rain, hail, frost). Terrior: Concept of Terrior, Terrior units and importance of Terrior	10
	Section II	
UNIT III	**Wine making** Classification of wine: Generic classification. varietal classification, vinitication classification and classification on the basis of chemical constituents. Flow charts of white wine production and recommended varieties. Flow charts of red wine production and recommended varieties. Flow charts of Fortified wine production and recommended varieties. Production of wine from fruits other than grapes.	10
UNIT IV	**Vine and wine** Present seenario of viticulture in different countries: Variation in varieties selection vines harvesting, irrigation practices, clonal selection and other practices, Grape variety as criteria for quality wine production: Study of criteria such as tractability. distinctive flavors, and other special characteristics. Introduetion to barrel: Distribution. species and advantages of oak, anatomical and chemical constituents of oak and liberation of oak flavors from the barrel or cask in wine. Barrel making and maintenance: Harvesting of oak wood. selection and seasoning of wood for barrel making and maintenance or storage of barrels in the winery. Automation in wine industry :Importance of automation operation in wine Industries and concept of Programmed Logic Control System	10

	Wine Technology Practicals	
	WTP 102: Microbiological & Analytical Techniques Microbiological Techniques 1 Microscopic observation of yeast during wine production Recording percentage of budding of the yeast. 2. Media preparation for yeast liquid and solid media, media sterilization. pouring of the plates and preparation of slants. Sub-culturing of wine yeast and Lactobacillus cultures on agar media slants. 3 Isolation and purification of wine yeast culture from stock culture by streak pate method 4 The isolation of pure monoclonal population of wine yeast Dilution-plate method. 1 ransfer of single cell colony to the agar medium slant and a part of it in nutrient broth tube simultaneously for sterility testing. 5. Growth of wine yeast in shake flasks on a shaker: Determination of exponential phase of growth of yeast by packed cell volume (PCV). 6. Determination of the total yeast cell count microscopically using cell counting chamber. 7. Vital staining of yeast cultures with methylene blue. Determination of percentage of live cells of yeast during wine production. 8. Gram staining for acetic acid bacteria (Gram negative) and lactic acid bacteria (Gram Positive). 9. Isolation and purification techniques for wine yeast from flower'fruits 10.Whole cell immobilization of yeast. Determination of the sugar alcohol conversion coefficient. B. Analytical Techniques Determination of total carboiy drates by Anthrone method. 11. Estimation of proteins from grapes and wort by Lowry's method. 12. Production of cattle feed/Poultry feed from the waste of fruits 13. Monitoring of fermentation kinetics by amount of sugar consumed and alcohol formed or carbon dioxide released. Graphical representation. (A case study at time of examination). 14. Determination of tannins in wine by Folin--Dennis method.	

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Biotechnology

Name of the Course: B.Sc. III (Sem.– V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

P.A.H.Solapur University, Solapur , Faculty of Science and Technology
Choice Based Credit System (CBCS)
B.Sc.-III Biotechnology
(2021-2022 : W.e.f. June 2021)

Background of Curriculum:

In accordance with the UGCs reference to standardize curricula at the national level and bring a match across all the Indian Universities, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template.
Biotechnology deals with the study of animal kingdom specially the structural diversity, biology, embryology, evolution, habits and distribution of animals, both living and extinct. As it covers a fascinating range of topics, the modern Biotechnologists need to have insight into many disciplines. The learning outcomes-based curriculum framework for a B.Sc. degree in Biotechnology is designed to cater to the needs of students in view of the evolving nature of animal science as a subject. The framework is expected to assist in the maintenance of the standard of Biotechnology degrees/programmes across the country by reviewing and revising a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework, however, does not seek to bring about uniformity in syllabi for a programme of study in Biotechnology, or in teaching learning process and learning assessment procedures. Instead, the framework is intended to allow for flexibility and innovation in programme design and syllabi development, teaching learning process, assessment of student learning levels. A comprehensive knowledge of structure-function relationship at the level of gene, genome, cell, tissue, organ, and systems, through development would further add to the knowledge base and the learning outcome in terms of editing of genes and genomes for industrial application and research purposes.

Learning Outcomes based approach to Curriculum Planning:

The courses should be delivered in terms of concepts, mechanisms, biological designs & functions and evolutionary significance cutting across organisms at B.Sc. level. These courses should be studied by students of all branches of biology. Both chalk and board, and PowerPoint presentations can be used for teaching the course. The students should do the dissertation/ project work under practical of different courses, wherever possible.

The students are expected to learn the courses with excitements of biology along with the universal molecular mechanisms of biological designs and their functions. They should be able to appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how contributions from research and innovation have made the subjects modern, interdisciplinary and applied and laid the foundations of Biotechnology, Animal Sciences, Life Sciences, Molecular Biology and Biotechnology. These courses and their practical exercises will help the students to apply their knowledge in future course of their career development in higher education and research. In addition, they may get interested to look for engagements in industry and commercial activities employing Life Sciences, Molecular Biology and Biotechnology. They may also be interested in entrepreneurship and start some small business based on their interest and experience.

Graduate Attributes in Biotechnology:

- Disciplinary knowledge and skills: Competent of demonstrating (i) complete information and understanding of major concepts, theoretical principles and experimental findings in Biotechnology and its different subfields (ii) capacity to apply modern instrumentation for advanced genomic and proteomic technology.

- Skilled communicator: Capability to communicate complex technical knowledge relating to Biotechnology in a obvious and brief manner in writing and oral skills.

- Critical thinker and problem solver: Talent to have critical thinking and competent problem solving skills in the basic areas of Biotechnology

- Sense of inquiry: Capability for asking appropriate/proper questions relating to issues and problems in the field of Biotechnology, and planning, executing and reporting the results of an experiment or investigation.

- Team player/worker: Accomplished of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

- Skilled project manager: Able of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

- Digitally literate: Skilled of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

- Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

- Lifelong learners: Capable of self-paced and self-directed learning aimed at individual growth and for improving knowledge/skill development and re-skilling

Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level. The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

• Outline of Choice Based Credit System:

1. *Core Course:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. *Elective Course:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. *Ability Enhancement Courses (AEC):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• Credit: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

PAH Solapur University, Solapur

Faculty of Science-New Choice Based Credit System (CBCS) - (w.e.f.2021-22)

Structure for B. Sc-III Biotechnology

Subject/ Core kCourse	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)	English (Business English)		Paper- III	4.0	--	--	100	80	20	4.0
Discipline Specific Elective (DSE) (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.	DSE-1A Bioprocess Technology			3	--	--	100	80	20	4.0
	DSE- 2 A Recombinant DNA Technology			3	--	--	100	80	20	4.0
	DSE- 3 A Bioinformatics			3	--	--	100	80	20	4.0
	DSE 4 A Intellectual Property Rights			3	--	--	100	80	20	4.0
	(Add-on /-self learning)-MOOC/SWAYAM/Skill based -certificate course –institute or university /internship/ apprenticeship			--	--	--	--	--	--	4.0
Grand Total				**16.0**	**--**	**--**	**500**	**400**	**110**	**24**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)	English (Business English)			4.0	--	--	100	80	20	4.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.	DSE- 1B Bio-Analytical Tools			3.0	--	--	100	80	20	4.0
	DSE- 2B Genomics and Proteomics			3.0	--	--	100	80	20	4.0
	DSE- 3 B Evolutionary Biology			3.0	--	--	100	80	20	4.0
	DSE 4B Environmental Biotechnology			3.0	--	--	100	80	20	4.0
Total (Theory)				**16.0**	**--**	**--**	**500**	**400**	**100**	**20**
DSE - Practical (Annual Exam)	**DSE- 1 A&B**			--	--	5	100	80	20	4.0
	DSE -2 A&B & DSE- 4 B			--	--	5	100	80	20	4.0
	DSE- 3 A&B & DSE- 4 A					5	100	80	20	4.0
	Project Work					5	100	80	20	4.0

Total (Practicals)					**20**	**400**	**320**	**80**	**16**
Grand Total			**32.0**		**20**	**1400**	**1120**	**280**	**60**

Summary of the Structure of B.Sc. Programme
as per CBCS pattern

Class	**Semester**	**Marks-Theory**	**Credits-Theory**	**Marks-Practical**	**Credits-Practicals**	**Total – credits**
B.Sc.-I	I	500	20	--	--	20
	II	550	20	400	16	36
B.Sc.-II	III	350	14	--	--	14
	IV	350	14	300	12	26
B.Sc.-III	V	500	22	--	--	22
	VI	500	20	400	16	36
Total		2750	110	1100	44	154

B.Sc .Programme :
Total Marks : Theory + Practical's = 2750 +1100 =3950
Credits : Theory + Practical's = 110 + 44 = 154
Numbers of Papers Theory: Ability Enhancement Course(AECC) : 05
Theory: Discipline Specific Elective Paper (DSE) : 08
Theory: DSC : 12
Skill Enhancement Courses /Add on : 01
Total : Theory Papers : 31
: Practical Papers : 11

Abbreviations :
L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

PAH SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science and Technology
Choice Based Credit System (CBCS)
(w.e.f. 2021-22)

• Title of the Course: B.Sc. Part-III (Honors)
• Subject: Biotechnology

• **Introduction**: This course provides a broad overview of Biotechnology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Biotechnology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

• Objectives of the course: The objectives of B. Sc. Biotechnology course are:
To provide an intensive and in depth learning to the students in field of Biotechnology. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world. To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

- **Course outcome and Advantages:** Biotechnology has tremendous job potential. The successful students will be able to establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc. Scientific Research Organizations. Universities in India & aboard.

• Medium of Instruction: English
• Syllabus Structure:
• The University follows semester system.
• An academic year shall consist of two semesters.
• B.Sc. Part-IIl Biotechnology shall consist of two semesters: Semester V and Semester VI

In semester V: there will be Four DSC papers having paper IX to XII of 100 marks each. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English and one self learning compulsory course of any one from - MOOC/SWAYAM COURSE/INTERNSHIP

In Semester VI: there will be two DSC papers having paper XIII to paper XVI of 100 marks each. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English

The scheme of evaluation of performance of candidates shall be based on University Assessment **(UA**) as well as **College Internal Assessment (CA)** as given below.

For B.Sc.Part-III Biotechnology Sem V & VI the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group

discussion, Brain storming sessions etc. as given below.

- **Practical course examination** is of 100 marks shall be conducted at the end of semester II. The practical examination of 400 marks shall also consist of **320 marks for University practical assessment** and **80 marks for college internal assessment (CA)**.

• **Scheme of Evaluation**: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks..

Semester – V: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper IX to paper XII)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper IX to paper XII)
c) **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** English
d) One Add-on - self learning course **(compulsory)** MOOC/SWAYAM/Sill based -certificate course – institute or university /internship/ apprenticeship

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

Semester – VI: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
Practical Examination: (400 marks)
University Examination (320 marks): Number . of practicals': 04

Practical-I: Based on DSE- 1 A&B	:(80 UA + 20 CA)
Practical-II: Based on DSE -2 A&B & DSE- 4 B	:(80 UA + 20 CA)
Practical-III: DSE- 3 A&B & DSE- 4 A	:(80 UA + 20 CA)
Practical-IV: Project Work	:(80 UA + 20 CA)

Internal Continuous Assessment: Total 80
(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 320 marks (Practical I to IV for Four separate days) will be conducted at the end of semester VI

Passing Standard:

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same stipulated marks of external examination and his/her performance shall be scaled to 100

PAH SOLAPUR UNIVERSITY, SOLAPUR Faculty of Science and technology New CBCS Structure for B.Sc – III Biotechnology Theory -								
Semester V								
Paper No.	**Title of Paper**	**Hrs/Week**			**Paper Marks**	**UA**	**CA**	**Credits**
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE-IX	**DSE-1A Bioprocess Technology**	3	-	-	100	80	20	4
DSE-X	**DSE- 2 A Recombinant DNA Technology**	3	-	-	100	80	20	4
DSE-XI	**DSE- 3 A Bioinformatics**	3	-	-	100	80	20	4
DSE-XII	**DSE 4 A Intellectual Property Rights**	3	-	-	100	80	20	4
SEC-	**(Add-on /-self learning)- MOOC/SWAYAM/Skill based - certificate course –institute or university /internship/ apprenticeship**	--	--	--	--	--	--	4.0
Total		16	-	-	500	400	100	24

marks.

• ATKT:

passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Biotechnology examination and clearly passed in B.Sc. Part-I-Biotechnology shall be permitted to enter upon
the course of Semester V of B.Sc. III Biotechnology.

Practicals- B .Sc III Biotechnology (CBCS)

Semester –VI

Paper No.	Title of Paper	Hrs/Week			Paper Marks	UA	CA	Credits
		L	T	P				
Ability Enhancement Course(AECC)	**English (Business English)**	4	-	-	100	80	20	4
DSE- -XIII	**DSE- 1B Bio-Analytical Tools**	3	-	-	100	80	20	4
DSE-XIV	**DSE- 2B Genomics and Proteomics**	3	-	-	100	80	20	4
DSE-XV	**DSE- 3 B Evolutionary Biology**	3	-	-	100	80	20	4
DSE-A XVI	**DSE 4B Environmental Biotechnology**	3	-	-	100	80	20	4
SEC-								
Total		16			500	400	100	20

Practical No.	Paper No. based on	Title of Paper	Hrs/Week			Paper Marks	UA	CA	Credits
			L	T	P				
I		**DSE-1A- Bioprocess Technology AND DSE- 1B- Bioanalytical Tools**		-	5	100	80	20	4
II		**DSE- 2 A - Recombinant DNA Technology** AND **DSE- 2B –Genomics and Proteomics** AND **DSE 4B- Environmental Biotechnology Biotechnology**		-	5	100	80	20	4
III		**DSE- 3A- Bioinformatics AND DSE- 3 B - Evolutionary Biology AND DSE 4 A- Intellectual Property Rights**		-	5	100	80	20	4
IV		**Project Work**		-	5	100	80	20	4
	Total				**20**	**400**	**320**	**80**	**16**

Abbreviations:

L: Lectures
T: Tutorials
P: Practicals
UA: University Assessment by End Semester Examination
CA: College Assessment by Internal Continuous Examination
UA: University Assessment: - University Theory paper shall be of 70 marks
CA: College Assessment: - The internal examination for theory and practical course

DSE-1A Bioprocess Technology
[Credits -4, Total Lectures-60]

Course Objectives:

- This course gives technical and biological aspects of fermentation process
- This course helps to introduce industrial applications of bioprocess technology

Course Outcome:

- After completion of this course students will be able to perform and control fermentation process.
- Students can design protocols for industrial fermentations.

UNIT I -Introduction to bioprocess technology (10 L)

Range of bioprocess technology (Microbial enzymes, Microbial Biomass, Transformation process, Recombinant Technology). Chronological development of fermentation industry. Basic principle components of fermentation technology. Types of microbial culture, its growth kinetics and product formation in-Batch, Fed-batch and Continuous culture.

UNIT II -Bioreactors
(20 L)

Design and operation of bioreactor- Significance of Impeller, Baffles, Sparger; Types of culture/production vessels- Airlift; fluidized bed reactor; bubble column reactor, photo bioreactor and their application in production processes.

Principles of upstream processing – Inoculum development Media preparation, and sterilization of media, bioreactor, liquid wastes, air.

UNIT III -Fermentation process control
(15 L)

Introduction to oxygen requirement in bioprocess; mass transfer coefficient; factors affecting KLa. Bioprocess measurement and control system (Physical, Chemical, biological parameters). Computer application in fermentation process control.

UNIT IV- Downstream processing
(15 L)

Introduction to downstream processing, product recovery and purification. Effluent treatments and disposal. Product recovery (Solid-liquid separation, Cell disintegration, purification, concentration, formulation).
Microbial production of ethanol, amylase, lactic acid and Single Cell Protein.

SUGGESTED READINGS:

1) Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
2) 2. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
3) 3. Patel AH. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
4) 4. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
5) 5. H. A. Modi (2009) .Fermentation Technology Vol.I and Vol. II. Pointer Published by Pointer, Jaipur

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DSE-2 A: Recombinant DNA Technology
[Credits -4, Total Lectures-60]

Course Objectives

- To familiarize the student with emerging field of biotechnology i.e. Recombinant DNA Technology.
- To create understanding and expertise in wet lab techniques in genetic engineering.

Learning outcomes:

On completion of this course, students will have the knowledge and skills to explain the key concepts in genetic modification of living organisms, Techniques in Recombinant DNA Technology

- Acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation of genes of interest.
- Identify problems associated with production of recombinant proteins and devising strategies to overcome problems

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UNIT I: Enzymes and Vectors [15]

Enzymes (source and functions): Exonucleases (Exonuclease I, III and λ), Endonucleases (S1nuclease, Mung bean nuclease, DNase1, Ribonuclease H), Restriction endonuclease (Type I, II, III), Ligases (E. coli DNA Ligase, T_4 - DNA Ligase, T_4 - RNA Ligase), DNA polymerases (Polymerase I, klenow fragments, Taq), RNA polymerases (E. coli RNA polymerases, SP-6 RNA polymerases, T_7 - RNA polymerases), Reverse transcriptases (AMV Reverse transcriptase, M-Mul V Reverse transcriptase), Alkaline phosphatases, Terminal deoxy nucleotidyl transferase, Kinases (T_4 – Poly Nucleotide kinase, T_4 – Poly Nucleotide kinase phosphatase free)

Plasmids (pSC101, pBR322, pUC), Phages (λ insertion vector and λ replacement vector) Cosmids, Phagemids (pBluescript II KS(+/-), pTZ19R/ pTZ19U), BAC, Shuttle vectors, plants (Caulimo viruses and Tobamo viruses), animals (SV40) and yeast (YIp, YEp, YCp), YAC

UNIT II: Recombinant DNA Technology in prokaryotes and eukaryotes [15]

Bacteria and yeast: DNA transfer techniques : transformation (CaCl2, ultrasonication), transduction. Screening of recombinants (Blue-white screening, immunological screening, colony hybridization,) Recombinant screening in plant cells. Animals : Recombinant screening in animal cells. Examples of proteins produced in animal cells.

UNIT III: Techniques in Recombinant DNA Technology [15]

Basic techniques: Isolation and Purification of DNA, Principle and applications of Polymerase chain reaction (PCR), Standard PCR, RT (Reverse transcription)-PCR, Real Time PCR). Probes: (Genomic DNA probes, cDNA, RNA probes).

DNA sequencing (Maxam and Gilbert, Sanger's, Automated DNA Sequencing.). Molecular Markers:(RFLP, RAPD, AFLP).

UNIT IV: Genetic and protein engineering & Applications of Recombinant DNA Technology[15]

Random and site-directed mutagenesis: Primer extension and PCR based methods of site directed mutagenesis, Random mutagenesis, Gene shuffling, production of chimeric proteins, Protein engineering concepts and examples (any two).

Applications: Gene targeting in mice, Therapeutic products produced by genetic engineering-blood proteins, human hormones and vaccines (one example each). Heterologous protein production in plant systems - edible vaccines, plantibodies, Transgenic plants - Insect-resistant, Stress tolerant plants , improved nutritional quality(Amino acids and Iron), Senescence - tolerant plants (fruit ripening and flower wilting- e.g. FlavrSavr), , Modification of food plants taste (Sweetness), plant as bioreactor for polymers

SUGGESTED READINGS:

1. Brown TA. (2006). Gene Cloning and DNA Analysis. 5th edition. Blackwell Publishing, Oxford, U.K.
2. Clark DP and Pazdernik NJ. (2009). Biotechnology-Applying the Genetic Revolution. Elsevier Academic Press, USA.

3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington
4. Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
5. Sambrook J, Fritsch EF and Maniatis T. (2001). Molecular Cloning-A Laboratory Manual. 3rd edition. Cold Spring Harbor Laboratory Press.

DSE 3 A: Bioinformatics
[Credits -4, Total Lectures-60]

Course objectives

- This course gives technical and biological aspects of Bioinformatics and its possible use in allied science areas.

Learning outcomes:

- Students will get background of bioinformatics.
- Students will get knowledge of biological databases.
- Students will able to retrieve information from nucleic acid and protein sequence.
- Students can predict the structure of proteins from their sequence.

Unit I : Introduction to Bioinformatics:-
(10 L)

Concept of Bioinformatics, history, branches of bioinformatics. Nomenclature and code letters of DNA and protein sequences. Scope and applications of bioinformatics. NCBI: role and its resources, Entrez. EMBL.

Unit II: Biological Databases:
(20 L)

Primary Protein sequence databases:- PIR, MIPS, Swiss – PROT, TrEMBL, NRL – 3D; Composite Protein sequence databases: - NRDB, OWL, MIPSx, SWISS-PROT + TrEMBL; Secondary Protein databases: - PROSITE, Pfam, Structure classification databases: - SCOP, CATH, PDBsum. Nucleic acid sequence databases: EMBL, DDBJ, GenBank; Structural Databases: - PDB, NDB, MMDB; Genomic database – Ensembl; Bibliographic databases – PubMed, PubMed Central, NCBI Bookshelf.

Unit III: Sequence Analysis and Tools:-
(20 L)

Global and Local alignments; Pairwise alignments – method, algorithm, scoring matrices, tools (e.g. BLAST and FASTA) and applications; Multiple alignments – consensus sequence, methods, tools (e.g. Clustal) and applications. Phylogenetic analysis: Elements of phylogeny, methods of phylogenetic analysis, Phylogenetic tree of life, phylogenetic analysis tools - Phylip.

Unit IV: Protein and Gene Structure Prediction:-
(10 L)

Physicochemical property prediction from primary protein sequence, secondary and tertiary structure prediction from protein sequence. Prokaryotic and eukaryotic gene prediction.

SUGGESTED READINGS

1) Introduction to Bioinformatics, (Atwood, T. K. and Parry-Smith, D. J).
2) An introduction to Computational Biochemistry. (C. Stain Tsai, A JohnWiley and Sons, Inc., publications).
3) Bioinformatics Methods and Applications Genomics, Proteomics and Drug Discovery. (Rastogi S. C. Mendiratta, and Rastogi P.)
4) Bioinformatics. (C.S.C. Murthy, Himalaya Publishing House, Mumbai.)
5) Biotechnology. (U. Satyanarayan, U Chakrapani, Books and allied Private Ltd)
6) Developing Bioinformatics Computer Skills. (Cynthia Gibas and Per Jambeck).
7) Basic Bioinformatics. (S. Ignacimuthu, S.J., Narosa Publication House, Pvt., Ltd.)
8) Bioinfrmatics. (R. Sunderlingam, V. Kumaresan, Saras Publication.)
9) NCBI Web site: http://www.ncbi.nlm.nih.gov
10) EMBl Website: http://ebi.ac.uk

DSE – 4A Intellectual Property Rights
[Credits -4, Total Lectures - 60]

About the course

- The course envisages information on IPR

Learning outcomes:

- To learn, understand and analyze the Laws and Relations relating to Intellectual Property Rights in India along with the glimpse of International practices.
- Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyze the social impact of intellectual property law and policy.
- Analyze ethical and professional issues which arise in the intellectual property law context.
- To create public awareness about the economic, social and cultural benefits of IPRs

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Unit I: Introduction to IPR
(15 L)

Introduction to Intellectual Property Rights: IPRs Policy, Novelty, Utility Inventiveness/Non-obviousness, Kinds of Intellectual Property Rights-copyright, patent, trademark, trade secrets, geographical indications (GI), Advantages and Disadvantages of IPR. Patentable subject matter, Patentability criteria, non-patentable inventions, Pharmaceutical products and process patent.

Unit-II: IPR in India & abroad
(15 L)

Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention 1883, the Berne Convention 1886, the Universal Copyright Convention 1952, the WIPO Convention 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994.

Unit -III: Procedure of patenting
(15 L)

Types of patenting, Rights of patentee, Procedure for granting a patent and obtaining patents in India and Abroad (ICT), Grounds for opposition Working of Patents, Compulsory License Acquisition, Surrender, Revocation, restoration Transfer of patent rights, Patenting of biological materials with examples and case studies, Infringement.

Unit -IV: Plant Breeder's rights
(15 L)

International Union for the Protection of New Varieties of Plants (UPOV), Breeders exemption, Plant variety protection in India. Farmer's right, Procedure for registration, effect of registration and term of protection, advantages and disadvantages of PBR.

SUGGESTED READINGS:

1. Entrepreneurship: New Venture Creation : David H. Holt
2. Patterns of Entrepreneurship: Jack M. Kaplan
3. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.
4. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.
5. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers.

6. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.
7. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.

*As a part of self learning mode students have to acquire 4 credits compulsorily other than routine credits mentioned in the university syllabus structure. It also mandatory for the students to submit the certificate from competent authorities in the stipulated time. It is the whole responsibility of the students with consultation of mentor to complete the course for successful acquiring 4 credits. Department will monitor the progression of the course completion of the students by assigning the responsibility to the concerned faculty as a mentor. It is also suggested that the students opting for internships or apprenticeship (should be of 60 hrs duration) will be allowed to join and complete the assignment preferably during winter and summer vacation. If the duration is extended, the institute may allow the students to complete the assignment with prior permission from the head of the institution/competent authorities and the absentee from the host institute may be compensated by allowing the students to join during holidays of the working period. During the completion of self learning course at the time of semester III in emergency or exceptional case students are allowed to continue and complete in the IV semester. Students have the options to select any one or two from **SWAYYAM/MOOCs/NPTEL /Skill based course-Institute or University/Internship/Apprenticeship.**

SEMESTER –VI

PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)
Theory Syllabus

B.Sc. III-Biotechnology (Semester-VI)

w. e. f. June 2021

DSE 1B - Bio-Analytical Tools
[Credits -4, Total Lectures-60]

Course Objectives:

- To develop the skills to understand the theory and practice of bio analytical techniques.
- To provide scientific understanding of analytical techniques and detail interpretation of results.
- To understand basic instruments used in Bioanalytical sciences laboratory

Learning outcomes

After successfully completing this course, the students will be able to:

- To be able to use selected analytical techniques.
- To get knowledge of working principals, tools and techniques of analytical techniques.
- To understand the advantages, disadvantages and creative use of techniques for problem-solving

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Unit 1: Introduction: pH meter & Electrophoresis
15L

Principle, construction, working and application of the following instruments: **pH meter:** Definition – acids and bases; pH. Dissociation of acids and bases, measurements of pH – pH indicators, pH paper, pH meter glass electrode, operation and calibration of pH electrode, errors in pH measurements.

Electrophoresis: Introduction to electrophoresis. Starch-gel, polyacrylamide gel (native and SDS-PAGE), agarose-gel electrophoresis, pulse field gel electrophoresis, immuno- electrophoresis, isoelectric focusing.

Unit 2: Spectroscopy
15L

Electromagnetic wave, Electromagnetic spectrum, Applications of each region of electromagnetic spectrum for spectroscopy. Introduction to molecular energy levels: Excitation, Absorption, Emission. Types of transition: Electronic, Vibrational, Rotational UV-visible spectroscopy. Principle Beer – Lambert's Law, deviation from Beer-Lambert' Law, construction and working of colorimeter, turbidometer, nephalometer. IR spectroscopy, Atomic absorption spectroscopy (AAS).

Unit 3: Centrifugation & Chromatography
15L

principle and application, Types of Centrifugation : Differential Centrifugation, Rate-Zonal Centrifugation, Isopycnic Centrifugation, Analytical Ultracentrifugation.

Chromatography : Introduction to the principle of chromatography. Paper chromatography, thin layer chromatography, column chromatography: silica and gel filtration, affinity and ion exchange chromatography, gas chromatography, HPLC

Unit 4: Blotting techniques
15L
Introduction of blotting technique for Nucleic acids and proteins, Principle and working of: Southern blotting, Northern blotting and Western blotting. Principles of autoradiography, Dot Blot technique.

SUGGESTED READINGS

1. Instrumental Methods of Chemical Analysis – G. R. Chatwal, S.K.Anand
2. Handbook on Analytical Instruments –R. S. Khandpur. (Mc Graw Hill).
3. Biophysical Chemistry - Upadhyay, Nath, Upadhyay (Himalaya Publishing House).
4. Practical Biochemistry –Wilson & Walker.
5. Biophysics– Dr. Mohan P. Arora
6. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley& Sons. Inc.
7. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
8. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates,
9. MA. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell.7th edition. Pearson Benjamin Cummings Publishing, San Francisco

DSE- 2B Genomics and Proteomics
[Credits -4, Total Lectures-60]

Course Objectives:-

- To acquaint the student with genome organization, gene identification, Expression and application of genomics analysis.
- To acquaint the student with proteomics, it's analysis and its applications.

Course Outcomes:-

- On the completion of this course students will have the knowledge and skill to explain the key concepts in genomics and proteomics.
- The course will provide comprehensive knowledge in genome analysis and proteomic analysis.
- The student will understand the applications of genomics and proteomics in Drug development, Glycobiology and Plant genetics and breeding.

UNIT I Organization of genomes:
10 L
Introduction: Genome, Genomics, Omics and importance, General features, The origin of genomes- Origin of macromolecules, RNA world and DNA world , Genome diversity. Introduction to Molecular taxonomy.

UNIT II Genome projects:
20 L
The Human genome project, HapMap Project, The 1000 genome project, and The ENCODE Project. Structural genomics: Assembly of a contiguous DNA sequence- Genome sequencing assembly clone counting method, and whole –genome shotgun sequencing, computer tools for sequencing project.
Significance of genomes – Bacteria, Yeast, Drosophila, Caenorhabditis, *Homo sapiens*, Arabidopsis.

UNIT III Introduction to Proteomics:
15 L
Introduction to proteomics, Analysis of Proteomes- Two -dimensional polyacrylamide gel electrophoresis, Sample preparation, Solubilization, Reduction, Resolution, Reproducibility of 2DE. Detecting proteins in Polyacrylamide gels, Image analysis of 2-DE gels. Mass spectrometry based methods for protein identification, 2-DE gel electrophoresis coupled with mass spectrometry

UNIT IV Applications of Genomics and Proteomics Analysis:
15 L

Analysis of Genomes- Human, Mouse, *Plasmodium falciparum*, *Saccharomyces cerevisiae*, *Mycobacterium tuberculosis*. Application of proteome analysis- drug development and toxicology, glycobiology and proteomics in plant genetics and breeding. Molecular diagnosis of human genetic diseases: Sickle cell anemia, Hemophilia.

SUGGESTED READINGS:

1. S.B. Primrose and R. M. Twyman- Principles of Genome Analysis and Genomics, 7th edition, Blackwell publishing, 2006
2. S. Sahai- Genomics and Proteomics, Functional and Computational Aspects, Plenum Publishing, 1999.
3. Andrezej K Konopka and james C. Crabbe, Compact hand book- computational biology, Marcel Dekker, USA, 2004. 4. Pennington & Dunn- Proteomics from protein Sequence to function, 1st edition, Academic Press, San Diego, 1996.

Paper- -XIV- DSE-3B : Evolutionary Biology
[Credits -4, Total Lectures-60]

Course objectives

The course provides information about the patterns and processes of evolution above the species level. Besides elaborating the process of speciation, it also categorically differentiates between the three methods of phylogenetic analysis *viz*., evolutionary systematics, phonetics and cladistics.

Learning outcomes

At the end of the course the students will be able to

- Understand the historical development of systematics past to the present.
- Understand the similarities and differences of different types of data.
- Understand the uses and limitations of phylogenetic trees.
- Appreciate the complexities and difficulties of various species concepts.
- Gain a basic grasp on the rules and philosophy of nomenclature.

Unit 1: Origin of Life & Historical Review of Evolutionary Concepts
(15L)

Chemogeny, RNA world, organic evolution, Evolution of prokaryotes and eukaryotes. Theories of Evolution: Lamarckism, Darwinism, Neo-Darwinism

Unit 2: Evidences of Evolution & Sources of Variation
(15L)

Fossil records (types of fossils, transitional forms, geological time scale, evolution of horse, Molecular evolution:- universality of genetic code and protein synthesizing machinery, example of globin gene family.
Sources of variations: Heritable variations and their role in evolution

Unit 3: Evolutionary Genetics, Product of Evolution and Extinctions
(15L)
Micro evolutionary changes - inter-population variations, clines, races, species concept, isolating mechanisms, modes of speciation-allopatric, sympatric & parapatric; Adaptive radiation/ macroevolution as exemplified by Galapagos finches.
Back ground and mass extinctions: causes and effects; example of K-T extinction.

Unit 4: Origin and Evolution of Man
(15L)
Unique hominin characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin; Socio-cultural evolution of man.

SUGGESTED READINGS:

1) Ridley,M (2004) Evolution III Edition Blackwell publishing
2) Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.
3) Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin & Cummings.
4) Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
5) Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell

DSE-4B : Environmental Biotechnology
[Credits -4, Total Lectures-60]

Course objectives:
- This course gives technical and biological aspects of Environmental Biotechnology.
- This course helps to introduce industrial applications of Environmental Biotechnology.

Learning outcome :
On completion of this course, students will have the knowledge and skills to explain the key concepts in
- Understanding the current applications of biotechnology to environmental quality evaluation, monitoring and remediation of contaminated environments.

UNIT I : Natural and Commercial Resources of Fuels
(15 L)
Conventional fuels and their environmental impact – Firewood, Plant, Animal, Water, Coal and Gas.
Modern fuels and their environmental impact – Role of Microorganisms in process and production of Biogas,
Microbial hydrogen Production, Conversion of sugars, agriculture and food industry waste (Corn starch, cotton) to alcohol Gasohol.

UNIT II: Bioremediation
(20 L)
Concept and Importance of bioremediation: Microbial bioremediation, Phytoremediation, Mycoremediation . Bioremediation of soil & water contaminated with oil spills, heavy metals and detergents. Bioremediation of lignin and

cellulose, Pesticides(chlorpyrifos, Acephate,), insecticides(Aldrin, Malathion), herbicides (Glyphosate, diclofop,), aromatic and chlorinates hydrocarbons, petroleum products(Diesel fuel, Kerosene, Paraffin wax) , plastic(Polyethylene terephthalate, Polyvinyl chloride) and radioactive wastes(nuclear waste, ion exchange resins).

UNIT III: Waste water treatment and bio-fertilizers
(15 L)
Different methods of treatment of municipal waste water and Industrial effluents. Biomedical waste management. Bio-fertilizers: Role of symbiotic and asymbiotic nitrogen fixing bacteria in the enrichment of soil (Rhizobium, Azotobacter, Azospirillum, Cyanobacteria, Phosphate solubilizing bacteria). Role of Algal and fungal bio-fertilizers (VAM, Frankia, Azolla.) in enhancement of soil fertility

UNIT IV: Bioleaching and Genetically modified Organisms
(10 L)
Bioleaching: Definition, microorganisms used in bioleaching, chemistry of bioleaching, types of bioleaching, Examples (Gold, Copper and Uranium leaching).
General introduction of genetically modified microbes, plants and animals and its role in environment clean-up.
Location, establishment and Rules and regulations of Environment Protection Act(EPA)

SUGGESTED READING

1. Environmental Science, S.C. Santra
2. Environmental Biotechnology, Pradipta Kumar Mohapatra
3. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening and Jesef Winter
4. Waste Water Engineering, Metcalf and Eddy, Tata McGraw hill
5. Agricultural Biotechnology, S.S. Purohit
6. Environmental Microbiology : Methods and Protocols, Alicia L. Ragout De Spencer, John F.T. Spencer
7. Introduction to Environmental Biotechnology, Milton Wainwright
8. Principles of Environmental Engineering, Gilbert Masters
9. Wastewater Engineering – Metcalf & Eddy

PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)
B.Sc. III-Biotechnology
w. e. f. June 2021 -Practicals Syllabus

Practical -I
Paper No. based on:
DSE-1A Bioprocess Technology
and
DSE- 1B Bio-analytical tools
(Credits-4)

DSE-1A Bioprocess Technology:-Practicals'

1. Isolation of antibiotic producer microorganisms from natural resource.

2. Calculation of thermal death point (TDP) of a given bacterial culture.
3. Calculation of thermal death time (TDT) of given bacterial culture.
4. Production and analysis of ethanol.
5. Production and analysis of amylase.
6. Production and analysis of lactic acid/ citric acid.
7. Biological assay of antibiotic by disc diffusion method.
8. Prepare SOPs for handling of instruments required for Laboratory scale fermentation
9. Determination of Minimum Inhibitory Concentration (MIC) of antibiotic on test organism.
10. Production of wine from any fruit.

DSE- 1B Bio-analytical tools

1. Gel electrophoresis of DNA/RNA
2. SDS-polyacrylamide gel electrophoresis of proteins.
3. Preparation of the sub-cellular fractions of cells.
4. Maltose calibration curve.
5. Separation of plant pigments by paper chromatography.
6. To identify amino acids in a given sample by TLC.
7. Sothern blotting technique.
8. pH measurement of biological samples.
9. UV spectra of protein and nucleic acid.
10. Qualitative and quantitative analysis of DNA using spectrophotometer

Practical –II
Paper No. based on:
DSE- 2A Recombinant DNA Technology
and
DSE- 2B Genomics and Proteomics
and
DSE 4B- Environmental Biotechnology
(Credits-4)

DSE- 2A Recombinant DNA Technology

1. Isolation of genomic DNA from whole blood
2. Elution of DNA band from agarose gel
3. Plasmid DNA isolation
4. Restriction digestion of DNA
5. Construction of restriction map of plasmid DNA

6. Demonstration of PCR
7. Calculation of molecular weight of digested DNA
8. Preparation of single stranded DNA template

DSE- 2B Genomics and Proteomics

1. *In silico* Genome study of *Drosophila/ Caenorhabditis*/ Homo sapiens/ Aradopsis.
2. Isolation of DNA from Yeast.
3. Protein molecular weight determination by SDS-PAGE
4. Isolation of whole cell protein and profiling from Bacteria/Plant .
5. Extraction of wheat gluten protein.
6. Hydropathy plots/ Ramchandran plots.
7. Image analysis of 2D gel.
8. Protein prediction by Mass Spectroscopy data.
9. Use of the SNP database at NCBI and other sites.
10. Use of OMIM database.
11. Detection of open reading frames using ORF Finder

Practical- DSE 4B- Environmental Biotechnology

1. Calculation of Total Dissolved Solids (TDS) of water sample.
2. Calculation of BOD of water sample.
3. Calculation of COD of water sample.
4. Bacterial Examination of Water by MPN Method
5. Chemical analysis of soil by rapid spot tests.
6. Decolorization of a textile dye to demonstrate concept of phytoremediation
7. Decolorization of a textile dye to demonstrate concept of bacterial remediation
9. Estimation of pesticides from given samples.
10. Estimation of residual chlorine from given water sample.

Practical –III
Paper No. based on:
DSE 3 A: Bioinformatics
and
DSE- 3 B Evolutionary Biology
and
DSE – 4A Paper Intellectual Property Rights
(Credits -4)

Practicals- DSE 3 A: Bioinformatics –

1. Searching and retrieval of literature from PubMed.

2. Retrieving of gene sequence from GenBank.
3. Retrieving of protein sequence from PIR/Uniprot.
4. Performing sequence similarity search by BLAST.
5. Performing sequence similarity search by FASTA.
6. Performing multiple alignment and cladogram by Clustal.
7. Prediction of physicochemical property of protein from sequence (ProtParam tool).
8. Retrieval 3-D structure of proteins from RCSB PDB.
9. Study 3-D structure of protein by RasMol.

Practicals- DSE- 3 B Evolutionary Biology –

1. Study of types of fossils using samples available in Biotechnology and Geology Lab./or models (for eg. Limulus, Peripatus, Dipnoi, Sphenodon, *Archaeopteryx*, examples based on: Molluscan, Echioderms, Brachiopods and as available in laboratory)
2. Study of Zoogeographical Regions of world to understand the concept of speciation with examples
3. Study of biogeographic zones of India to study evolutionary variation and adaptation in species with examples
4. Study of macroevolution using Darwin's Finches using charts/models
5. Study of homologous organs from suitable specimens/models in the museum
6. Study of analogous organs from suitable specimens/ models in the museum
7. Study of adaptive radiation in mammals from museum specimens/models
8. Study of phylogeny of horse using model/charts (reconstruction using limbs and teeth of horse ancestors)
9. Study of Molecular phylogeny of prokaryote and eukaryote.
10. Visit to natural history museum and submission of report

Practical- DSE – 4A Paper Intellectual Property Rights

1. Indian and ICT patent search
2. Demonstration of Indian and International patent filing
3. Case study of Biotechnological patents
4. A case study on clinical trials of drugs in India with emphasis on ethical issues.

Practical –IV

(Credits-4)

The project report is to be prepared by the student on the subjects in consultation with the Project coordinator in the year. The project work is carried out in group of maximum 4-5 students OR individually. The coordinator will guide the students in selecting the topic of the project, working of the experiments, results of the same and writing the report. The report shall be signed by the coordinator and shall be submitted to the University at the time of the University Practical examination of B.Sc. Part III. The student should visit any place of Biotechnological interest (Pharmaceutical industry, Dairy, Research institutes, Food processing industry, Botanical or Zoological place etc.) and submit the report of their visit at the time of practical examination in practical course No. XI: Project Work. The visit report should be duly certified by the Head of the Department. For this visit 10 marks are allotted in
Practical Course No. IV: .Project Work.

And

Review article on any topic prepared by individual student in consultation with project guide will be submitted at the time of university practical examination whichever signed by project guide and head of the department. **(10 mark)**

OR

One national or international research publication in any one of the UGC approved journal **(10 mark)**

Note:

1. Kindly note that during field visits students shall observe only animals and make record of the observations without disturbing natural habitat nor kill the animals. Students should be told about the importance of biodiversity and conservation;
2. Students are encouraged to prepare and submit a concise report of the excursion;
3. Report on multiple excursion tours may be clubbed for preparing and submitting report at the time of final examination will be allowed;
4. Reduce or avoid the use of plastic files during submission of reports / projects as an ecofriendly method.

Equivalence:

Paper no.	**Old CBCS (June 2018)**	**New CBCS w e f .2021-22**
	Semester-V	
Core BT 301	Plant Development	**NO- Equivalence**
Core BT 302	Fermentation Technology	**DSE-1A Bioprocess Technology**
Core BT 303	Tools and Techniques	**NO- Equivalence**
DSE BT 304A	Recent Trends in Biotechnology	**NO- Equivalence**
DSE BT 304B	Introduction to Biotechnology based Industries	**NO- Equivalence**
	Semester-VI	

Core BT 305	Animal Development	**NO- Equivalence**
Core BT 306	Food and Dairy Technology	**NO- Equivalence**
Core BT 307	Bioinformatics and Nanotechnology	**NO- Equivalence**
DSE BT 308A	Applications of Biotechnology	**NO- Equivalence**
DSE BT 308B	Quality Standard Practices in Biotechnology	**NO- Equivalence**

Chairman
(Board of studies in Biotechnology)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Entire Computer Science

Name of the Course: B. Sc. (E.C.S.) Part- III (Sem. V & VI)

(Syllabus to be implemented from w.e.f. June 2021)

PunyashlokAhilyadeviHolkarSolapurUniversity,Solapur
FacultyofScienceandTechnology
ChoiceBasedCreditSystem(CBCS)(w.e.f.2021-22)RevisedStructureforB.Sc.(ECS)-III

Subject/ CoreCourse	Nameand Typeof thePaper		No. ofPapers /Practical	Hrs./Week			Total Marks perPaper	UA	CA	Credits
	Type	Name		L	T	P				
Class:	**B.Sc.(EntireComputer Science)- IIISemester–V**									
AbilityEnhancementCourse	(AECC)	English (BusinessEnglish)	Paper IIPart A	4	--	--	50	40	10	2.0
Core	DSE1 A	Data CommunicationandNetworking	Paper IX	4	--	--	100	80	20	4.0
	DSE2 A	Theory of ComputerScience	PaperX	4	--	--	100	80	20	4.0
	DSE3 A	VisualProgramming	PaperXI	4	--	--	100	80	20	4.0
	DSE4 A	AdvancedJava	PaperXII	4	--	--	100	80	20	4.0
SkillEnhancementCourse	SEC3	Advanced PythonProgramming	Paper XIII	4	--	--	100	80	20	4.0
TotalTheorySemester-V				**24**			**550**	**440**	**110**	**22**
Class:	**B.Sc.(EntireComputerScience)-IIISemester –VI**									
AbilityEnhancementCourse	(AECC)	English (BusinessEnglish)	Paper IIPartB	4	--	--	50	40	10	2.0
Core	DSE1 B	SystemSecurity	Paper XIV	4	--	--	100	80	20	4.0
	DSE2 B	CompilerConstruction	PaperXV	4	--	--	100	80	20	4.0
	DSE3 B	InternetProgramming usingASP.Net	Paper XVI	4	--	--	100	80	20	4.0
	DSE4 B	AngularJS	Paper XVII	4	--	--	100	80	20	4.0
Skill Enhancement Course	SEC4	Mobile ApplicationDevelopment	Paper XVIII	4	--	--	100	80	20	4.0
TotalTheorySemester-VI				**24**			**550**	**440**	**110**	**22**
Practical'son		DSE2 AandDSE 2 B		--	--	5	100	80	20	4.0
		DSE3 AandDSE 3 B		--	---	5	100	80	20	4.0
		DSE4 AandDSE 4 B		--	--	5	100	80	20	4.0
		Project work		--	--	5	100	80	20	4.0
Total(practical's)						**20**	**400**	**320**	**80**	**16**
Grand Total				**48**	**--**	**20**	**1500**	**1200**	**300**	**60**

Abbreviations:

L:

LecturesT:

TutorialsP:

Practicals

UA : University

AssessmentCA : College

AssessmentCC:CoreCourse

AEC:AbilityEnhancementCourseDSE :

Discipline Specific Elective PaperSEC:

SkillEnhancement Course

Type: DSE1A

CourseTitle:DataCommunicationandNetworking(PaperCode:PaperIX)

CourseObjectives:

1. TounderstandthestructureofDataCommunicationsSystemanditscomponents.
2. Befamiliarizewithdifferentnetworkterminologies.

CourseOutcomes: Upon successfulcompletionofthis course,studentswill beable to-

1. Familiarizewithcontemporaryissuesin network technologies.
2. Knowthelayered modelapproachexplainedinOSIandTCP/IP network models
3. Identifydifferenttypes ofnetworkdevices andtheirfunctions withinanetwork.
4. Know the Basic routing mechanisms, IP addressing scheme and internetworkingconcepts.
5. Familiarizewith IPand TCP Internetprotocols.
6. Understandmajor conceptsinvolvedindesignof WAN, LAN andwirelessnetworks.
7. Knowthebasicsofnetworkconfigurationandmaintenance.
8. Knowthe fundamentals of networksecurityissues.

Unit1:IntroductiontoComputerNetworks [6]

Network Definition, Network Topologies, Network Classifications, Network Protocol,Layered Network Architecture, Overview of ISO-OSI Reference Model, Overview of TCP/IPProtocolSuite.

Unit2:DataCommunicationFundamentalsandTechniques [10]

Signals-Analog and Digital Signal, Data-Rate Limits, Digital to Digital Line EncodingSchemes, Pulse Code Modulation,ParallelandSerialTransmission,DigitaltoAnalogModulation, Multiplexing Techniques- FDM, TDM, Transmission Media, Switching: CircuitSwitching,MessageSwitching, Packet Switching,

Unit3:DataLinkLayerFunctionsandProtocols [8]

Design issues, Error Detection and Error Correction Techniques, Data-Link Control-Framingand Flow Control, Error Recovery Protocols-Stop and Wait ARQ, Go-Back-N ARQ, Point toPointProtocol on Internet.

Unit4:MultipleAccess ProtocolandNetworkLayer [8]

Design issues, CSMA/CDProtocols, EthernetLANS;ConnectingLANandBack - BoneNetworks-Repeaters,Hubs, Switches, Bridges, Router and Gateways, Networks LayerFunctions and Protocols, Routing,RoutingAlgorithms,NetworkLayerProtocolofInternet-IP Protocol,Internet ControlProtocols.

Unit5:Transport,Session,Presentation andApplicationLayerProtocol

[12]Trans

port Services- Error and Flow Control, Connection Establishment and ConnectionRelease, Flow Control & Buffering, TCP/IP protocol suite, Concept of- TCP, UDP, IP, FTP,DNS,Telnet, SMTP, POP, HTTP, WWW, ARP,RARP.

ReferenceBooks:

- B.A.Forouzan:Data Communications and Networking, Fourth edition, THMPublishingCompanyLtd2007.
- S.Tanenbaum:ComputerNetworks, Fourthedition,PHIPvt. Ltd2002

Type: DSE2A

CourseTitle:TheoryofComputerScience(P aperCode:PaperX)

CourseObjectives

1. Course should provide a formal connection between algorithmic problem solving andthe theory of languages and automata and develop them into a mathematical (and lessmagical)viewtowardsalgorithmicdesignand ingeneralcomputationitself.
2. The course should in addition clarify the practical view towards the applications oftheseideasin theengineeringpart ofCS.

CourseOutcomes: Afterlearningthiscourse,the studentsshouldbeableto-

1. Understandthebasicconceptsandapplication inTheoryofComputation.
2. ApplythisbasicknowledgeofTheoryof Computation inthecomputerfield to solvecomputationalproblems and in thefieldof compiler also.

Unit1:Preliminaries **[4]**

BasicDefinitions,Sets,VariouswaysofdescribingaSet,Subsets,operationsonSets,InfiniteSetsRelations, Properties of relations, Equivalenceof relations.

Unit2:FiniteAutomata **[10]**

Introduction, Deterministic Finite Automata, Non Deterministic Finite Automata, TheEquivalenceofDFAsandNFAs, FiniteAutomata withεMoves,EquivalenceofNFAwith εTransitions and NFA without Transitions, Finite Automata with output, Moore Machine,MelayMachine Equivalenceof Mooreand MelayMachine.

Unit3:RegularExpression andPropertiesof RegularSets

[10]

Regular Expression Operations on set of strings, Regular Expression, Regular Sets,Equivalence of finite automata and regular expression Properties of Regular Sets Closureproperties,Thepumpinglemma ofregular sets,Application ofpumpinglemma.

Unit4:Regularand Context FreeGrammars

[8]

Context Free Grammars (CFG) Derivation and Language generated by grammar, DerivationTrees, Ambiguity of CFG, Simplification of CFG, Normal forms of CFG Regular

GrammarsEquivalenceof regular grammars andfiniteautomata Closureproperties of CFG.

Unit5:PushdownAutomata **[8]**

Introduction, Definitions, Equivalence of acceptance by final state and empty stack,Definition of DPDA and NPDA their correlation and examples of NPDA, CFG to PDA:Methodandexample, Closurepropertiesof Regularlanguage,ApplicationofPDA.

Unit6:Introduction ofTuring Machine **[4]**

Turing Machine model and definition of TM, Language accepted by TM, Design of TM andexamples.

ReferenceBooks:

- J.P.Hopcroft,RajeevMotwani,J.D.Ullman,IntroductiontoAutomataTheory,Languagesand Computation,IIEdition, PearsonEducation, 2001.
- JohnMartin,IntroductiontoLanguagesandTheoryofComputation,TataMcGrawHill,2003.
- Daniel I.A., Cohen, Introduction to Computer Theory, 2 nd Edition, John Wiley andSons,Inc, 2000.

Type: DSE3A

CourseTitle:VisualProgramming(

PaperCode:PaperXI)

CourseObjectives:

1. Tounderstand.NetFramework.
2. To learn computer programming using the Visual programming language with object-orientedprogrammingprinciples.
3. To understand the concepts of Exception handling mechanism and Input outputprogrammingparadigms.
4. Emphasis is on event-driven programming methods, including creating andmanipulating objects, classes, and using object-oriented tools such as the classdebugger.

CourseOutcomes: Upon successfulcompletionofthis course,studentswill beable to-

1. Design, create,build,anddebugVisualprogrammingapplications.
2. ExploreVisualProgrammingIntegratedDevelopmentEnvironment(IDE).
3. Implementsyntax rulesinVisualprogramming.
4. Explainvariablesanddatatypesusedinprogramdevelopment.
5. Writeand applydecisionstructuresfordeterminingdifferent operations.
6. Writeand applyloop structuresto performrepetitivetasks.
7. Writeandapplyprocedures, sub-procedures,andfunctionsto createmanageablecode.

Unit1:IntroductiontoDot.NetFramework

[6]

Introduction to DOTNET, DOT NET class framework, Common Language Runtime,Overview, Elements of .NET application, Memory Management, Garbage Collector: FasterMemory allocation, Optimizations, Common Language Integration, Common type system,Userand ProgramInterface

Unit2:IntroductiontoC# **[6]**

C# Language elements, Data types -Reference Type and Value Type, Boxing and Unboxing,Enum and Constant, Operators, Control Statements, working with Arrays and Strings,Parameterpassingtechnique:Pass byvalueand byreference, outparameters, Variablelengthparameter.

Unit3:ObjectorientedProgrammingConcepts

[8]

Working with Indexer and Properties, Constructor and Destructor, working with "static"Members, Inheritance & Polymorphism - Types of Inheritance - Constructor in Inheritance -Interface Implementation - Operator and method Overloading and overriding - Static andDynamicBindingandVirtual Methods, AbstractClass, sealed keyword.

Unit4:ExceptionHandlingandI/OProgramming

[8]

What is Exception, Rules for Handling Exception, Exception classes, Exception handlingkeywords, Throwing exceptions, Stream Classes, System.IO and Base classes of Stream,Console I/O Stream,Workingwith File, Directoryclasses.

Unit5:Delegates,Collectionclasses **[6]**

Introduction to Delegation, Types of delegates, Anonymous Methods, ArrayList, HashTable,Stack,Queue, Writingcustom genericclasses,workingwith GenericCollection Classes.

Unit6:WindowsFormsandADO.NET **[10]**

Controls: Common control Group, Data, control Group, Dialog control Group, Containercontrol Group, Menus and Context Menus: Menu Strip, Toolbar Strip. SDI and MDIApplications, Evolution of ADO.NET, Connected and Disconnect Classes, EstablishingConnection with Database, Executing simple Insert, Update and Delete, Statements,DataReaderandDataAdapter, Datasetand itsAdvantages, StoredProcedures.

ReferenceBooks:

- “ProgrammingC#”-JesseLiberty,O’ReillyPress.
- “ProfessionalC#”-Robinsonetal,Wrox Press,2002.
- “TheCompleteReference:C#”-HerbertSchildt,TataMcGrawHill.
- “TheCompleteReference:Ado.Net”-Jerke,TataMcGrawHill.
- “C#forprogrammer”-Deilte-Pearson

Type: DSE 4 A

CourseTitle:Advanced Java

(PaperCode:PaperXII)

CourseObjectives:

1. To learn GUIprogrammingusingswingTechnology
2. Tostudydatabaseprogrammingusing Java.
3. Tostudyweb development conceptusingServletand JSP
4. TolearnsocketprogrammingconceptusingNetworking.

CourseOutcomes: Upon successfulcompletionofthis course,studentswill beable to-

1. Design,create,build,and debugJavaapplications.
2. ExploreIntegratedDevelopmentEnvironment(IDE).

Unit1:Networking **[6]**

Basics,networkingclassesandinterfaces,usingjava.netpackage,doingTCP/IPandDatagramProgramming.

Unit2:IntroductiontoSwingTechnology

[10]

JApplet, JFrame and JComponent, Icons and Labels, Handling Threading issues, Text fields,JButton class, Check Boxes, Radio buttons, Combo boxes, Tabbed panes, Scroll panes, Tree,Tableand Menus.

Unit3:Working withdatabases **[6]**

Steps for Connecting to databases, Types of Drivers, Handling Exceptions, Creating andUsingStatementObjects,UsingStatementstoInsert,Update,DeleteDataintoaDatabase,UsingtheResultSet Class,Datanavigation, PreparedStatements,CallableStatements.

Unit4:Servlets **[10]**

Introduction, HTTP Request Model, Sending the HTTP Request, HTTP Request Methods,Servlet Architecture, Servlets Packages, Life Cycle of Servlet, Types of Servlet, HandlingHTTP Requests and Responses using GET and POST methods, Deployment Descriptors,Multithreading in Servlets, Session Tracking, Using Cookies, Servlet Filters-ImplementingtheFilter Interface,TheMVC Architecture.

Unit5:JavaServer Pages **[12]**

Introduction to JSP- JSP Development, Basic JSP Lifecycle, JSP Elements, Creating andDeploying a JSP Web Application, Using Implicit Objects- The Request Object, TheResponse Object, The Out Object-The Session Object, The config Object, The ExceptionObject, The Application Object, Using Standard Actions and Implicit Objects in JSP Pages,Translation and Compilation, Handling Error and Exceptions-Dealing with Exceptionsthrough the Page Directive, Dealing with Exceptions in the Deployment Descriptor, AddingException Handling in JSP Pages, Including and Forwarding from JSP Pages- ExpressionLanguage,Custom Actions andTagHandlers JSPStandard TagLibrary(JSTL).

Referencebooks:

- Javathecomplete ReferencebyHerbert Schildt
- JavaServlet ProgrammingbyJasan Hunter
- BeginningJavaEE5from NovicetoProfessionals byK. Makhar&C.Zelenk
- JavaServerProgrammingbyBayross &Shah
- Thinkingin javabyBrucel

Type:SEC3

CourseTitle:AdvancedPythonProgramming(Paper Code:PaperXIII)

CourseObjectives:

1. TolearnMultithreadedProgramming.
2. TolearnGUIprogrammingusingdifferent typesofpython modules.
3. TostudydatabaseprogrammingusingMySQL.
4. TostudyWeb serverprogrammingusingCGIandXML.
5. To study Statistical Data analysis and Generating Reports using pandas and matplotlibmodules.
6. TolearnsocketprogrammingconceptusingNetworking.

CourseOutcomes: Upon successfulcompletionofthis course,studentswill beable to-

1. Design,Create,Build,andDebugPythonapplications.
2. ExploreIntegratedDevelopmentEnvironment(IDE).

Unit1:Multithreading **[6]**

Understandingthreads,DifferencebetweenProcessand aThread,CreatingThreads,ThreadSynchronization,Deadlock of Threads,AvoidingDeadlock inaProgram.

Unit2:Networkingin Python **[5]**

IntroductiontoSocketsProgramming,ServerSocketMethods,ClientSocketMethods, IPAddress,URL, TCP/IP Server,TCP/IP Client, SendingE-mail Application.

Unit3:GUI Programming: **[11]**

Introduction, Advantages of GUI, Introduction to GUI library, Root Window, Working withContainers: Frame, Canvas Layout Management, Events and Bindings, Font, Colors, drawingon Canvas (line, oval, rectangle, etc.) Widgets: Label, Button, Checkbutton, Entry, Listbox,Message, Radiobutton, Text, Spinbox, Scrollbar, Menu etc. Writing Python Programs for GUIapplications.

Unit4:Database ConnectivityusingMySQL

[4]

Installation of MySQL Database Software, Installing MySQL Connector, Steps for DatabaseConnectivity, Working with MySQL Database: Inserting, Retrieving, Deleting and updatingthedataworkingwith Stored Procedure.

Unit5:IntroductiontoCGI ProgrammingandXML

[10]

Introduction to CGI, Architecture of CGI, Web Server Configuration, Http Header, CGIEnvironment Variables, GET and POST Methods, File Upload, Handling Cookies, Validationand Authentication, Accessing and Managing Users, Introduction to XML, XML ParserArchitectureandAPI's,ParsingXMLwithSAX API's,ParsingXMLwithDOMAPI's.

Unit6:Python forData Analysis **[8]**

Use of pandas module, Install and import module, Creating Series and DataFrame, UpdatingSeries and DataFrame, Exporting and importing data- Excel and MySQL, Introduction toplotting- use of matplotlib, Install and import matplotlib, statistical graphics using matplotlib-Univariate, Bivariate and Multivariate data, Pandas objects- Histograms, Density plot, Scatterplot,Hexbin plot, Boxplot

ReferenceBooks:

- AdvancedPython Programming-ByRichardOzer, 2017
- CorepythonProgramming- Dr.RNageswaraRao
- PandasforEveryonePythonData Analysis-ByDanielY. Chen · 2017
- Expert Python Programming,: Become a master in Python-By Michał Jaworski, TarekZiade
- MySQLforPython:DatabaseAccessMadeEasy- A.Lukaszewski

Type:DSE1BCourseT itle:SystemSecurity (PaperCode:PaperXIV)

CourseObjectives:

1. Tolearncryptographictools.
2. Tolearn securityissues regardinguser Authentication.
3. Tounderstandthevariousaccesscontrolmechanisms.
4. TolearnvarioustypesofmaliciousSoftwaresandDenial-of-Serviceattacks.

CourseOutcomes: Uponsuccessful completionof thiscourse, studentswill beable to-

1. Develop an understanding of information assurance as practiced in computer operatingsystems,distributed systems,networks and representativeapplications.
2. Gainfamiliaritywithprevalentnetworkanddistributedsystemattacks,defensesagainstthem, and forensics to investigate theaftermath.
3. Developabasicunderstandingofcryptography,howithasevolved,andsomekeyencryption techniques used today.
4. Developanunderstandingofsecuritypolicies(suchasauthentication,integrityand confidentiality),as well as protocols to implement such policies in the form ofmessageexchanges.

Unit1:Cryptographic Tools **[6]**

Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions,Public-Key Encryption, Digital Signatures and Key Management, Random andPseudorandomNumbers,PracticalApplication: EncryptionofStoredData.

Unit2:UserAuthentication **[6]**

Means of Authentication, Password-Based Authentication,Token-BasedAuthentication,BiometricAuthentication,Remote UserAuthentication,SecurityIssuesforUserAuthentication,Practical Application: An Iris Biometric System, Case Study: SecurityProblemsforATM Systems.

Unit3:AccessControl **[8]**

Access Control Principles, Subjects, Objects, and Access Rights, Discretionary AccessControl, Example: UNIX File Access Control, Role - Based Access Control, Case Study:RBACSystem for aBank.

Unit4:DatabaseSecurity **[6]**

The Need for Database Security, Database Management Systems, Relational Databases,Database Access Control, Inference, Statistical Databases, Database Encryption, CloudSecurity

Unit5:MaliciousSoftware **[10]**

Types of Malicious Software (Malware), Propagation– Infected Content– Viruses,Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail,Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload–Information Theft– Keyloggers, Phishing, Spyware, Payload–Stealthing–Backdoors,Rootkits,,Countermeasures

Unit6:Denial-of-ServiceAttacks **[8]**

Denial-of-ServiceAttacks,FloodingAttacks, Distributed Denial-of-Service Attacks,Application-Based BandwidthAttacks,ReflectorandAmplifierAttacks,DefensesAgainstDenial-of-ServiceAttacks, Respondingto aDenial-of-ServiceAttack.

ReferenceBooks:

- M.Stamp,“InformationSecurity:PrinciplesandPractice,”2stEdition,Wiley, ISBN:0470626399, 2011.
- M. E. Whitman and H. J. Mattord, “Principles of Information Security,” 4 st Edition,CourseTechnology,ISBN: 1111138214, 2011.
- M. Bishop, “Computer Security:Art and Science,” Addison Wesley, ISBN: 0 -201-44099-7, 2002.
- G.McGraw, “Software Security:Building Security In,” Addison Wesley, ISBN:0321356705, 2006.

Type:DSE2B

CourseTitle:CompilerConstruction(Paper Code:PaperXV)

CourseObjectives:

1. Tolearntheprocessoftranslatingamodernhigh-levellanguagetoexecutablecode.
2. To learn an understanding of the fundamental principles in compiler design and toprovidetheskillsneededforbuildingcompilersforvarioussituationsthatonemayencounterin acareer in ComputerScience.
3. Todevelopanawareness ofthefunctionand complexityofmoderncompilers.
4. To apply the code generation algorithms to get the machine code for the optimizedcode.
5. Torepresentthetargetcodeinanyoneofthecodeformats
6. Tounderstandthemachinedependentcode
7. Todrawtheflowgraphfortheintermediatecodes.
8. Toapplytheoptimizationtechniquestohaveabettercodeforcode generation

CourseOutcomes:

1. Togivesyouwithboththeoreticalandpracticalknowledgethatiscrucialinordertoimplement aprogramminglanguage.
2. It gives you a new level of understanding of a language in order to make better useofthelanguage(optimization is just oneexample).

Unit1:Introductiontocompiling [4]

Compiler, self-compiler, cross compiler, boot strapping , phases of compiler, compilerconstructiontools,asimpleonepass,twopassandmultipasscompiler,factoraffectingpassstructureofcompiler.

Unit2:Lexical Analysis [6]

Roleoflexicalanalyzer,inputbuffering,specificationandrecognitionoftokens,finiteautomataimplications, designingalexical analyzergenerator

Unit3:SyntaxAnalysis **[8]**

RoleofParser,writinggrammarsforcontextfreeenvironments,topdownparsing,recursivedescen t and predictive parsers (LL), Bottom-up parser, Operator precedence Parsing, LR,SLRandLALRparsers.

Unit4:SyntaxDirectedTranslation **[6]**

Syntax directed definitions, construction of syntax tree, bottom-up evaluation of S-attributeddefinitions, L-attributed definitions, Top-down translation and Bottom – up evaluation ofinheritedattributes,analysis of syntax directed definitions.

Unit5:Runtime environments **[4]**

Sourcelanguageissues,storageorganizationandlocationstrategies,parameterpassing,symboltabl eorganization andgeneration, dynamicstorage allocation.

Unit6:Intermediatecodegeneration **[4]**

Intermediate languages, declarations, assignments statements and Boolean expressions, casestatements,back patching, procedurecalls.

Unit7:Codegeneration **[6]**

Issuesindesignofacodegeneratorandtargetmachine,runtimestoragemanagement,basicblocks and flow graphs, next use information and simple code generator, issue of registerallocation, assignment and basic blocs, code generationfrom DAG and the dynamic codegenerationalgorithm.

Unit8:Code optimization **[6]**

Source of optimization, peephole optimization and basic blocks loop in flow graphs, dataflow analysis and equations, code improving transformation and aliases, data flow analysisandalgorithms,symbolicdebuggingof optimizedcode.

ReferenceBooks:

- Compilers Priciple,Techniques,ToolsbyAho,Lam,Sethi and Ulman
- CompilerDesignbyWihelm,Mauer
- CompilerDesign:Theory,ToolsandExamplesbyBergamann

Type:DSE3B

Course Title: Internet Programming using ASP.Net(PaperCode:PaperXVI)

CourseObjectives:

1. TounderstandtheAsp.netarchitecture.
2. Tolearnthevariouswebservercontrolsandvalidationcontrols.
3. Toknowtheconceptofmasterpage,themesandsitenavigation.
4. Tounderstandthestatemanagementtechniquesanditstypes.
5. TolearnAjaxclient and server sitetechnology.
6. Toknowthewebservices
7. Tolearnthe differentdatatransactionsusingADO.NET

CourseOutcomes: Uponsuccessfulcompletionofthis course,studentswillbeableto-

1. Create,Design,DebugandDeployWebapplications.
2. ExploreIntegratedDevelopmentEnvironment(IDE).

Unit1:IntroductionofAsp.Net

Evaluation of Asp.Net, Fundamentals of ASP.NET, Understanding architecture ASP.NET,CompilationTechniqueofASP.Net,ApplicationLocation,WebPage andWebSite lifecycle,ASP.Net Page Structure, Page Directives, Self-page and Cross page posting, Postback andViewStateconcepts,Application Folders.

Unit2:WebServerControl

Creating ASP.NET Pages – Web Forms, Working with web controls – Standard, controlgroup, Rich Controls, Different type of List controls, FileUpload, AdRotator, MultiView,Calendar,CreateWebUser Control

Unit3:Validationcontrols

Introductionofvalidation,Typesofvalidation,ValidationControls,ValidationGroups.

Unit4:MasterPagesandThemes

Need of Master Pages, Basics of master pages, Creating Master and Content pages,Programmaticallyassign masterpages, NestedMasterpages,Eventorderingofmasterpages,

BasicThemesandSkins,CreatingandUsingThemes,Definingmultipleskins,Programmaticallyworkingwiththemes.

Unit5:SiteNavigation

SiteNavigationtechnique,SiteMapPath,TreeViewandMenuControl,Nestingsitemapfile,AttachXMLfileto treeviewand menu.

Unit6:StateManagement

Introductionofstatemanagement,technique,TypesofStateManagementtechnique-Clientsideand server sideStateManagement.

Unit7:AJAX

WhatisAJAX andneedforAJAX, Clientsideand server sideAJAX,ImplementingAJAXwith JavaScript, Using ASP.NET Ajax Control toolkit, Working with AJAX's Server sidecontrols,ScriptManager,ScriptMangerProxy,Updatepanel,UpdateProgress,Timer.

Unit8:WebServices

WhatisWebService?UnderstandingSOAP,WSDL,Proxyetc.CreatingWebservices,Howtoconsumewebservices,to buildanWebService application andClient

Unit9:StoringandRetrievingDatawithADO.NET

Accessing Data with ADO.NET, Using Data Sets on Web Forms, Processing Transactions,WorkingwithDMLcommands.

ReferenceBooks:

- "ProfessionalASP.Net"-Evjen, Sivkumar,WroxPress.
- "TheCompleteReference:Asp.Net"-MacDonald, TataMcGrawHill.
- "TheCompleteReference:Ajax"- Powell,Tata McGrawHill.
- "Asp.NetStepbystep"-GeorgeShephera-MicrosoftPress
- Completereferencecrystalreports-GeogrePeak.

Type: DSE 4

BCourse Title: Angular JS(PaperCode:PaperXVII)

Courseobjectives:

1. Reducetheamountofcode youwritetobuildrichuserinterface applications.
2. Increasethereliabilityand maintainabilityofUIbyusingdata binding.
3. Retrievedatafromback-endserver,manipulateit anddisplayitwithease.
4. Modularizeyourcodewiththecustomservicesanddirectives.
5. Providingtwowaybindingof data.
6. Create SinglePageApplications (SPA).

CourseOutcomes: Uponsuccessfulcompletionofthiscourse,studentswillbeableto-

1. Create,Design,DebugandDeployWebapplications.
2. ExploreIntegratedDevelopmentEnvironment(IDE).

Unit1:IntroductiontoJavaScript **[8]**

Including scripts on a page, adding statements or expressions, comments, functions,parametersandreturnvalues,primitivetypes,JavaScriptoperators,EqualityVs.Identity, pre,postincrement,Reading andmodifyingobjectsproperties,addingmethodstoobjects,Control flow statements, working with arrays, Error handling mechanisms usingtry/catch/finally,throwingour ownexceptions.

Unit2:BasicsofAngularJS **[9]**

Introduction to Angular JS, Features of Angular JS, MVC Architecture, Setting up theEnvironment, First Simple Application, Working with Directives- Directive lifecycle, UsingAngular JS built-in directives, Core Directives, Conditional Directives, Style Directives,MouseandKeyboardEventsDirectives,Matchingdirectives,creatingacustomdirective .

Expressions and Data Biding- Number and String Expressions, Object Binding andExpressions,WorkingwithArrays,ForgivingBehavior,Understanding Data binding.

Unit3:Controllers **[6]**

UnderstandingControllers,ProgrammingControllersandscopeobject,AddingBehaviorto aScope Object, Passing Parameters to the Methods,Array as members in Controller Scope,NestedControllersand Scope Inheritance,MultipleControllers andtheirscopes.

Unit4:FiltersandModules **[6]**

Filters:Built-infilters,Uppercaseand LowercaseFilters,CurrencyandNumberFormattingFilters, OrederBy Filter, Filter Filter, Creating custom filters. AngularJS Modules-Introduction to Angular JS Module,Module Loading and Dependencies, RecommendedSetupofApplication, Creation vs Retrieval.

Unit5:Forms **[10]**

Angular JS Forms: Working with Angular Forms, Model binding, Understanding DataBinding, Binding controls to data, Form controller, Validating Angular Forms, Form events,Updatingmodelswithatwist,$errorobject,Scope-Whatisscope,Scopelifecycle,Twowaydatabinding,Scopeinheritance,Scopeandcontrollers,Scopeanddirectives, $applyand $watch,Rootscope,Scopebroadcasting,Scopeevents.

Unit6:ServicesandAjaxinAngularJS

[5]

Understanding Services, Developing Creating Services, Using a Service, InjectingDependenciesin aService.
$httpService,$qService,AjaxImplementationusing$httpand $qService

ReferenceBooks:

- BeginningAngularJS-ByAndrewGrant- 2014
- ProfessionalAngularJSby DiegoNettoandValeriKarpov-Wroxpress
- LearningAngularJSbyBradDayley-Addison-WesleyProfessiona
- AngularJSbyBradGreenandShyamSeshadri-O'Reilly

Type:SEC4

CourseTitle:MobileApplicationDevelopment(Paper Code:PaperXVIII)

CourseObjectives:

1. TounderstandAndroidplatformanditsarchitecture.
2. Tolearnaboutmobiledevicestypesanddifferentmodernmobileoperatingsystems.
3. TolearnactivitycreationandAndroidUserInterfacedesigning.
4. TolearnbasicsofIntent,BroadcastandInternetservices.
5. Tolearnaboutdifferentwirelessmobiledatatransmissionstandards.
6. Tounderstandandlearnhowtointegratebasicphonefeatures,multimedia,cameraandLocationbased servicesinAndroidApplication.
7. Tolearnaboutdifferentsystemsformobileapplicationdevelopment,deploymentanddistributioninMobilemarket place(Android, IOS).
8. Tounderstandand carryoutfunctionalteststrategiesformobileapplications.

CourseOutcomes: Uponsuccessfulcompletionofthiscourse,studentswillbeableto-

1. Create,Design,Debugand DeployAndroidapplications.
2. ExploreIntegratedDevelopmentEnvironment(IDE).

Unit1:Introduction

WhatisAndroid,AndroidVersionsandits FeatureSet,VariousAndroidDevices ontheMarket, Android Market Application Store, Android Development Environment, SystemRequirements,AndroidSDK, InstallingJava, and ADTbundle- Eclipse IntegratedDevelopmentEnvironment(IDE),CreatingAndroidVirtualDevices (AVDs).

Unit2:AndroidArchitecture OverviewandApplication

AndroidSoftwareStack,TheLinuxKernel,AndroidRuntime-DalvikVirtualMachine,AndroidRuntime–Core Libraries,DalvikVMSpecificLibraries, JavaInteroperabilityLibraries,Android Libraries, Application Framework, Creating a NewAndroid Project, Defining the Project Name and SDK Settings, Project ConfigurationSettings, Configuring the Launcher Icon, CreatinganActivity,RunningtheApplicationintheAVD,StoppingaRunning Application,Modifyingthe Example Application,ReviewingtheLayoutand ResourceFiles.

Unit3:AndroidSoftware DevelopmentPlatformandFramework

Understanding Java SE and the Dalvik Virtual Machine, The Directory Structure of anAndroid Project, Common Default Resources Folders, The Values Folder, LeveragingAndroid XML, Screen Sizes , Launching Mobile Application: The AndroidManifest.xml File,Android Application Components, Android Activities:Defining the UI, Android Service s:Processingin the Background, Broadcast Receivers: Announcementsand NotificationsContent Providers: Data Management, Android Intent Objects: Messaging for Components,AndroidManifestXML:DeclaringYour Components.

Unit4:UnderstandingAndroidUserInterfaces,ViewsandLayouts

Designingfor Different Android Devices, Views and View Groups, Android LayoutManagers, The View Hierarchy,DesigninganAndroidUserInterfaceusingtheGraphicalLayoutTool,DisplayingTextwithTextView,RetrievingDatafromUsers,UsingButtons, Check Boxes and Radio Groups, Getting Dates and Times from Users, UsingIndicators to Display Data to Users, Adjusting Progress with Seek Bar, Working with Menususing views, Gallery, Image Switcher, Grid View, and Image View views to display images,CreatingAnimation.

Unit5:Databases,Intents,Location-basedServices

Saving and Loading Files, SQLite Databases, Android Database Design, Exposing Access toa Data Source through a Content Provider,ContentProviderRegistration,NativeContentProvidersIntentsandIntentFilters:Intent Overview,ImplicitIntents,CreatingtheImplicitIntent Example Project, Explicit Intents, Creating the Explicit Intent Example Application,IntentswithActivities,Intentswith BroadcastReceivers.

Unit6:ApplicationDevelopment

SendingSMS MessagesProgrammatically,GettingFeedbackafter Sendingthe Message,Sending SMS Messages Using Intent Receiving, Sending email, Introduction to location-basedservice,ConfiguringtheAndroidEmulatorforLocation-BasedServices,Geocodingand Map-Based Activities Multimedia: Audio, Video, Camera: Playing Audio and Video,RecordingAudio andVideo,Usingthe Camera toTake and ProcessPictures.

ReferenceBooks

- AndroidProgrammingUnleashed(1stEdition)byHarwani.
- BeginningMobileApplicationDevelopmentintheCloud (2011),Richard Rodger.

- LearnAndroidApp DevelopmentbyWallaceJackson.
- ProfessionalAndroidApplicationDevelopmentbyRetoMeier.

PracticalAssignmentson DSE2Aand DSE2B

Tool:JFLAP

PracticalAssignmentson DSE 2A: (Theory ofComputerScience)

ThestudentsareexpectedtounderstandJFLAPtoolsanddesigningsuitableautomatatorecognizethe followingandtest theoutput asstringaccepted orrejected.

1. Design aDFAwhich accept stringisstartwithaover∑={a,b}.
2. Design aDFAwhich acceptnumberisevenorodd.
3. Design aDFAwhich acceptstringeitherendingwithaorbcover ∑={a,b,c}.
4. DesignaDFAwhichacceptstringdoesnot havingabcassubstringover∑={a,b,c}.
5. DesignDFAwhichacceptstringslengthisoddover∑={0,1}.
6. DesignMooremachine forfindingbinaryisevenor odd.
7. DesignaMealymachine for1'scomplementofbinarynumber.
8. Design Mealymachinefor accepting 2's complement ofbinarynumber.
9. Removalunitproductionoffollowinggrammar;

I) A -> BB -> aB- >b	II) S -> AS -> bbA -> BA -> bB->a B->S

10. Removalε-productionof followinggrammar;

I) S -> aSaS -> bSbS - >ε	II) S->aS- >Xb S- >aYaX - > YX- >ε Y->b Y->ε

11. ConvertfollowingContextFreeGrammar(CFG)toChomskyNormalForm(CNF);

I) S- >ABABA- >Aa A- >aB- >b	II) S- >ABAA- >aAA->ε B->bB B->ε

12. Design aPDAforacceptingpalindromestringover∑={0,1}.

13. DesignaPDAto checkwhethera given stringover{a,b}endsinabb.

14. DesignTMfor L={$a^n b^n$|n>1}.

15. ConstructTuringmachinefor copystringover ∑={a,b}.

16. ConstructTuringMachinethatrecognizethelanguage:

17. L={xϵ{0,1}*|xends in 00}.

PracticalAssignmentsonDSE2B:(CompilerConstruction)

1) ConvertfollowingGrammartoLLGrammar;

I)	S -> ABcCA- >aA A->ϵ B -> bbBB->ϵ C ->BA	II)	S -> ABcCA- >aA A->ϵ B- >bbBB- >ϵ C->BA

2) Build LL(1)parsetable forfollowingGrammar andfindoutLL(1)ornot;

I.	S ->A A -> aaAA->b	II.	E- >E+TT - > T*FF- >(E)F-> a
III.	S -> aAS-> aA->a	IV.	S -> ASS->a A->SA A->b
V.	S -> BAcA -> aAA->a B -> ABB -> bBB->d		

3) BuildSLR(1)parsetableforfollowingGrammar and findoutLL(1)ornot;

I.	S->AS -> BA - > aAA- >bB- >dB B->b	II.	E- >E+TT - > T*FF- >(E)F-> a
III.	S -> AAS - >aA A->b	IV.	S->A A- >aaAA- >b
V.	S ->AbA ->aAA- >ab A->ϵ		

PracticalAssignmentson DSE3AandDSE3

BPracticalAssignmentsonDSE3A: (Visual Programming)

1. Writeaprogramtocheck enterednumberiseven orodd.
2. Writeaprogramto getnumberanddisplaysumofdigits.
3. Writeaprogramtocheck whetherenteredyearisleapyearornot.
4. Writeaprogramtodisplaydateinvariousformats.
5. Write aprogramtoillustrate theUse ofAccess Specifiers.
6. WriteaProgramtocreatesealedclass.
7. WriteaProgramtoperformboxingandunboxingoperation.
8. WriteaProgramtodemonstratemultilevelinheritance.
9. WriteaProgramtodemonstratesinglelevelinheritance.
10. WriteaProgramtodemonstratemultilevelinheritancewithvirtualmethods.
11. WriteaProgramtogetlowerboundandupperboundofanarray.
12. WriteaProgramtodemonstratejaggedarray.
13. WriteaProgramtofindMinimumandMaximumofnumbers.
14. WriteaProgramtosearchelementsofanarray.
15. WriteaProgramtocopyasectionofonearraytoanother.
16. WriteaProgramtodemonstrateabstractproperties.
17. WriteaProgramtoimplementdelegates.
18. WriteaProgramtocombinetwodelegates.
19. WriteaProgramtoimplementmulticastdelegate.
20. WriteaProgramtodemonstrateDivideByZeroException.
21. WriteaProgramtodemonstrateMultipleexceptions.
22. WriteaProgramtocreateafile.
23. WriteaProgramtoRead theContentsofFile.
24. WriteaProgramtoCreateDirectory.
25. WriteaProgramtoimplementBinaryReader.
26. WriteaProgramtoRead LinefromFileuntilendoffileisreached.
27. WriteaProgramtoDesignuserinterfaceusingallwindowscontrols.
28. Write a ProgramtodesignMDIapplication.29.WAPtodemonstrateADO.NET.
29. WriteaProgramtodemonstrateInsert,UpdateandDeleteStatements.

PracticalAssignmentsonDSE3B: (InternetProgrammingusingASP.Net)

1. Designwebpageforstudentadmissionwhichusesl Label,TextBox,RadioButton,Chec kBox,ListClass,ButtonClass,Calendar,Image, FileUploadetc.controls.
2. Designscientificcalculator.
3. Designwebpagewhichdemonstratecommandnameproperty.
4. Design web page which demonstrate which code is execute at first either server sideorclient side.
5. Design webpageforSelf PagePostingandCrossPagePosting.
6. Design web page which demonstrate App_code using class library. Class librarycontainsmethodswhich checksodd,even,prime,Armstrong,Palindrome, StrongandMagicnumber.
7. DesignwebpagewhichdemonstrateApp_GlobalResourcesandAp p_LocalResources.
8. Designwebpagewhich demonstratepagelifecycleandwebsitelifecycle.
9. Designsimpleapplicationwhich displaysselectedcheckboxesandradiobutton.
10. Designawebpageforimagemappingusingstatic anddynamicmethod.
11. Demonstrateallmethodsofinsertionofitemin list class.
12. Design web page which displays all system fonts, system colors, font size in ListClass.Displaytextmessage accordingtotheselectedfont,sizeandcolor.
13. DisplayCurrentYearcalendar.Thiscalendarshowsallholidaysin Redcolorwithinform ation.
14. Displayselecteddateinatleast10differentformats.
15. Designs XML file which shows College-Stream-Department-Staff-name-quali-exp-subject.
16. Displayatleast10differentadvertisements.
17. DesignawebpageforWizardandMultiViewcontrol.
18. Designawebpagewhichdisplays10 textboxcontrolsbyusingcontrolarraymethod.
19. Designwebpagewhichusesallvalidationcontrolswithvalidationgroupproperty.
20. DesignNestedmasterpagesusingthemes.
21. Designwebpagewhich demonstrateworkingofDMLQueries.

PracticalAssignmentson DSE4Aand DSE4B

PracticalAssignmentsonDSE4A:(AdvancedJava)

1. Writeajavasocketprogramminginwhichclientsendsa textandserverreceivesit.
2. WriteaprogramtodemonstrateURLclass.
3. WriteaprogramtodemonstrateInetAddressclass.
4. WriteaprogramtodemonstrateuseofDatagram Socket.
5. Writeaprogramtocreate StudentregistrationformusingSwingComponent.
6. WriteaprogramtodemonstrateJTabbedPane,JScrollPaneandJTreeCo mponent.
7. WriteaprogramforinsertingdataintotableusingPreparedStatement.
8. WriteaprogramforupdatingdataintotableusingPreparedStatement.
9. WriteaprogramfordeletingdataintotableusingPreparedStatement.
10. Writeaprogramtodemonstratecallablestatement.
11. Writeaservletbasedprogramtodisplay“Hello!”messageonbrowser.
12. Writeaprogramthatreadsparametersfromservletanddisplayit.
13. WriteaservlettohandleHttpGETRequest.
14. WriteaservlettohandleHttpPOSTRequest.
15. Writeaservletbasedprogramthatwilladdthecookieanddisplayallthecookiesstored.
16. Writeaservletbasedprogramthatwilldisplaythelastlogindateandtimeofauser.
17. Writeaservletbasedprogramthewilldisplayhowmanytimes auservisitedtothepage.
18. WriteaprogramthatimplementsFilterinterfaceandservletfiltermappinginweb.x ml.
19. Writeaservletbasedprogramforloginformvalidation.
20. Create a simple HTML form, Example.html, which allows a user to enter a number.Example.html submits the number captured to the web server when the user clicks onthe form’s Submit button. The web server executes Example.jsp code spec andrespondswithanHtmlpagewithHelloWorld!Repeatedasmanytimesasspecified.
21. Createajsp pagethatwill displaycurrent data andtime.
22. Create a user interface that accepts data using an Html form and display the same onpagesubmission.

23. Createanhtmlpage[userinterface] forcapturingBookinformation.Thisform willacceptdatafrom the useranddisplaythe same upon pagesubmission.
24. Create an html page [user interface] for capturing Book information. This form willacceptdatafrom the useranddisplaythe same upon pagesubmission.
25. Createthefollowingfilestodemonstratethe<jsp:forward>actionelement:
26. Writeanapplicationtodemonstratethe<jsp:plugin>actionelement.
27. Create a registration form using action elements, perform the following steps:register.jsp- This file holds the actual registration form interface. The data capturedhere is submitted to the process.jsp file for further processing. Process.jsp- This filevalidates the form contents i.e. data captured using a method of FormBean.java and ifdata is found valid, then control is forwarded to success.jsp file. If data if foundinvalid then control is shifted back to register.jsp file. Success.jsp- This file retrievesthe captured and validated data using bean and displays the same. FormBean.java-Thisfiledoesthe actual validation.
28. Createajsppagethatusesthe implicitobject.
29. Createacustom taganduseitin ajsppage.

PracticalAssignmentsonDSE4B:(AngularJS)

1. Write anAngularJSsimple HelloWorld! Program.
2. WriteanangularJSprogramthatdisplayyourRollNo,NameandClassofstudent.
3. WriteanangularJSprogramwhichdemonstratethatone-waydatabindingandtwo-waydata binding.
4. WriteanangularJSprogramwhichdemonstrateng-cut,ng-copy,ng-pastedirective.
5. WriteanangularJSprogramwhichdemonstratedifferentdirective relatedtokeyboard.
6. WriteanangularJSprogramwhichdemonstrateconditionaldirective.
7. WriteanangularJSprogramforcreatingcustomdirectivewhichdisplayemployeeidandname.
8. WriteanangularJSprogramwhichdemonstratealltypesofexpressions1)Numberexpression2) Stringexpression 3)Objectexpression 4)Arrayexpression
9. WriteanangularJSprogramtodemonstrateuseofnestedcontroller.
10. WriteanangularJSprogramtodemonstratemultiplecontroller
11. WriteanangularJSprogramtodemonstratejsonfilter
12. WriteanangularJSprogramtodemonstratecustomfilter
13. WriteanangularJSprogramtodesignsimplesinglepageapplication.
14. WriteanangularJSprogramtocreateCustomvalidationin.

CourseTitle:ProjectWork

Instructions:

1. Teamsizeformajorprojectnotexceedthantwostudents.
2. RealtimeandliveprojectfollowedbyPresentationandViva-Voce.

Equivalent Subject for Old SyllabusB.Sc. (Entire Computer Science) - III (Semester –V and VI)

Semester-V		
Sr. No.	**Name of the Old Paper (w.e.f.2018-19)**	**Name of the New Paper (w.e.f.2021-2022)**
1	English	English (Business English) Paper-II Part-A (Sem-V)
2	Data Communication and Networking - I	Data Communication and Networking(Sem-V)
3	Theory of Computer Science	Theory of Computer Science(Sem-V)
4	Visual Programming - I	**No Equivalence**
5	Web technology and E-commerce –I	**No Equivalence**
6	Python – I	**No Equivalence**
Semester-VI		
Sr. No.	**Name of the Old Paper (w.e.f.2018-19)**	**Name of the New Paper (w.e.f.2021-2022)**
1	English	English (Business English) Paper-II Part-B (Sem-VI)
2	Data Communication and Networking – II	System Security(Sem-VI)
3	Advanced Java	Advanced Java (Sem-V)
4	Visual Programming -II	Visual Programming (Sem-V)
5	Web technology and E-commerce –II	Internet Programming using ASP.Net(Sem-VI)
6	Python - II	Advanced Python Programming (Sem-V)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited (2015)

'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Botany

Name of the Course: B.Sc. Part- III (Semester V & VI)

[Draft Syllabus to be implemented- w.e.f. June 2021]

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science- New Choice Based Credit System (CBCS) [w.e.f. 2021-22]

Draft Structure for B.Sc. Part- III

Subject/ Core Course	Name and Type of the Paper	No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Name		L	T	P				
Class:	**B.Sc. Part- III Semester- V**								
Ability Enhancement Course (AECC)	**English (Business English)**	Paper- III	4.0	--	--	50	40	10	2.0
Discipline Specific Elective (DSE) (Students can opt any one) Subjects among the three Subjects excluding interdisciplinary offered at B.Sc. Part- II.	**DSE- 1A Plant Systematics**	Paper- IX	4	--	--	100	80	20	4.0
	DSE- 2 A	Paper -X	4	--	--	100	80	20	4.0

	Genetics								
	DSE- 3 A **Molecular Biology**	Paper- XI	4	--	--	100	80	20	4.0
	DSE 4 A **Plant Breeding** **Economic Botany**	Paper-XII Paper-XII	4	--	--	100	80	20	4.0
	(Add-on-self learning)-Skill deveoplment course / College run courses /MOOC/SWAIM/ INTRSHIP/Apprentiship		--	--	--	100	80	20	4.0
Grand Total			**20.0**	**--**	**--**	**450**	**360**	**90**	**22**
Class:	**B.Sc. Part- III Semester- VI**								
Ability Enhancement Course (AECC)	**English** **(Business English)**	Paper IV	4.0	--	--	50	40	10	2.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.	**DSE- 1B** **Plant Pathology**	Paper - XIII	4.0	--	--	100	80	20	4.0
	DSE- 2B- **Plant Biotechnology**	Paper-XIV	4.0	--	--	100	80	20	4.0
	DSE- 3B- **Cell Biology**	Paper-XV	4.0	--	--	100	80	20	4.0
	DSE 4B- **Nursery, Gardening & Horticulture**	Paper-XVI	4.0	--	--	100	80	20	4.0

	DSE 4B- Biostatistics	Paper XVI	4.0	--	--	100	80	20	4.0
Total (Theory)			**20.0**	**--**	**--**	**450**	**360**	**90**	**18**
DSE - Practical (Annual Exam)	**DSE- 1 A & B**	Practical- IX & XIII	--	--	5	100	80	20	4.0
	DSE -2 A & B	Practical- X&XIV	--	--	5	100	80	20	4.0
	DSE- 3 A & B	Practical- XI&XV			5	100	80	20	4.0
	DSE- 4 A & B	Practical- XII & XVI			5	100	80	20	4.0
Total (Practical's)					**20**	**400**	**320**	**80**	**16**
Grand Total			**32.0**		**20**	**1300**	**1040**	**260**	**56**

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total – credits
B.Sc.-I	I	500	20	--	--	20
	II	550	20	400	16	36
B.Sc.-II	III	350	14	--	--	14
	IV	350	14	300	12	26
B.Sc.-III	V	500	22	--	--	22
	VI	500	18	400	16	34
Total		2750	110	1100	44	154

B.Sc. Programme:

Total Marks : Theory + Practical's = 2750 +1100 =3950

Credits : Theory + Practical's = 110 + 44 = 154

Numbers of Papers:	Theory: Ability Enhancement Course (AECC)	05
	Theory: Discipline Specific Elective Paper (DSE)	08
	Theory: DSC	12
	Skill Enhancement Courses/Add on	01
Total:	Theory Papers	31
	Practical Papers	11

Abbreviations:

L: Lectures
P: Practical's
CA: College Assessment
AEC: Ability Enhancement Course
SEC: Skill Enhancement Course
CA: Continuous Assessment

T: Tutorials
UA: University Assessment
DSC/CC: Core Course
DSE: Discipline Specific Elective Paper
GE: Generic Elective
ESE: End Semester Examination

Semester- V

PLANT SYSTEMATICS

Paper- IX

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit 1: Descriptive Terminology **(25 Lecture)**

1.1 : Habitat.

1.2 : Habit and life span.

1.3 Roots- Types and modification.

1.4 : Stems- Types and modification.

1.5 : Leaves- Types and modification.

1.6: Inflorescence- Racemose types, Cymose types, Specialized types.

1.7: Flower- Calyx, Corolla, Perianth, Androecium, Gynoecium.

1.8: Fruit- Simple fruits, Aggregate fruits, Multiple fruits.

1.9: Floral formula and Floral diagram.

Unit 2: Species Concept, Identification and Nomenclature **(05 Lectures)**

2.1: Species definition and Species concept (Typological, Non-dimensional Multi-dimensional species concept).

2.2 : Identification of plants.

2.3 : Nomenclature, Binomial nomenclature of plants.

2.4: Principles of ICBN.

Unit 3: Herbarium and Botanical Garden **(7 Lectures)**

3.1 : Herbarium- Steps in preparation and significance.

3.2 : Botanical gardens of India- Sir J. C. Bose Botanical Garden, Calcutta & Lead Botanical Garden of Shivaji University Kolhapur.

Unit 4: Systems of Classification **(8/ Lectures)**

4.1: Outline of Bentham and Hookers system of classification. Merits and demerits of Bentham and Hookers system of classification.

4.2 Outline of APG III system of classification of Angiosperm Phylogeny Group.

4.3: Merits and Demerits of APG III system of classification.

Unit 5: Families of Angiosperms (15 Lectures)

5.1 Study of following Angiosperms families; follow the Bentham & Hookers System of classification.

1. Annonaceae	2. Malvaceae	3. Rutaceae
4. Rubiaceae	5. Bignoniaceae	6. Lamiaceae
7. Nyctaginaceae	8. Polygoniaceae	9. Orchidaceae
10. Poaceae.		

Suggested Readings-

1. Cooke, T. 1901–1908. *The Flora of The Presidency of Bombay.* London. (B.S.I. Reprint). Calcutta, Vols. I, II & III, 1958.
2. Gaikwad, S. P. & Garad K. U. 2016. *Flora of Solapur District.* Laxmi Book Publication, Solapur.
3. Singh, N. P. & Karthikeyan, S. (edt.) 2000. *Flora of Maharashtra State, Dicotyledones.* vol. I.& IIBotanical Survey of India, Calcutta.
4. Gurucharan S. 2010. *Plant Systematics- Theory and Practice.*Science Publishers, Enfield, NH, USA an imprint of Edenbridge Ltd., British Channel Islands Printed in India.
5. Naik V. N. 2005. *Taxonomy of Angiosperms*. Tata McGrew- Hill Publishing Company Limited, New Delhi.

GENETICS

Paper- X

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit1: Heredity **(15 Lectures)**

1.1: Introduction to genetics.

1.2: Brief life history of Mendel.

1.3: Terminologies.

: Mendel's Laws of Inheritance:

A) Law of dominance,

B) Law of segregation,

C) Law of independent Assortment.

1.5: Back cross, Test cross.

1.6. Gene Interaction.

Unit 2: Linkage and Crossing over **(10 Lectures)**

2.1: Linkage: concept & history

2.2: Complete & Incomplete linkage, Bridges experiment.

2.3: Coupling& Repulsion, recombination frequency.

2.4: Linkage maps based on two and three factor crosses.

2.5: Crossing over: concept and significance,

cytological proof of crossing Over.

Unit 3: Sex-determination and Sex-linked Inheritance **(15 Lectures)**

3.1: Autosomes and sex chromosomes.

3.2: Mechanism of sex determination.

3.3: Sex chromosomes in *Drosophila*.

3.4: Sex chromosomes in man.

3.5:Balance concept of sex determination in *Drosophila*- Bridge's Experiment.

3.6 : Sex linked inheritance in man:

a) Colour blindness.

b) Haemophilia.

c) Holandric gene

Unit 4: Quantitative inheritance (5 Lectures)

4.1: Quantitative traits, continuous variation.

4.2: Polygenic trait in corolla length in *Nicotiana*, cob length in *Zea mays.*

4.3: Population genetics. Hardy –Weinberg's law, Factors affecting on gene and gene frequencies.

Unit 5: Cytoplasmic inheritance (15 Lectures)

5.1: Mitochondrial and Chloroplast genome.

5.2: Inheritance of chloroplast genes (*Mirabilis jalapa* and *Zea mays*).

5.3: Inheritance of mitochondrial genes (Petite in Yeast and cytoplasmic male sterility in plants).

5.4: Interaction between cytoplasmic and nuclear gene.

5.5: Maternal effect in inheritance.

Suggested Readings-

1. Plant Chromosomes: Analysis Manipulation and Engineering. Hawood Sharma A K and Sharma A.1999: Academic Publishing Co. Ausrtalia.
2. Principles of Gene Manipulation. Old R. W. and Primrose, S. B.1989 Blackwell Scientific Publications. Oxford UK.
3. Genetics: M. L. Shrivastav, Shri Publishers and Distributors, Ansari Road New Delhi,110002.
4. Genetics, P. K. Gupta, Rastogi Publications, Meerut, 250002.
5. Genetics and Evolution, H. S. Bhamrah, Kavita Juneja, Anmol Publications, Pvt. Ltd. New Delhi,110002

MOLECULAR BIOLOGY

Paper- XI

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit 1: Nucleic acids **(05 Lectures)**

1.1: Introduction.

1.2: Historical perspective.

1.3: DNA as the carrier of genetic information (Griffith's experiment).

Unit 2: The Structures of Genetic Material **(15 Lectures)**

2.1: Introduction.

2.2: Structure of DNA: Watson and Crick model.

2.3: Salient features of double helix.

2.4: Types of DNA.

2.5: Denaturation and renaturation of DNA.

2.6: Organization of DNA in Prokaryotes and Eukaryotes.

2.7: Structure of RNA.

2.8: Types of RNA.

Unit 3: Replication of DNA **(10 Lectures)**

3.1: Introduction.

3.2: Synthesis of DNA (Kornberg's discovery).

3.3: Replication of DNA in prokaryotes and eukaryotes.

3.4: Enzymes involved in DNA replication.

Unit 4: Transcription **(15 Lectures)**

4.1: Introduction.

4.2: Transcription in prokaryotes and eukaryotes.

4.3: Principles of transcriptional regulation.

4.4: Prokaryotes: Regulation of lactose metabolism in *E. coli.*

4.5: Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormone.

Unit 5: Translation **(15 lecture)**

5.1: Introduction.

5.2: Structure of Ribosome.

5.3: Assembling of Ribosome and m-RNA.

5.4: Charging of t-RNA and aminoacyl t-RNA synthetases.

5.5: Steps in protein synthesis

5.6: Proteins involved in initiation, elongation and termination of polypeptides.

5.7: Post-translational modifications of proteins.

Suggested Readings-

1. Watson J.D., Baker, T. A., Bell, S. P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition.
2. Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons Inc., U. S. A. 5thedition.
3. Klug, W. S., Cummings, M. R., Spencer, C. A. (2009). Concepts of Genetics. Benjamin Cummings U.S.A. 9th edition.
4. Russell, P. J. (2010). i-Genetics- A Molecular Approach. Benjamin Cummings, U. S. A. 3rd edition.
5. Griffiths, A. J. F., Wessler, S. R., Carroll, S. B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U. S. A. 10thedition.

PLANT BREEDING

Paper- XII **Elective Paper**

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit1: Plant Breeding: **(5 Lecture)**

1.1: Introduction.

1.2: Aim and objectives.

1.3: Scope of plant breeding.

Unit 2: Methods of Crop Improvement **(25 Lecture)**

2.1: Introduction.

2.2: Methods of crop improvement.

2.3: Centres of origin and domestication of crop plants.

2.4: Plant genetic resources.

2.5: Introduction and acclimatization.

2.6: Selection methods: Pure line, Mass and Clonal selection.

2.7: Hybridization: Procedure.

2.8: Hybridization in self-pollinated crop plants.

2.9: Hybridization in cross pollinated crop plants.

Unit 3: Mutation and Plant Breeding **(15 Lecture)**

3.1: Role of mutation

3.2: Role of

polyploidy .

3.3: Role of biotechnology in crop improvement.

Unit 4: Intellectual Property Rights **(10 Lecture)**

4.1: Introduction

4.2: Types of Property.

4.3: Intellectual Property.

4.4: Forms of Intellectual Property.

4.5: Advantages and Disadvantages of IPR.

Unit 5: Crop Breeding Institutes/Centers **(05 Lectures)**

5.1: Introduction.

5.2: International Institutes.

5.3: National Institutes.

Suggested Readings-

1. Singh, B. D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
2. Chaudhari, H. K. (1984). Elementary Principles of Plant Breeding. Oxford – IBH. 2nd edition.
3. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. Blackwell Publishing.
4. Kader, A. A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, U. S. A. 5.
5. Capon, B. (2010). Botany for Gardeners. 3rd Edition. Timber Press, Portland, Oregon.

ECONOMIC BOTANY

Paper- XII **Elective Paper**

Credits: Theory- 4 Practical- 2 **Lectures: 60**

Unit 1: Legumes **(10 Lecture)**

1.1 Botanical names, Morphology, Source and Economic importance of Pulses-Chickpea and Red gram, legumes - Lucerne and *Sesbania*

Unit2: Plant Fibres **(10 Lecture)**

2.1 Botanical names, Morphology, Source and Economic importance of Cotton and Coir.

Unit3: Vegetable Oil Sources **(10 Lecture)**

3.1 Botanical name, source and economic importance of – Groundnut, Soybean; Brief account of cultural practices of Ground nut and Soybean.

Unit4: Drug Yielding Plants **(15 Lecture)**

4.1 A brief account of plant drugs and their chief constituents used in Indigenous and allopathic systems in-

A) Rhizome – *Zingiber officinale* B) Root –*Withania somnifera*

C)Stem – *Tinospora cordifolia* D) *Leaf –Adhatoda zeylanica.*

E) Floral bud – *Syzigium aromaticum* F) Fruit – *Emblica officinalis*

Unit5: Natural Products **(15 Lecture)**

A- Rubber- Introduction, properties of rubber, source (*Hevea brasilensis*), morphological characters, extraction method and economic importance

B- Botanical pesticides: Botanical name, morphological characters, source and importance of Neem, Tobacco, Custard apple.

C- Plant Dyes - Botanical name, source and economic importance.

a) Wood-Log wood, Kutch. b) Bark-Oak, Teak.

c) Root and rhizome -Manjista, Turmeric, d) Leaves- Indigo, Henna.

e) Flowers-Saffron, Palas.

Suggested Readings-

1. R.C. Grewal – Medicinal plants, Campus Books International 4825/24, Prahiadstreet, Ansari Road, Darya Ganj, New Delhi.
2. F.O. Bower – Plants and Man Ariana Publishing House, New Delhi.
3. Fuller, K.W. and Galon, J.r. 5985. Plant Products and New Technology. CalrendonPress, Oxford, New York.
4. Kocchar, S.L. 5998. Economic Botany in Tropics, 2nd edition. Macmillan India Ltd.,New Delhi.
5. Sambamurthy, A.V.S.S. and Subramanyam, N.S. 5989. A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.

Semester- VI

PLANT PATHOLOGY

Paper- XIII

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit 1: Introduction (07 Lectures)

1.1: Terms, Nature, and concept of plant diseases.

1.2: Cause of disease.

1.3: Classification of Plant Diseases Based on- 1. Symptoms, 2. Spread and Severity of Infection.

1.4: Importance of plant diseases.

Unit 2: Rots, Damping offs, Downy mildews, Powdery Mildews, White rusts and Smuts (13 Lectures)

2.1 Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Fruit rot of Cucurbits.
2. Late blight of Potato.
3. Downy mildew of Grapes.
4. Powdery mildew of Mango
5. White rust of Crucifers.
6. Smut of Jowar

Unit 3: Rusts, Wilts, Leaf spots & blights and Anthracnoses (15 Lectures)

Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Brown rust of Wheat
2. Wilt of Pigeon pea (*Cajanus cajan*)
3. Brown spot of Maize
4. Tikka disease of Groundnuts
5. Red-rot of Sugarcane

Unit 4: Mycoplasmas, Bacteria and Viruses (15 Lectures)

4.1 Study of following plant diseases with respect to causal organisms, symptoms, and control measures-

1. Little leaf of Brinjal
2. Oily spot of Pomegranate (Telya diseases)
3. Citrus canker
4. Tobacco & Tomato mosaic

Unit 5: Aerobiology and Seed Pathology (10 Lectures)

5.1: Aerobiology- Definition, scope and importance and disease forecasting.

5.2: Seed pathology- Definition, seed borne pathogens (external and internal) seed treatment (hot water, solar, chemical) and seed certification.

Suggested Readings-

1. Introductory Mycology John Wiley and Sons Inc. by Alexopoulos C.J., Mims C.W. and Blackwel. M. (1996).
2. Introduction to Bacteria McGraw Hill book Co. New York by Clifton. A.(1958)
3. Introductory Phycology Affiliated East – West Press Ltd. New Delhi by Kumar H. D. (1988).
4. Introduction to Plant Viruses Chand and Co. Ltd. Delhi by Mandahar C. L. (1978).
5. Diseases of crop plants in India Prentice Hall of India Pvt. Ltd. New Delhi by Rangaswamy G. and Mahadevan A.

PLANT BIOTECHNOLOGY

Paper- XIV

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit1: Recombinant DNA Technology **(15 Lectures)**

1.1: Introduction and principles.

1.2: Enzymes involved in recombinant DNA Technology.

1.3: Vectors.

1.4: Southern and northern blotting technique.

1.5: DNA finger printing.

: PCR.

: DNA libraries.

Unit 2: Methods of Gene Transfer **(10 Lectures)**

2.1: Introduction.

2.2: Marker and Reporter genes.

2.3:Methods of gene delivery-Physical, Chemical and Biological (*Agrobacterium* mediated gene transfer).

2.4: Transgenic plants (Flavr-Savr tomato, Golden rice).

Unit 3: Gene Cloning **(10 Lectures)**

3.1: Introduction.

3.2: Bacterial Transformation and selection of recombinant clones

3.3: PCR- mediated gene cloning.

3.4: Complementation, colony hybridization.

Unit 4: Plant Tissue Culture **(15 lectures)**

4.1: Introduction.

4.2: Terminology in tissue culture.

4.3: Techniques of tissue culture.

4.4: Micro propagation.

4.5: Anther culture.

4.4: Protoplast isolation and culture.

4.5: Somatic Hybridization.

Unit 5: Applications of Biotechnology (10 lectures)

5.1: Introduction.

5.2 : Role of Biotechnology in agriculture, Industry, Forestry.

5.3: Biotechnological Institutes and their role (any two).

Suggested Reading-

1. Bhojwani, S. S. and Razdan, M. K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
2. Glick, B. R., Pasternak, J. J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
3. Bhojwani, S. S. and Bhatnagar, S. P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
4. Snustad, D. P. and Simmons, M. J. (2010). Principles of Genetics. John Wiley and Sons, U. K. 5th edition.
5. Stewart, C. N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U. S. A.

CELL BIOLOGY

Paper- XV

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit 1: Microscopic Techniques in Biology **(15 Lectures)**

1.1: Principles of microscopy.

1.2: Light microscopy.

1.3: Sample preparation for light microscopy.

1.4: Phase contrast microscopy.

: Electron microscopy (EM)- Scanning electron microscopy (SEM) and Scanning transmission electron microscopy (STEM).

: Sample Preparation for electron microscopy.

Unit2: Cell- Unit of Life **(10 Lectures)**

2.1: The Cell Theory.

2.2: Prokaryotic cell- structure, cell size and shape.

2.3: Eukaryotic cells- structure, cell size and shape.

2.4: Eukaryotic cell components.

Unit 3: Cell Organelles **(10 Lectures)**

3.1: Ultra structure and function- Mitochondria, Chloroplast, Nucleus, ER, Golgi body, Lysosomes, Peroxisomes and Glyoxisomes, Cell-Membrane and Cell wall.

3.2: Structure and function of cytoskeleton & its role in motility.

Unit 4: Chromosome **(15 Lectures)**

4.1: Introduction.

4.2: History of chromosome.

4.3: Morphology, shape, size.

4.4: Types of Chromosome.

4.5: Karyotype.

Unit 5: Cell Division **(10 Lectures)**

5.1: Mitosis & Meiosis, their regulations.

5.2: Steps in cell cycle.

5.3: Regulation & Control of cell cycle.

5.4: Significance of cell cycle (Mitosis and Meiosis).

Suggested Reading-

1. Lewin B.2000 Genes VII Oxford University Press, New York.
2. Wolfe, S. L. (1993) Molecular and cell Biology-Wadsworth publishing Co. California, U.S.A.
3. Krishnmourthy, K. V. (2000) Methods in Cell Wall chemistry. CRC Press, Boca Raton, Florida.
4. Buchanan, B. B. Griossem W and Jones, R.L.2000. Biochemistry and Molecular Biology of Plants American Society of plant Physologist, Maryland, U.S.A.
5. Harris, N. and Oparka, K.J.1994. Plant cell Biology: A Practical Approach, IRL press at Oxford university Press, Oxford, U.K.

NURSERY, GARDENING & HORTICULTURE

Paper- XVI **Elective Paper**

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit1: Nursery & Gardening **(15 Lectures)**

1.1: Introduction.

1.2: Objectives and scope.

1.3: Types of gardening–landscape, home gardening and parks

1.4: Computer applications in land scaping.

Unit 2: The Seed **(10 Lectures)**

2.1: Introduction.

2.2: Structure and types.

2.3: Seed dormancy; causes and methods of breaking dormancy.

2.4: Seed storage: Seed banks, factors affecting seed viability, genetic erosion.

2.5: Seed production technology.

2.6: Seed testing and certification.

Unit 3: Vegetative Propagation **(10 Lectures)**

3.1: Introduction.

3.2: Types of layering, cutting, budding and grafting.

Unit 4: Horticultural Techniques **(15 Lectures)**

4.1: Introduction.

4.2: Application of manure, fertilizers, nutrients and PGRs.

4.3: Weed control, Biofertilizers and biopesticides.

Unit 5: Floriculture **(10 Lectures)**

5.1: Introduction.

5.2: Cut flowers.

5.3: Bonsai, commerce (market demand and

supply).

5.4: Importance of flower shows and exhibitions.

Suggested Reading-

1. Singh, D. & Manivannan, S. (2009). Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India.
2. Swaminathan, M. S. and Kochhar, S. L. (2007). Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India. Macmillan Publishers, India.
3. NIIR Board (2005). Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.
4. Kader, A. A. (2002). Post-Harvest Technology of Horticultural Crops. UCANR Publications, U. S. A.
5. Capon, B. (2010). Botany for Gardeners. 3rd Edition. Timber Press, Portland, Oregon.

BIOSTATISTICS

Paper- XVI **Elective Paper**

Credits: Theory- 4, Practical- 2 **Lectures: 60**

Unit1: Introduction **(10 Lectures)**

1.1: Definition.

1.2: Basic principles.

1.3: Statistical methods.

1.4: Variables - measurements, functions, limitations and uses of statistics.

Unit 2: Collection of Primary and Secondary Data **(15 Lectures)**

2.1: Introduction

2.2: Types of data

2.3: Methods of data collection.

2.4: Merits and demerits.

2.5: Classification of data.

2.6: Tabulation and presentation of data

2.7: Sampling methods

Unit3: Measures of Central Tendency **(15 Lectures)**

3.1: Introduction.

3.2: Mean, median and mode, merits & demerits.

3.3: Measures of dispersion- range, standard deviation and mean deviation, merits &demerits.

3.4: Co- efficient of variations.

Unit 4: Probability **(10 Lectures)**

4.1: Introduction.

4.2: Basic Concepts.

4.3: Kinds of Probabilities.

4.4: Measures of Probability.

Unit 5: Statistical Inference **(10 Lectures)**

5.1: Introduction.

5.2: Hypothesis - Student ‘t’ test and chi square test and its significance.

Suggested Readings-

1. Biostatistics Danniel, W.W., 1987. New York, John Wiley Sons.
2. An introduction to Biostatistics, 3rd edition, Sundarrao, P. S. S and Richards, J. Christian Medical College, Vellore.
3. Statistical Analysis of epidemiological data, Selvin, S., 1991. New York University Press.
4. Statistics for Biology, Boston, Bishop, O. N. Houghton, Mifflin.
5. Statistics for Biologists, Campbell, R. C., 1998.Cambridge University Press.

PLANT SYSTEMATICS & PLANT PATHOLOGY

Practical- IV

1. Preparation of botanical description of a plant species.
2. Study of root types.
3. Study of stem modifications.
4. Study of inflorescence types (Cymose, Racemose & Specialized).
5. Study of fruit types.

6-11. Study of families as per theory syllabus (Available plant families and Bentham and Hooker's system to be followed).

1. Annonaceae	2. Malvaceae	3. Rutaceae
4. Rubiaceae	5. Bignoniaceae	6. Lamiaceae
7. Nyctaginaceae	8. Polygoniaceae	9. Orchidaceae
10. Poaceae.		

12. Identification of genus and species with the help of regional (any available) flora.
13. Preparation & submission of herbarium specimens preferably of weeds (10).
14. Study of laboratory equipment's- Autoclave, Hot Air Oven, Inoculating chamber, Laminar Air Flow, Air Sampler, Incubator, Centrifuge etc.
15. Preparation of culture media (PDA).
16. Micrometry- Calibration of microscope and measurement of fungal spores.
17. Study of air-borne pathogen by exposed petri plates/air sampler.
18. Isolation of plant pathogens (Serial Dilution Agar Plate Method).
19. Estimation of chlorophylls (Any healthy & diseased/infected plant material).
20. Study of symptoms and causal organisms of-
    1. Rots- Fruit rot of Cucurbits
    2. Damping offs- Late blight of Potato
    3. Downy mildews- Downy mildew of Grapes.
21. Study of symptoms and causal organisms of-
    1. White rusts- White rust of Crucifers.
    2. Powdery Mildews- Powdery mildew of Mango
    3. Smuts- Smut of Jowar
22. Study of symptoms and causal organisms of-
    1. Rusts- Brown rust of Wheat

2. Wilts- Wilt of Pigeon pea (*Cajanus cajan*)

3. Leaf spots- Brown spot of Maize

23. Study of symptoms and causal organisms of-

1. Leaf blights- Tikka disease of Groundnuts

2.Anthracnoses- Red-rot of Sugarcane

3. Mycoplasmas- Little leaf of Brinjal

24. Study of symptoms and causal organisms of-

1. Bacteria- Citrus canker, Oily spot of Pomegranate (Telya diseases)

2. Viruses- Tobacco & Tomato mosaic

25. Study Excursion Report & Collection and submission of plant diseases as per the theory syllabus.

GENETICS & PLANT BIOTECHNOLOGY

Practical- V

1. Solve the problems based on Mendelian inheritance (Monohybrid ratio and Dihybrid ratio)

2. Studies on Mendelian trait by using pea plant.

3. Studies on genetic trait related to the Colour blindness, Haemophilea, Holandric genes by using photograph.

4. Solve the problems based on Linkage and crossing over (two point cross, three point cross)

5. Solve the problems based on polygenic inheritance

6. Solve the problems based on Population genetics.

7. Study of *Mirabilis jalapa* with respect to Plastid inheritance

8. Studies on biotechnological equipments (Principle and working).

9. Study of recombinant vectors with the help of photographs.

10. Studies on transgenic plant (Bt-cotton and golden rice)

11. Demonstration of Gene transfer techniques (Video/Photograph).

12. Demonstration of gel-electrophoresis techniques

13. Organization of plant tissue culture laboratory.

14-16. Aseptic culture techniques for establishment and maintenance of cultures Techniques in Plant Tissue Culture.

17. Demonstration of Southern blotting technique with the help of Chart/photograph

18. Demonstration of Northern blotting technique with the help of Chart/photograph

19-20. Preparation of plant tissue culture medium (M.S.)

21-23. Study of anther, embryo culture and micropropagation.

24. Isolation of protoplast from given plant material

25. Visit to Biotechnology laboratory

.

MOLECULAR BIOLOGY & CELL BIOLOGY

Practical- VI

1. Preparation of LB medium and raising *E. Coli*.
2. Isolation of genomic DNA from *E. Coli*.
3. DNA isolation from cauliflower head (or any suitable plant material).
4. Qualitative and Quantitative estimation of DNA by diphenylamine reagent.
5. Qualitative and Quantitative estimation of RNA by Orcinol reagent.
6. Dialysis of starch and simple sugar.

7-8. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and Semi-discontinuous replication).

9. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase-II through photographs.
10. Photographs establishing nucleic acid as genetic material (Griffith's experiments).
11. Mitosis and the cell cycle in onion root-tip cells.
12. Meiotic cell division in *Allium* spp.
13. Study of permeability of plasma membrane.
14. Isolation of Mitochondria
15. Isolation of chloroplasts.
16. To study of karyotype and prepare ideogram of plant by photograph.
17. Estimation of amount of chlorophyll present in the leaf tissue.
18. Observation of growth and differentiation in single cells.
19. Structure of onion peel cell.

20-24. Microtome technique.

25. Submission (submit at least 5 slides per student- Microtome technique).

PLANT BREEDING & NURSERY GARDENING AND HORTICULTURAL PRACTICES

Practical- VII (Elective)

1. To study floral biology in self-pollinated crop plants.
2. To study floral biology in cross pollinated crop plants.
3. To study pollen viability.
4. Calibration of ocular micrometer and estimate the size of pollen grain.
5. To study hybridization techniques in Malvaceae.
6. To study hybridization techniques in Fabaceae.
7. To study hybridization techniques in Brassicaceae.
8. To study hybridization techniques in Poaceae.
9. Study of male sterility in sorghum in field or in laboratory by staining the pollen grain.
10. Studies on Learning the precautions on handling of different mutagenic agents: Physical and chemical mutagens.
11. Different types of pots and potting medium & Potting and Repotting.

12-13. Propagation practices by seed, vegetative propagation, cutting, budding, layering and grafting.

14. Method of preparing Bonsai, Bottle garden/Terrarium, Hanging Baskets, Dish Garden.
15. Preparation of garden layout.
16. List of plants suitable for garden locations- 2 to 3 plants for each location.

17-18. Identification of important horticultural plants- herbs(Foliage and flowering); shrubs(Foliage and flowering); trees (Foliage and flowering); climbers; Lianas; Epiphytes; Creepers; Trailers; Aquatic plants; Succulents;(from all types- any two plants).

19-20. Flower Arrangements- Indian (Gajara, Veni, Garland, Bouquet, Pot, Hanging).

21-22. Green house plants- Information regarding soil, temperature, irrigation and fertilizer, requirements and propagation methods for- Anthurium, Gerbera, Orchids, Tuberose, Carnation, Roses and Capsicum.

23-24. **Project-** Each student should individually present a project to any topic related to nursery and garden development. It should be duly certified by HOD and submit in the practical examination (Compulsory).

25. Visits:

1. Visit to breeding/research stations.
2. Visit to garden/Parks/Nurseries/Exhibition/Horticulture industries etc. and record should be duly certified by HOD and submit in practical examination.

ECONOMIC BOTANY & BIOSTATISTICS

Practical- VII (Elective)

1. Study of Vegetative, Floral morphology and pod in Chickpea, Red gram.
2. Study of fodder legumes- Source and uses- Sesbania and Lucerne.
3. Study of structure of oil storing tissues in sectioned seeds of Groundnut and Coconut endosperm using micro chemical tests.
4. Study of vegetative, Floral and Fruit morphology of Cotton. Microscopic structure Cotton fibres.
5. Study of plants (live or herbarium) used as resource of drugs as per theory.
6. Study of plant pesticides (as per theory).
7. Study of dyes- source and uses (as per theory).
8. Study of ornamental plants, seasons of flowering plants, botanical name morphology and uses (as per theory).
9. Study of plant perfumes and cosmetics (as per theory).
10. Horticultural term Paper- Based on- Seasonal/Perennials/Climbers/Cacti/ Succulents/Bonsai/Indoor plants and Cut flowers etc.
11-13. Methods of estimation of Heterosis (i) Mid- Parent Heterosis (ii) Better parent Heterosis (iii) Standard Heterosis (Demo).
14. Determination of interspecific variation in chromosome number in Allium.
15-16. Collection of Data and tabulation.
17-18. Methods of sampling.
19-20. Presentation of Data.
21. Measures of central tendency (Mean, mode and median) of given plant material.
22. Calculation of Standard Deviation.
23. Examples based on probability.
24. Calculation of 't' test.
25. Calculation of chi square test.

PLANT BREEDING & BIOSTATISTICS

Practical- VII (Elective)

1. To study floral biology in self-pollinated crop plants.
2. To study floral biology in cross pollinated crop plants.
3. To study pollen viability.
4. Calibration of ocular micrometer and estimate the size of pollen grain.
5. To study hybridization techniques in Malvaceae.
6. To study hybridization techniques in Fabaceae.
7. To study hybridization techniques in Brassicaceae.
8. To study hybridization techniques in Poaceae.
9. Study of male sterility in sorghum in field or in laboratory by staining the pollen grain.
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ECONOMIC BOTANY & NURSERY GARDENING AND HORTICULTURAL PRACTICES

Practical- VII (Elective)

1.Study of Vegetative, Floral morphology and pod in Chickpea, Red gram.

2.Study of fodder legumes- Source and uses- Sesbania and Lucerne.

3.Study of structure of oil storing tissues in sectioned seeds of Groundnut and Coconut endosperm using micro chemical tests.

4.Study of vegetative, Floral and Fruit morphology of Cotton. Microscopic structure Cotton fibres.

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11.Different types of pots and potting medium & Potting and Repotting.

12-13. Propagation practices by seed, vegetative propagation, cutting, budding, layering and grafting.

14.Method of preparing Bonsai, Bottle garden/Terrarium, Hanging Baskets, Dish Garden.

15.Preparation of garden layout.

16.List of plants suitable for garden locations- 2 to 3 plants for each location.

17-18. Identification of important horticultural plants- herbs(Foliage and flowering); shrubs(Foliage and flowering); trees (Foliage and flowering); climbers; Lianas; Epiphytes; Creepers; Trailers; Aquatic plants; Succulents;(from all types- any two plants).

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Tuberose, Carnation, Roses and Capsicum.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: MATHEMATICS

Name of the Course: B. Sc.-III (Sem.– V & VI)

(Syllabus to be implemented from w.e.f. July 2021)

1) Preamble

B.SC III Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology. Also logical development of various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things. In the theory courses of Linear algebra ,Complex Analysis, Real Analysis, Partial differential Equation, Mathematical analysis, Integral calculus, Metric Space, Numerical Analysis, graph theory, Programming In C

Various deductions of theorems, corollaries and lemmas will be acquired by Students. Change is the Universal truth of the nature .So our aim is that Students should learn various techniques to find solutions. Students who opted T.Y.B.SC Mathematics have to complete 8 theory courses 4 each semester , four practical entitled (Numerical Techniques in Laboratory) NTL A,B,C,D Courses (Annual). In the practical course of 400 marks students exercise the problem solving techniques for practical course A,B,C,D . The details are mentioned in the syllabus.

2) Aims

The aim of the course is to generate Intelligent and Skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To include conceptual understanding in basic Phenomena, statements, theorems and development of appropriate problem solving skills suitable for applications and sufficient logical connectivity is provided.

3) Objective of the Course

1) To design the syllabus with specific focus on key Learning Areas.

2) To equip student with necessary fundamental concepts and knowledge base

3) To develop specific problem solving skills.

4) To impart training on abstract concepts, analysis, deductive techniques.

5) To prepare students for demonstrating the acquired knowledge.

6) To encourage student to develop skills for developing innovative ideas.

7) A student is able to apply their skills and knowledge that is translate information presented verbally into mathematical form select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

8) A Student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.

PUNYSHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for B.Sc III –Mathematics Semester Pattern

Choice Based Credit System

(CBCS Pattern) (w.e.f .2021-22)

To be implemented from Academic Year 2021-22

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :	**B.Sc.- III Semester – V**									
Ability Enhancement Course(AECC)		**English (Business English)**	**Paper- III**	**4.0**	**--**	**--**	**50**	**40**	**10**	**2.0**
Discipline Specific Elective (DSE) **(Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II.**		**DSE- 1 A**	**Paper- IX**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 2 A	**Paper –X**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 3 A	**Paper- XI**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 4	**Paper- XII**	**(Elective A or B) Choose any one**						
		DSE- 4 A	**Paper- XII**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 4 B								
		(Add-on /-self learning)- MOOC/SWAYAM/ Skill based - certificate course – institute or university /internship/ apprenticeship		**--**	**--**	**--**	**--**	**--**	**--**	**4.0**
Grand Total				**20**	**--**	**--**	**450**	**360**	**90**	**18**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)		**English (Business English)**	**Paper IV**	**4.0**	**--**	**--**	**50**	**40**	**10**	**2.0**
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.		**DSE- 1B**	**Paper -XIII**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 2B	**Paper- XIV**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
		DSE- 3 B	**Paper- XV**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**

	DSE- 4	**Paper- XVI**	**(Elective A or B) Choose any one**						
	DSE- 4 A	**Paper- XVI**	**4.0**	**--**	**--**	**100**	**80**	**20**	**4.0**
	DSE- 4 B								
Total(Theory)			**20**	**--**	**--**	**450**	**360**	**90**	**18**
DSE (Practical Annual Exam)	**DSE- 1 A & B**	**Practical- IX & XIII**	**--**	**--**	**5**	**100**	**80**	**20**	**4.0**
	DSE -2 A & B	**Practical- X&XIV**	**--**	**--**	**5**	**100**	**80**	**20**	**4.0**
	DSE- 3 A & B	**Practical- XI&XV**			**5**	**100**	**80**	**20**	**4.0**
	DSE- 4 A & B	**Practical- XII & XVI**			**5**	**100**	**80**	**20**	**4.0**
Total (Practicals)					**20**	**400**	**320**	**80**	**16**
Grand Total			**40**		**20**	**1300**	**1040**	**260**	**52**

Summary of the Structure of B.Sc.Programme

as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical	Total – credits
B.Sc.-III	V	450	18	--	--	18
	VI	450	18	400	16	34
Total		900	36	400	16	52

B.Sc.Programme :

Total Marks : Theory + Practical's = 900 +400 = 1300

Credits : Theory + Practical's = 36 + 16= 52

Numbers of Papers: Theory: Ability Enhancement Course (AECC) : 02

Theory: Discipline Specific Elective Paper (DSE) :02

Theory: DSC : 08

Skill Enhancement Courses : 02

Total : Theory Papers : 10

: Practical Papers : 08

Abbreviations:

L: Lectures

T: Tutorials

P: Practical

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Cours

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

PUNYSHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for

B.SC.-III (MATHEMATICS)

CBCS pattern Syllabus w.e.f. June – 2021

Structure of the revised course:-

SEMESTER – V

(I) Theory Papers:-

Paper	Title of the Paper	Marks
IX	Algebra – II	80+ 20 = 100
X	Complex Analysis	80+ 20 = 100
XI	Real Analysis	80+ 20 = 100
XII	Partial Differential Equations (Elective - A)	80+ 20 = 100
	Mathematical Analysis (Elective - B)	80+ 20 = 100

SEMESTER – VI

(II) Theory Papers:-

Paper	Title of the Paper	Marks
XIII	Metric Spaces	80+ 20 = 100
XIV	Numerical Analysis	80+ 20 = 100
XV	Graph Theory	80+ 20 = 100
XVI	Integral Calculus (Elective - A)	80+ 20 = 100
	Programming in C (Elective - B)	80+ 20 = 100

Equivalent Subject for Old Syllabus

Sem-V

Sr. No.	Name of the Old Paper	Name of the New Paper
1	Paper-IX : Algebra – II	Paper-IX : Algebra - II
2	Paper-X : Complex Analysis	Paper-X : Complex Analysis
3	Paper-XI : Integral Calculus	Paper-XI : Real Analysis
4	Paper-XII : Partial Differential Equations (Elective - A)	Paper-XII : Partial Differential Equations (Elective - A)
	Paper-XII : Mathematical Analysis (Elective - B)	Paper-XII : Mathematical Analysis (Elective - B)

Sem-VI

Sr. No.	Name of the Old Paper	Name of the New Paper
1	Paper-XIII : Metric Spaces	Paper-XIII : Metric Spaces
2	Paper-XIV : Numerical Analysis	Paper-XIV : Numerical Analysis
3	Paper-XV : Programming in C	Paper-XV : Graph Theory
4	Paper-XVI : Integral Transform (Elective - A)	Paper-XVI : Integral Calculus (Elective - A)
	Paper-XVI : Graph Theory and Combinatory (Elective - B)	Paper-XVI : Programming in C (Elective - B)

Numerical Technique Laboratory (NTL)

NTL No.	Topic	Marks
NTL-III (A)	**S-I : Algebra-II[6]** **S-II : Metric Space[6]** **+Seminar**	**80+ 20 = 100**
NTL-III (B)	**S-I : Complex Analysis [6]** **S-II : Numerical Analysis [6] + project**	**80+ 20 = 100**
NTL-III (C)	**S-I : Real Analysis [6]** **S-II : Graph Theory [6]** **+Study Tour/Book review**	**80+ 20 = 100**
NTL-III (D)	**S-I : Partial Differential Equation [6]** **OR** **S-I: Mathematical Analysis[6]**	**80+ 20 = 100**
	S-II : Integral Calculus [6] **OR** **S-II: Programming in C [6] + Viva Voce**	**80+ 20 = 100**

Note: [ ] Number inside bracket indicated **number of assignments**.

In Numerical Technique Laboratory: NTL - III (A) - III (D) [Project / Seminar / Study Tour/ Viva-Voce / Book Review]

Project: Biography of One Mathematician or One Mathematics Topic (which is not included in the syllabus up to B.Sc.-III Mathematics) about five Pages**. 10Marks**

Seminar: Any topic in mathematics. **10Marks**

Book Reviews: Mathematics Book other than text book **10Marks**

Study Tour: Visit to any Industry / Research Institution / Educational Institution.

10Marks

Viva Voce: Viva voce on Project, Seminar, Book review and Study Tour**. 10Marks**

(Free internet should be availed for collection of Material for Project, Seminar.)

Distribution of each Theory paper (Marks 100)

University Assessment (UA): **80 Marks**

College Assessment (CA): **20 Marks**

Scheme of College Assessment

1. Unit Test: **10 Marks**

2. Home Assignment: **10 Marks**

Distribution of Practical Marks (100)

Practical examination will be at the end of sixth semester. The candidate has to perform eight practical, one from each group.

A. University Practical Examination (80) Marks: (UA)

a) Problems from NTL (A) 80: [S – I: 30 M + S – II: 30 M + Seminar: 10 M + J: 10 M]

b) Problems from NTL (B) 80: [S – I: 30 M + S – II: 30 M + Project: 10 M + J: 10 M]

c) Problems from NTL (A) 80: [S – I: 30 M + S – II: 30 M +Study tour/Book Review: 10 M + J: 10 M]

d) Problems from NTL (A) 80: [S – I: 30 M + S – II: 30 M + Viva voce: 10 M + J: 10 M]

B. Practical: Internal Continuous Assessment (20 marks)

Scheme of Marking: **10 Marks:** Internal Test on each NTL and

10 Marks: Home assignment/oral/Seminars/Conference /Industrial Visit/Group Discussion/Viva, etc. on each NTL

Instructions:

1. Each Theory Paper is allotted 45 periods per semester.

2**.** All **Numerical Technique Laboratories (NTL)** (similar to Practical) will be conducted in the batch as a whole Class.

3. Total evaluation of B.Sc. III (1400 Marks.)

[Theory papers (1000 Marks)

+

[Practical NT L-III (A) to III (D) (400 Marks)

4. The annual **Numerical Technique Laboratory (NTL - III (A) to III (D))]** will carry **100** Marks each.

5. Department of Mathematics should provide FIVE computers per batch of TEN Students

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Nature of paper of Numerical Technique Laboratory

(For NLT - III (A) to NLT - III (D))

I) Attempt THREE out of SIX (each of 10 marks)	**Marks 30**
OR Attempt SIX out of EIGHT (each of 05 marks)	
II) Attempt THREE out of SIX (each of 10 marks)	**Marks 30**
OR Attempt SIX out of EIGHT (each of 05 Marks)	
III) Seminar/Project/Study Tour/Viva-voce/Book Review	**Marks 10**
IV) Journal	**Marks 10**
	Total Marks 80

SEMESTER-V

Paper - IX: Algebra – II

Unit - 1: Introduction to Rings. **[10]**

1.1 Definitions and Examples

1.2 Integral Domains. Subrings

1.3 Fields

1.4 Isomorphism, Characteristic of rings

Unit - 2: Quotient Rings. **[05]**

2.1 Homomorphism of rings, ideals

2.2 Quotient Rings

Unit - 3: Vector Spaces **[10]** 3.1
Vector spaces, subspaces

3.2 Linear combination and system of linear equation

3.3 Linear dependence and independence, basis and dimensions.

Unit - 4: Linear transformation and matrices **[15]**

4.1 Linear transformation, null spaces and range

4.2 Matrix representation of linear transformation, composition of linear transformation and matrix multiplication

4.3 Inevitability and isomorphism.

Unit - 5: Inner product space **[05]** 5.1
Inner products and Norms.

Recommended books (Scope of Syllabus):

Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition.

Unit - 1: Chapter - VI: Art. 24, 25, 26, 27

Unit - 2: Chapter - IX: Art. 38, 39

Linear Algebra Fourth Edition by Stephen H. Friedberg, Arnold J. Insel Lawrence E. Spence Prentice Hall of India New Delhi (EEE)

Unit 3: Chapter - I (Vector Spaces): Art. 1.2 to 1.6

Unit 4: Chapter-II (Linear transformation and matrices):Art.2.1to2.4

Unit 5: Chapter - VI (Inner product space) Art. 6.1

Reference Books:

1. A First Course in Abstract Algebra by J. B. Fraleigh, Pearson Education 7th edition.

2. University Algebra by N.S. Gopalkrishnan

3. Fundamental of Abstract Algebra by D.S. Malik & N. Mordeson & M.K. Sen, Mc. Graw Hill International Edition.

4. Liner Algebra by Vivek Sahai & Vikas Bist, Narosa Publishing House.

5. Topics in algebra by John Wiley & Sons and by I.N. Herstein

6. Abstract algebra by K.S. Bhambri and Khanna Vijay

Paper – X: Complex Analysis

Unit - 1. Analytic Functions [10]

Complex Differentiation, Limits and Continuity, Differentiability Necessary and sufficient condition of analytic function, Method of constructing a regular function and analytic function, Simple method of constructing analytic function, Polar from of Cauchy-Riemann Equations.

Unit - 2: Complex Integration [20]

Introduction, Some basic definitions, Complex integral, Reduction of complex integrals to real integrals, Some properties of complex Integrals, An estimation of a complex integral, Line integrals as functions of arcs, Cauchy's Fundamental Theorem (Theorem-I), Cauchy Goursat Theorem [Statement Only], Cauchy's Integral formula [Statement only], its consequences and examples, Derivative and higher order derivatives of an analytic function [Statement(s) only] and examples, Expansions of Analytic functions as power series (Taylor's Maclaurin's and Laurent's Series [Statement only]) and its examples, The zeros of an analytic function, Different Types of Singularities, Some Theorems on Poles and other Singularities (Theorem-I to IV only) and its examples, The point at infinity

Unit - 3: Calculus of Residues [15]

Residue at simple pole, Residue at a Pole of order greater than unity, Residue at infinity, Cauchy's Residue Theorem. Evaluation of Definite integrals, Integration round the unit Circle. Evaluation of $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$.

Recommended Book (Scope of Syllabus):

1. **Functions of Complex Variable** by J.N. Sharma Revised by Dr. Shanti Swarup, (38 Edition) Krishna Prakasha Media Ltd., Meerut.

Chapter - 2 (Analytic Functions): 1 to 7

Chapter - 6 (Complex Integration): 1 to 8, 9 (Statement only),

19 (Theorem-1, Theorem- II (Statements only),

20, 21, 22 [Theorems I to IV only], 23. 24.

Chapter- 7 (Calculus of Residues): 1 to 6.

Reference Books:-

1. Graduate texts in mathematics functions of one complex variable – J.B.Conway.

2. Theory of functions of a complex variables- Shanti Narayan , P.K.Mittal, Chand Publication.

3. A function of complex variable by A.R.Vashishtha.

4. Complex variables and applications by J.W.Brown , J.R.Churchill.

Paper – XI: Real Analysis

Unit - 1. Sets and Function **[15]**

1.1 Sets and elements
1.2 Operations on sets
1.3 Functions
1.4 Real Valued functions
1.5 Equivalence , countability

Unit - 2. Sequences of real numbers **[15]**

2.1 Definition of sequence and subsequence

2.2 Limits of sequence

2.3 Convergent sequence

2.4 Divergent sequence

2.5 Bounded sequence

2.6 Monotonic sequence

2.7 operations on convergent sequence

2.8 operations on divergent sequence

2.9 Limit superior and limit inferior

2.10 Cauchy sequence

Unit - 3. Series of real numbers **[15]**

3.1 Convergence and divergence

3.2 Series with non negative terms

3.3 Alternating Series

3.4 Conditional convergence and absolute convergence

3.5 Test for absolute convergence (Comparison test, Ratio test, Root test)

3.6 Series whose terms from non increasing sequences

Recommended Book (Scope of Syllabus):

Scope: Methods of Real Analysis by R.R.Goldberg John wiley & sons 1976

Real Analysis

Unit – 1: (sets and function) Art: 1.1 to 1.5

Unit – 2: (Sequences) Art: 2.1 to 2.10

Unit – 3: (Series of real number) Art: 3.1 to 3.4, 3.6, 3.7

Reference Books:-

1. A First course in Mathematical Analysis by D.Somasundaram & B.Choudhary Narosa Publishing House.

2. Mathematical Analysis second edition by S.C.Malik and Svita Arora.

3. Principles of Mathematical Analysis by Rudin W. McGraw – Hill , New Yokr.

4. A Course of Mathematical Analysis by Shanti Narayan S.Chand and company New Delhi.

Paper-XII: Partial Differential Equations (Elective-A)

Unit - 1: Linear Partial differential equation of order one **[15]** 1.1 Formation of partial differential equation by eliminating arbitrary constants

1.2 Formation of partial differential equation by eliminating arbitrary functions.

1.3 Types of integrals of partial differential equation

1.4 Lagrange's Method of solving linear partial differential equation of order one namely Pp + Qq = R (Working rule for solving Pp+Qq = R by Lagrange's Method).

1.5 Integral surface passing through a given curve

Unit-2: Non Linear partial differential equation of order one **[15]**

2.1 Solution of first order partial differential equation by Charpit's Method.

2.2 Special methods of solution applicable to certain standard form I, II, III, IV.

Unit-3: Linear partial differential equation with constant Coefficient **[15]**

3.1 Homogeneous and Non – Homogeneous linear partial differential equation with constant coefficient working rule for finding complementary function (C.F.), method of finding particular integral (P.I.)

3.2 Short method when f (x, y) is φ (ax + by) and $x^m y^n$

Recommended Book (Scope of syllabus):

1. **Ordinary and partial differential equation by M.D. Raisinghania, S. Chand Co. [PART - III]**

Unit - 1: Chapter -1: 1.1, 1.2, 1.2a, 1.2b, 1.3, 1.4, 1.5, 1.5a, 1.5b, 1.5c, 1.5d, 1.6

Unit - 2: Chapter -2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10

Unit - 3: Chapter - 3: 3.1, 3.2, 3.3, 3.4, 3.4A, 3.4B3.5, 3.6, 3.6A, 3.6B, 3.7, 3.8, 3.9, 3.10

Reference Books:

1) Elements of partial differential equations by IAN Sneddon (International students edition by MC Graw Hill Book)

2) Differential equations Sharma & Gupta (Krishna Prakashan Media (P) Ltd. Meerut)

3) Introduction to Partial differential equations – K.Sankara Rao, PHI Publication

4) Partial Differential Equations by J.M.Kar.

Paper- XII: Mathematical Analysis (Elective - B)

Unit - 1: Functions of a Single Variable (I) **[15]**

1.1 Limits

1.2 Continuous functions

1.3 Functions continuous on closed intervals

1.4 Uniform continuity

Unit - 2: Functions of a Single Variable (II) **[15]**

2.1 The Derivative

2.2 Continuous functions

2.3 Increasing and decreasing Functions

2.4 Darboux's Theorem

2.5 Rolle's Theorem

2.6 Lagrange's Mean Value Theorem

2.7 Cauchy's Mean Value Theorem

2.8 Higher Order Derivatives

Unit - 3: Functions **[15]** 3.1 Power series

3.2 Exponential functions

3.3 Logarithmic functions

3.4 Trigonometric functions

3.5 Functional fquations

3.6 Functions of bounded variation

3.7 Vector - Valued functions

Recommended Books:

1) Mathematical Analysis by S. C. Malik and Savita Arora by S. New Age International Publishers.

2) Methods of Real Analysis by R.R. Goldberg.

Reference Books:

1) Elements of Real Analysis: Shanti Narayan, Dr. M. D. Raisinghania, S. Chand Publication

2) Principles of Mathematical Analysis - Water Rudin, McGraw Hill

3) Introduction to Real Analysis by R.G. Bartle, Donald R. Sherbert.

SEMESTER - VI

Paper- XIII: Metric Spaces

Unit - 1: Limits and metric Spaces **[15]**

1.1 The Class l^2 (Schwartz, Minkowski inequality)

1.2 Limit of a function on the real line

1.3 Metric Spaces

1.4 Limits in metric spaces

Unit - 2: Continuous functions on metric spaces **[15]**

2.1 Functions continuous at a point on the real line

2.2 Reformulation

2.3 Function continuous on a metric space

2.4 Open Sets

2.5 Closed Sets

Unit - 3: Completeness and Compactness **[15]**

3.1 More about open sets

3.2 Bounded sets and totally bounded sets

3.3 Complete metric spaces

3.4 Compact metric spaces

3.5 Continuous functions on compact metric spaces.

Recommended Book (Scope of Syllabus):

Scope: Methods of real analysis by R.R. Goldberg John Wiley & Sons 1976.

Metric Spaces

Unit - 1: Limits and metric spaces Art: 3, 10, 4.1 to 4.3

Unit - 2: Continuous functions on metric spaces Art: 5.1 to 5.5

Unit - 3: Completeness and Compactness Art: 6.1, 6.3, 6.4, 6.5, 6.6

Reference books:

1. A first course in mathematical analysis by D. Somasundaram & B.Choudhary Narosa Publishing House.

2. Mathematical Analysis second edition by S.C. Malik & Savita Arora.

3. Principles of Mathematical analysis by Rudin W. McGraw-Hill, New York.

4. A Course of Mathematical Analysis by Shanti Nasrayan S. Chand & Company New Delhi. 5. Metric space – Pundir and Pundir.

Paper- XIV: Numerical Analysis

Unit - 1: Finite Differences **[10]**

1.1 Introduction

1.2 Finite differences,

1.3 Differences of Polynomial

1.4 Relation between the operators

Unit - 2: Interpolation **[15]**

2.1 Introduction

2.2 Newton's forward interpolation formula

2.3 Newton's backward interpolation formula

2.4 Central difference interpolation formula

2.5 Gauss's forward interpolation formula

2.6 Gauss's backward interpolation formula

2.7 Stirling's formula

2.8 Interpolation with unequal Intervals

2.9 Lagrange's Interpolation Formula

Unit - 3: Numerical Differentiation and Integration **[10]**

3.1 Numerical differentiation

3.2 Formula for derivatives

3.3 Maxima and minima of a tabulated function

3.4 Numerical Integration

3.5 Quadrature formulae (Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 thrule)

Unit - 4: Difference Equations **[10]**

4.1 Introduction

4.2 Definitions

4.3 Formation of difference equations

4.4 Linear difference equation

4.5 Rules for finding the Complementary function

4.6 Rules for finding the Particular Integral

4.7 Difference equations reducible to linear form

Recommended Book (Scope of Syllabus):

Numerical Methods in Engineering & Science with Programs in C and C++ Nineth Edition by B.S. Grewal Khanna Publishers New Delhi.

Chapter – 6: (Finite differences) Art. 1, 2, 3, 7

Chapter – 7: (Interpolation) : Art 1, 2, 3, 4, 5, 6, 7, 11, 12

Chapter – 8: (Numerical Diffentiation and Integration) Art. 1, 2, 3, 4, 5 (except IV and V)

Chapter – 9: (Difference Equations) Art. 1 to 7.

Reference books:

1. Numerical Analysis and Programming in C by Pundir and Pundir (Pragati Prakashan)

2. Numerical Analysis by P.Kandasamy , K.Thilagavathy,K Gunavathi , S,Chand Publications

3. Introductory Methods of Numerical Analysis by S.S.Sastry and by PHI

Paper-XV: Graph theory

Unit – 1: Graph Theory **[12]**

Graphs – undirected and directed, simple graphs, multigraphs, degree of vertex, indegree and outdegree of vertex, Types: Null graph, Complete graph, regular graph, platonic, cycles, wheels, Bipartite, complete bipartite , subgraphs , Isomorphic graphs.

Unit – 2: Operations on Graph **[13]**

Union , Intersection, Sum, Ring sum, Complements, product, composition and fusion, Paths, Cycles, Cut – vertex, cut set, Bridge, Connectedness, Matrix representation, Adjacency matrix, Incidence matrix, Planner graphs, Eulerian and Hamiltonian graphs, Eulers formula.

Unit – 3: Trees **[10]**

Trees and their Properties, Rooted trees, Spanning trees, Construction of spanning trees, weighted graphs, Minimal Spanning trees, Tree traversal, Prefix and Postfix notation (Delete binary search tree onword).

Unit – 4: Number Systems **[10]**

Base – b number system, Decimal, Binary, Octal and Hexadecimal number system and Conversions between these systems.

Recommended Books (Scope of syllabus):

[I] A text book of Discrete Mathematics by Swapan Kumar Sarkar (S.Chand Co. 1st edition 2003)

Ch – 13: 13.1 to 13.12 Ch – 14: 41.1 to 14.4

[II] Essential Computer Mathematics by Seymour Lipshutz, Schaum's outline series

Ch – 1: 1.1 to 1.3 Ch – 2: 2.1 to 2.4

Reference Books

1. Discrete Mathematics by Dr.Ranjeet singh, Manish Soni, University Book House (P) Ltd. Jaipur.

2. Discrete Mathematics and Graph theory by Purna Chandra Biswal, PHI, EEE.

3. Introduction to Discrete Mathematics by M.K.Sen, B.C.Chakraborty, Books and Allied (P) Ltd.

4. Fundamental Approach to Discrete Mathematics by D.P.Acharya, Sreekumar, New age Publishers

Paper - XVI: Integral Calculus (Elective-A)

Unit - 1. Improper Integrals: **[20]**

Convergence of Improper integrals of the first kind, Test of convergence of a (Positive integrands), Necessary and sufficient condition for the convergence of improper integrals, Comparison of two integrals, A practical comparison test, Useful comparison integrals, Two useful tests, f(x) not necessarily positive general test for convergence, Absolute and conditionally convergence, Convergence of improper integrals of the second kind, Convergence at infinity (Integrand being positive), Comparison of two integrals, A useful comparison integrals, General test (for convergence at infinity and f(x) may be positive or negative), Cauchy's test for convergence, Absolute and conditionally convergence of improper integrals of second kind, Test for the absolute convergence of the integral of product, Abel's test, Dirichlet's test.

Unit - 2: Beta and Gamma function: **[15]**

Definition, Properties, Transformations of Gamma function and Beta function and relation between them, some important deductions, Duplication formula.

Unit - 3: Multiple integrals: **[10]**

Double Integrals, Cartesian and polar, Applications of Double Integration (Area of regions and Volume of a Solid only), Change of order of integration, Change of Variables.

Recommended Book:

Integral Calculas by Shanti Narayan and P.K. Mittal S.Chand publication Revised Edition - 2005.
Unit 1: 16.1 to 16.18

Unit 2: 7.1, 7.2, 7.3, 7.4, 7.5

Unit 3: 12.2, 12.3, 12.4, 12.5

Reference books:-

1. N. Pisknov, Differential and Integral Calculus, Peace Publishers, Moscow

2. P.N. Wartikar and J.N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona

Vidyarthi Griha Prakashan, Poona 30.

3. Tom M.Apostol, Calculus Vol I and II, Wiley Publication.

4. Mathematical Analysis by S.C. Malik and Savita Arora.

Paper - XVI: Programming in C (Elective-B)

Unit 1: Overview of C. **[4]**

1.1 Introduction

1.2 Importance of C

1.3 Sample C programs

1.4 Basic structure of C programs

1.5 Programming style

1.6 Executing a C program

1.7 Points to remember

Unit - 2: Constants, Variables and Data Types **[6]**

2.1 Introduction

2.2 Character Se

t 2.3 C Token

2.4 Constants

2.5 Keywords and Identifiers

2.6 Variables

2.7 Data Types

2.8 Declaration of variables

2.9 Assigning values to variables

2.10 Defining symbolic constants

Unit - 3: Operators and Expressions [9]

3.1 Introduction

3.2 Arithmetic Operators

3.3 Relational Operators

3.4 Logical Operators

3.5 Assignment Operators

3.6 Increments and decrement operators

3.7 Conditional operators

3.8 Bit-wise operators

3.9 Special operators

3.10 Arithmetic expressions

3.11 Evaluation of expressions

3.12 Precedence of arithmetic operators

3.13 Some computational problems

3.14 Type conversions in expressions

3.15 Operators precedence and associativity

3.16 Mathematical functions

Unit - 4: Managing Input and Output Operators [4]

4.1 Introduction

4.2 Reading a character

4.3 Writing a character

4.4 Formatted input

4.5 Formatted output

Unit - 5: Decision Making and Branching **[6]**

5.1 Introduction

5.2 Decision making with IF statement

5.3 Simple IF statements

5.4 The IF…ELSE Statement

5.5 Nesting of If….ELSE Statement

5.6 The ELSE…. IF ladder

5.7 The SWITCH Statement

5.8 The? : Operator

5.9 The GOTO statement

Unit - 6: Decision Making and Looping **[4]**

6.1 Introduction

6.2 The WHILE Statement

6.3 The DO Statement

6.4 The FOR Statement

6.5 Jumps in loops

Unit - 7: Arrays **[5]**

7.1 Introduction

7.2 One dimensional arrays

7.3 Two dimensional arrays

7.4 Initializing two dimensional arrays

7.5 Multidimensional arrays

Unit - 8: User - defined Functions **[7]**

8.1 Introduction

8.2 Need for user - defined functions

8.3 A multifunction program

8.4 The form of C Functions

8.5 Return values and their types

Recommended Book (Scope of Syllabus):

[I] Programs in C by E. Balgurusamy, MeGraw Hill, New-Delhi

Unit 1: 1.1- 1.7 **Unit - 2:** 2.1- 2.10 **Unit - 3:** 3.1- 3.16 **Unit 4:** 4.1-4.5

Unit 5: 5.1 - 5.9 **Unit - 6:** 6.1 - 6.5 **Unit - 7:** 7.1- 7.5 **Unit 8:** 8.1 - 8.5

Reference Books:

1. Numerical Methods in Engineering & Science with Programs in C and C++ Nineth Edition by B.S. Grewal Khanna publishers New Delhi.

2. Numerical Analysis and Programming in C by Pundir and Pundir (Pragati Prakashan)

3. A Book on C, Macmillan, by Berry, R.E. and Meekings.

4. C Programming Language : An applied perspective, John Wiley & Sons

5. The C Programming Tutor, Prentice-Hall, by Wortman, L.A. and Sidebottom.

6. C made Easy, Osbone MeGraw-Hill by Schildt, H.C.

7. Let us C by Yashwant Kanetkar BPB Publications, New-Delhi.

8. Programming in C by Schaum's Outline Series, Tata McGraw Hill, EEE.

Numerical Technique Laboratory [NTL-III (A) to III (D)]

Note: Each assignment is of 1.5 periods [50+25 = 75 minutes]

NTL-III (A) (Algebra - II + Metric Spaces)

(Problems on the following topics)

Section - I: Algebra - II

Assignment-1: Rings and subrings, Integral domains and Fields

Assignment-2: Isomorphism and Characteristic.

Assignment-3: Homomorphisms of Rings. Ideals, Quotient Rings

Assignment-4: Subspaces, Liner Dependence, independence and basis

Assignment-5: Linear transformation and matrices, Kernel and range.

Assignment-6: Inverse and Composite, Inner Product Space

Section - II: Metric Spaces

Assignment-7: Metric Space-I (Examples on Metric spaces, open set, closed set, boundary set in Metric spaces)

Assignment-8: Metric Space-II (Examples on bounded set, Totally bounded set and Diameter of set in Metric spaces)

Assignment-9: Metric Space-III (Examples on Limit of metric space, Cauchy sequence in Metric spaces)

Assignment-10: Metric Space-IV (Contraction, Isometry,homeomorphism in Metric spaces)

Assignment-11: Metric Space-V (Examples on cover, open cover, Dense in Metric spaces)

Assignment-12: Metric Space-VI (Examples on completeness and compactness in Metric Spaces)

NTL-III (B) (Complex Analysis + Numerical Analysis)

(Problems on the following topics)

Section - I: Complex Analysis

Assignment-1: Find the regular (analytic) function of which function (real, Imaginary,$u+v$, $u-v$ type.)

Assignment-2: Solving the complex integration Circle, Line and Parabola.

Assignment-3: Obtain the Taylor's and Laurent's series.

Assignment-4: Calculus of residue.

Assignment-5: Integration round the unit circle.

Assignment-6: Evaluation of integral $\int_0^{2\pi} f(\cos\theta, \sin\theta)\mathrm{d}\theta$.

Section- II: Numerical Analysis

Assignment-7: Finite Differences: Example on Forward, Backward and Central difference formulae, Differences of a Polynomial, Relation between operators, (Forward (Δ), Backward (∇), Central δ, Shift (E))

Assignment-8: Interpolation-I: Examples on Newton's forwards, Newton's backward difference formulae, Central difference formulae

Assignment-9: Interpolation-II: Examples on Gauss's forward and backward difference formulae, Stirling's formula, Lagrange's interpolation formula

Assignment-10: Numerical Differentiation: Examples on Numerical differentiation, formula for derivatives and maxima and minima of tabulated function.

Assignment-11: Numerical Integration: Examples on Numerical integration, Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 th rule.

Assignment-12: Difference Equations: Examples on Formation of difference equations, Linear difference equation, finding to Complementary function, finding the Particular Integral, Difference equations reducible to linear form.

NTL-III(C) (Real Analysis + Graph Theory)

Section - I: Real Analysis

Assignment-1: Sets and Function (Numerical examples on domain, range, mapping (one – one, many – one, into, onto) inverse mapping, extension – restrictions of f and composite function)

Assignment-2: Sequence – I (n^{th} term of sequence, subsequence of sequence, relation between $\in \ -\delta$ in limit of sequence, existence of limit, boundedness, monotonic)

Assignment-3: Sequence – II (Convergence, Divergence, Limit superior, Limit inferior)

Assignment-4: Series – I (Examples on convergence, divergence, absolute and conditional convergence)

Assignment-5: Series – II (Test for convergence Comparison test, ratio test, p- test, Geometric series, divergence)

Assignment-6: Series – III (Test for convergence Condensation test, Raabe's test, Logarithmic test, Cauchy's integral test)

Section – II: Graph Theory

Assignment-7: Operations on graph

Assignment-8: Adjacency and incidence matrix (with graphs)

Assignment-9: Spanning tree and Minimum spanning tree

Assignment-10: Infix/Prefix and postfix and their tree

Assignment-11: Conversion of decimal to binary/octal/Hexadecimal.

Assignment-12: Conversion of binary/octal/Hexadecimal to decimal

NTL-III (D) (Partial Differential Equation OR Mathematical Analysis

+ Integral Calculus OR Programming in C)

Section – I: Partial Differential Equations

Assignment-1: Solve linear differential equation of first order by arbitrary constant and arbitrary function, Lagrange's method.

Assignment-2: Non linear partial differential equation of order one by Charpit method.

Assignment-3: Non linear partial differential equation of standardF. and P.I. for Homogeneous linear partial differential equation with constant coefficient.

Assignment-5: Find C.F. and P.I. for Non-Homogeneous linear partial differential equation with constant coefficient.

Assignment-6: Find C.F. and P.I. for equation reducible to linear differential equation with constant coefficient.

OR

Section- I: Mathematical Analysis

Assignment-1: Limits, Continuous Functions.

Assignment-2: Functions Continuous on closed Intervals, Uniform continuity.

Assignment-3: Increasing and decreasing functions, continuous functions.

Assignment-4: Rolle's theorm, Lagrange's MVT & Cauchy's MVT, High Order derivatives.

Assignment-5: Exponential Functions, logarithmic functions, Trigonometric functions.

Assignment-6: Functional Equations, Functions of Bounded Variations, Vector - valued functions.

Section II: Integral Calculus

Assignment-7: Improper Integral - I

Assignment-8: Improper Integral - II

Assignment-9: Beta and Gamma function - I

Assignment-10: Beta and Gamma function - II

Assignment-11: Multiple integrals - I (change of order Change of Variable)

Assignment-12: Multiple integrals - II (Area and Volume)

OR

Section- II: Programming in C

Assignment No.7: Sample Programs – I: Addition, subtraction, multiplication and division. Area, Volume of a sphere, Temperature Conversion, Simple Interest Calculation, Compound Interest Calculation, Salary Calculation, Bonus and Commission.

Assignment No.8: Sample Programs – II: Star pattern, Reverse of a given number, Fibonacci sequence, Factorial ${}^{n}C_{r}$, ${}^{n}P_{r}$, Roots of the quadratic equation.

Assignment No.9: Sample Programs – III: Maximum and Minimum, Sum of the series $1+2+3+\ldots..+n$, $1^2+2^2+3^2+\ldots.+n^2$, $1^3+2^3+3^3+\ldots..+n^3$, $1^2+3^2+\ldots.+(n-1)^2$, $2^2+4^2+6^2+\ldots+(2n)^2$

Assignment No.10: Sample Programs – IV: Sine, Cosine, Exponential series

Assignment No.11: Sample Programs - V: Ascending and descending data. Matrix addition/Subtraction, Matrix multiplication.

Assignment No.12: Sample Programs – VI: Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 th Rule.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Fermentation Technology

(Skill Enhancement Course)

Name of the Course: B. Sc. Part- III (Sem. V)

(Syllabus to be implemented from w.e.f. June 2021)

Enhancement Course (SEC)

Introduction: -

Solapur district is known for the production of fruits like Grapes, Pomegranate and sugarcane. One of the emerging agro based industry is the Fermentation industry. Fermented food products are part and partial of our daily. Recently, farmers have realized this fact and Government has also taken initiatives by relaxing the taxation and certification rules for the Industries. In future large number of expertise is likely to be required in this area. In order to meet this requirement of skilled expertise the **Skill Enhancement Course** in Fermentation Technology is proposed to be started as a part of B Sc. Microbiology course.

Objective of the course

1.To provide the knowledge of basic principle of fermentation process, which help students to design, develop and operate industrial level fermentation process.

2.To develop skills of the students in the area of downstream processing

3.To impart basic knowledge of quality control and good manufacturing practices in industries

4. To equip the students to pursue higher studies.

5. To prepare the student for an eventual job in industry.

The **Skill Enhancement Course** in fermentation Technology provides platform for job opportunities in exciting fields of fermentation industry. This course has to be completed along with the degree course.

B.Sc. III- Microbiology (Semester-V) w. e. f. June 2021

[Credits -4, Total Lectures-60(theory 30+practical 30)]

Title :SEC: Fermentation Technology

SEC	Fermentation Technology	Total30 lectures
UNIT I	Definition and Scope of Industrial Microbiology. Basic Concepts of Fermentations. a) Fermentations Introductions b) Fermenter design - parts & their functions c) Types of fermenter - batch, Continuous, Dual and Multiple d) Design of fermentation media- water, carbon and nitrogen source, Growth factors, precursors, aeration and antifoam agents. e) Factors affecting fermentation process.	05
UNIT II	Selection & Preservation of Industrial microorganisms a) Primary and Secondary Screening b) Strain Improvement c) Scale up of Fermentation d) Preservation of Industrially important microorganisms e) Microbiological assays	05
UNIT III	Specific Fermentations a.Penicillin b.Amylase c.Vinegar d.Vit B 12 Production of SCP,biogas,biofertilizers,biopesticides	11
UNIT IV	1. Recovery of Fermentation product, Criteria for method selection,Methods-Filteration, Centrifugation,Drying, Crystallization, Solvent extraction etc. 2.-Quality control of Health Care Products,Testing for Sterility,Toxicity, Pyrogenesity,Allergy,Catcinogenesity. 3-Good Manufacturing Practices-General requirements,GMP 10-Principles,GMP Categories.	09

SEC	PRACTICAL COURSE total 30 practical lectures
	1. Sterility testing of dry powder by direct inoculation on Soyabean casein digest medium
	2. Sterility testing of media
	3.Bioassay of Vitamin B12
	4.Bioassay of Penicillin
	5. Screening of antibiotic producers
	6. Estimation of alcohol by using K2Cr207
	7. Thin layer chromatography
	8. Demonstration of crude recovery of amylase enzyme
	9. Immobilization of enzyme by using Sodium alginate.
	10.Preservation of industrially important microorganisms

References:

1. Stanbury P.F., Whitaker A., Hall S.J.,(1997) Principles of fermentation technology. 2nd ED, Aditya books(P) Ltd, New Delhi.

2. El-mansi E.M.T., Bryce C.F.A., Demain A.L., Allman A.R., (2009) Fermentation microbiology and biotechnology, 2nd ED,CRC Press.

3. Crueger W. and Crueger A. (2003) Biotechnology: A textbook of industrial microbiology, 2nd ED, Panima publishing corporation, New delhi.

4. Bailey J. S. and Bhatia S.C. (2009) Biochemical engineering. Vol – 1&2. CBS publishers & distributors, India.

5. Reed, G.(1981) Prescott and Dunn's Industrial Microbiology. Chapman & Hall.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science& Technology

Choice Based Credit System (CBCS)

Syllabus: Electronics

Name of the Course: B.Sc. III (Sem–V& VI)

(Syllabus to be implemented from w.e.f. June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Syllabus
For B.Sc. III Electronics
(CBCS Pattern)

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year 2021-22

1. **Preamble:**

Bachelor of Science (B.Sc.) in Electronics is the course disseminatingknowledge of the subject from fundamental concepts to state-of-technologies.Indeed, the curriculum encompasses knowledge of various themes such asMicrocontroller and Embedded System, Instrumentation, CommunicationElectronics, Power Electronics, Medical Electronics, Virtual Instrumentation, etc.The Choice Based Credit System (CBCS) is implemented for this course. Out of4 theory papers, in each semester, 3 papers are of core. However, students haveto opt one paper from DSE papers. In the practical course of 400 marks there are compulsory experiments for practical course IV, V, VI and VII. Moreover, project work is also mandatory in curriculum at last semester to ensure better practical knowledge and hence better jobopportunities in industrial sector.The details are mentioned in the syllabus.

2. **Objectives of the course:**

The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of the various facets of electronic circuits and systems. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, devices, circuits and products and development of appropriate practical skills suitable for industrial needs. Objectives are

- To design the syllabus with specific focus on key Learning Areas.
- To equip student with necessary fundamental concepts and knowledge base.
- To develop specific practical skills.
- To impart training on circuit design, analysis, building and testing.
- To prepare students for demonstrating the acquired knowledge.
- To encourage student to develop skills for accepting challenges of upcoming technological advancements.

3. Course Structure:

Subject/ Core Course	Subject	Title of the paper	Marking Scheme			Hrs/Week			Credits
			UA	CA	Total	L	T	P	
Semester –V									
(AECC)	Ability Enhancement Course	Paper II Part A English (Business English)	40	10	50	4	-	-	2.0
IX	Core 1	Linear Integrated Circuits and Applications	80	20	100	4	-	-	4
X	Core 2	Fundamentals of Microcontroller	80	20	100	4	-	-	4
XI	Core 3	Sensors and Transducers	80	20	100	4	-	-	4
XII	DSE-1	Biomedical Electronics	80	20	100	4	-	-	4
	DSE-2	Electronics Communication							
	SEC	Add-on-self learning (On-line Platform: MOOC/SWAYAM Course/Skill Course)	--	--	--	--	--	--	4
		Total	**360**	**90**	**450**	**20**	-	-	**18**
Semester –VI									
(AECC)	Ability Enhancement Course	Paper II Part B English (Business English)	40	10	50	4	-	-	2.0
XIII	Core 1	Power Electronics	80	20	100	4	-	-	4
XIV	Core 2	Embedded System Design	80	20	100	4	-	-	4
XV	Core 3	Electronics Instrumentation	80	20	100	4	-	-	4
XVI	DSE-1	Virtual Instrumentation	80	20	100	4	-	-	4
	DSE-2	Modern Communication Systems							
		Total	**360**	**90**	**450**	**20**	-	-	**18**
Practical									
	Core 1	Practical V	80	20	100	-	-	5	4
	Core 2	Practical VI	80	20	100	-	-	5	4
	Core 3	Practical VII	80	20	100	-	-	5	4
	DSE-1/2	Practical VIII(Project/ Internship)	80	20	100	-	-	5	4
		Total	**320**	**80**	**400**	-	-	**20**	**16**
		Grand Total	**1040**	**260**	**1300**	**40**	-	**20**	**52**

Abbreviations:
L: Lectures
T: Tutorials
P: Practical

UA: University Assessment
CA: College Assessment
DSE: Discipline Specific Elective Paper
SEC: Skill Enhancement Course

4. Nature of theory question paper

The nature of theory question paper is as per university common model.

Total Marks 40.

Q. 1 Multiple choice questions (One mark each)	12
Q. 2 Short answer question (Any four)	04
Q. 3 A Short answer question (Any two)	05
B Short answer question (one compulsory)	03
Q. 4 Short answer question (Any two)	08
Q. 5 Long answer question.	08
OR	
Q. 5 Answer the following.	08
A.	
B.	

5. Distribution of Practical Marks (400) :

Sr. No.	**UA (320)**		**CA (80)**	
1.	Practicals (50 x 4Practicals)	200	1Circuit Test (10 + 10)	20
2.	Project(Project-60,Report-10,Oral-10, Presentation-10, Idea/Theme-10)	100	Practical Test (20 + 20)	40
3.	Journal	20	Seminar	10
4.			Industrial visit/ IndustrialCase Study /Visit to industrial exhibition/Participation in Conference/ Workshop/ Seminars	10
	Total	320	**Total**	80
			Total	400

A) University Assessment:

Practical Marks (50X4=200) may be as given below.

a) Circuit diagram/ Flow Charts -10
b) Assembly of the circuit/Programming -10
c) Understanding/Observations -10
d) Calculations,graph / printout -10
e) Result / comment -05
f) Oral -05

- Flexibility should be given to the students to write code of respective experiments.
- **Project:** Every student should take up a project and submit the report of the work carried out.The project work will be assessed independently at thetime of practical examination.
- It is mandatory for the students to produce certified journal at the time of practical examination.

B) College Assessment (80):

- **Circuit Diagram Test** : Two circuit diagram tests, each of 10 marks.
- **Practical Test :**Two practical tests, semester-wise, each of 20 marks.
- **Seminar:** Every student of B.Sc. III, Electronics will have to deliver one seminar of at least 10minutes on any advanced topic in Electronics using ICT(power point presentation) and submit the report of presentation, for 10marks.
- **Industrial visit / Local industry case study / Job training/ Visit to industrialexhibition/Participation in the Conference/ Workshop/seminars** :In order to give the exposure ofindustry/ Research Institute and advances in thefield of Electronics, industrial visit should bearranged and submit the report.OR he should submit the report of the case study of local industryor on jobtraining (minimum four days) OR he may visit to an industrial/ Scienceexhibition ORparticipate in conference / Seminar / workshop and produce certificate of participation, for 10marks.

C) Skill Enhancement Course (SEC):

Student has to complete min one of this activity on his own resources and has to produce the certificate of the same. If any official documentation is necessary from institute, it will be provide, e.g. consent letter, etc. The Internship/Industrial Training must have min of 240 hours.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester -V
PaperIX: Linear Integrated Circuits and Applications

Total Marks: 100 Credits: 04
(60 Periods)

Unit 1. Fabrication of Integrated Circuits 15

Advantages of IC's, Epitaxial process, Diffusion process: Constant source and Limited source, Oxidation (SiO2 layer), Photolithography, Metallization, Fabrication of monolithic components:NPN and PNP, transistors, diodes, resistors and capacitors.

Unit 2.Non linear Application of Op- amp 09

Precision full wave rectifier, Active peak detector, Sample and hold circuit, Clipper and Clamper, Log and Antilog Amplifier.

Unit 3.Active Filters 10

Introduction to filters (Passive and Active), Advantage of active filters overpassive filters,Classification (low pass, high pass, band pass, band stop and allpass filters), Types of filters (Butterworth and Chebyshev) and their comparison, Second order Butterworth Low pass and High pass filters, Band pass, Band stopfilters (narrow and wide).

Unit 4. Regulated Power Supply 11

Series Op-Amp regulator, Basic block diagram of IC regulator, Protectioncircuits for ICregulators (over current, over voltage, thermal shutdown) Voltageregulators using IC78XX, 79XX, LM 317 and LM337.Designing of regulatedpower supply for 5Volt.

Unit 5. Phase Locked Loop 15

VCO, Block diagram of PLL, Principle and working of PLL, Transfercharacteristics,Derivation of lock range and capture range, Features of IC 565,Application of PLL asFrequency multiplier, FM demodulator, FSK demodulatorusing IC 565.V to F converter and F to V converter (LM 331)

Reference Books:

1. Integrated Circuit (New Edition) – K. R. Botkar
2. Integrated Electronics – Millman and Halkies (MGH)
3. Linear Integrated Circuit – D Roy Choudhari, Shail Jain (Wiley Eastern Ltd)
4. Op-Amps and Linear Integrated Circuits – RamakantGaikwad (PHI)

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester -V
Paper X : Fundamentals of Microcontroller

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Architecture of Microcontroller 18

Comparison of Microprocessor and Microcontroller, Requirement ofMicrocontrollers, Overview and features of MCS 51 Family, Block Diagram andPin description of 8051, Memory organization, GPRS, and SFRs, Flags, I/OPorts, study of Timer/Counter, study of Interrupts, study of Serialcommunication port, Clock and Reset circuit.

Unit 2. Instruction Set of 8051 13

Addressing Modes, Instruction Set, Execution of Instruction, Classification ofInstruction Set - Data transfer group, Arithmetic group, Logical group, branchcontrol group, Boolean/Single Bit Instructions, Concept of Stack andSubroutine.

Unit 3. Assembly Language Programming with 8051 11

Assembly Language Programming for Data Transfer, Arithmetic and Logicaloperations.Branching and Looping,I/O Port Programming and Bit manipulation,Time Delay Subroutine.

Unit 4. Timer and Interrupt Programming in 8051 09

Configuration of timers as a timers in various modes, Configuration of Timer asa Counter, Time delay generation, square wave generation. Programming of theinterrupts: ALP for interrupt (external and internal) execution.

Unit 5. Serial Port Programming in 8051 09

Basics of serial communication, Serial port of 8051, RS-232 standard and ICMAX–232, Baud rate in 8051, Baud rate doubling using crystal frequency andPCON register, SBUF, SCON registers, Importance of TI and RI flags,Assembly Language Programming for serial data transmission and reception.

Reference Books:

1. The 8051 microcontroller Architecture, programming and application byKenneth J. Ayala
2. The 8051 Microcontroller and Embedded Systems, M. A. Mazadi, J. G. Mazadi,Pearson Education, Asia
3. Microcontroller by Ajay Deshmukh
4. Microcontroller by D. S. Dhote

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester –V
Paper XI : Sensors and Transducers

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Fundamentals of Sensors and Transducers 15

The measurand, basic needs of measurements, Block diagram of measurementsystem, Characteristics of measurement Systems, static characteristics, dynamiccharacteristics and responses, Need of system calibration.Definition: Sensor and Transducer, Principle of transduction, Basic differencebetween sensor and transducer, Types of sensor, Static and Dynamiccharacteristics,Classification of transducers, Basic requirement of transducers,Selection criteria for transducer.Concept of Active and Passive Sensors.

Unit 2. Resistive Transducers 10

Principle of operation, Potentiometer, Resistance pressure transducer, Resistiveposition transducer, Strain gauge, Temperature transducer: RTD, Thermistors.

Unit 3. Inductive Transducer 08

Principle of operation, Variable reluctance type transducer, Differential transducer:Linear Variable Differential Transducer (LVDT) and Rotary Variable DifferentialTransducer (RVDT)

Unit 4. Capacitive Transducer 07

Principle of operation, Variable Area Type, Variable Air Gap type,VariablePermittivity type, Capacitor microphone.

Unit 5. Electronic Transducers and Actuators 20

Transducers: Thermocouple, Piezoelectric transducer, Hall Effect transducers,Photoelectric transducer: LDR, Photo-voltaic cell, Photo diode, Phototransistor.Pyrometers. Smart Sensors: Temperature sensor (LM35), LPG sensor(N26), PIR sensor. Actuators : Electromagnetic Relay, Solenoid, Opto-couplers.

Reference Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation by AKSawhney, DhanpatRai Publication.
2. Electronic Instrumentation by K.S.Kalsi, TMH Publication.
3. Sensors and Transducers by KV Gitapathi, Center: Technical Coordination.
4. Instrumentation devices and systems, CS Rangan, JR Sharma and VSV Mani,MGH.
5. Smart sensors from datasheet (LM35, N26, PIR)
6. Basic Electronics – B L Thereja S Chand.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS Pattern Semester –V
Paper XII (DSE-1): Biomedical Electronics

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Bioelectric Signals 12

Introduction to physiological systems, Sources of biomedical signals. The origin ofBioelectric signal: Resting and Action potentials, Propagation of action potentials.Introduction to bioelectric signals: ECG, EEG, EMG.

Unit 2. Study of Bioelectric Electrodes 13

Introduction to electrode theory, Silver-Silver Chloride electrode,Classification ofbioelectric electrodes, Microelectrodes: Metal and micropipette.Surface electrodes:Limb & Floating electrode, ECG Leads,Suction-cup electrode, fluid columnelectrode, Pad electrode. Needle electrode

Unit 3. Fundamentals of Biomedical Instrumentation System 12

Basic architecture of medical instrumentation system, preamplifiers, differentialamplifiers, instrumentation amplifiers, Isolation amplifier, Sources of the noise.

Unit 4. Monitoring System 11

Electrocardiograph (ECG): Basic principle, block diagram of ECG.
Electroencephalograph (EEG): Basic principle, block diagram of EEG.
Electromyograph (EMG): Basic principle, block diagram of EMG

Unit 5. Imaging System 12

Basic of Diagnostics radiology, Block diagram of x- ray machine, Principles ofUltrasound: properties, mode of transmission and imaging.

Reference Books:

1. Handbook of Biomedical Instrumentation, -R.S. Khandpur, 2nd edition, TMH, NewDelhi Reprint 2007
2. Introduction to Biomedical Equipment Technology- J.J.Carr& J.M. Brown, PHI1993.
3. Biomedical Instrumentation and Measurements –Cromwell, Weibell& Pfeiffer, PHI2nd Ed.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS Pattern Semester –V
Paper XII(DSE-2): Electronics Communication

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Introduction to Communication System 10

Introduction, Need, importance, Elements of electronic communication system,Typesof communication system, analog communication system, digitalcommunication system, concept of simplex and duplex communication, Noiseincommunication (S/N ratio and noise figure).

Unit 2. Modulation and Demodulation Techniques 14

Need, Types of modulation-Analog and digital modulation.

Analog Modulation: Amplitude modulation: Principle, mathematicalexpression, modulation index, Power distribution, frequency spectrum, Conceptof DSB, SSB, VSB.

Frequency modulation: Principle, mathematicalexpression, modulation index, frequency spectrum, side bands.

Demodulation ofAM and FM (Envelop detector & ratio detector)

Digital Modulation: Introduction to PAM, PWM, PPM, PCM, ASK, FSK,FDM & TDM

Unit 3. Antenna and Radio Wave Propagation 12

Principle of antenna, Concept of radiation pattern, Antennaparameters,Evaluation of ($\lambda/2$) antenna (without mathematical treatment), Typesof antenna: Yagi and Parabolic antennas (radiation pattern, frequency range,applications).Radio Wave propagation: Principle, types of radio wave propagation: Ground waves, Space waves, Sky waves, Concept of skip distanceand Virtual height.

Unit 4. Radio Receiver and Television 14

Radio receiver: Characteristics of receiver, Superheterodyne principle, Blockdiagram of AM, FM receivers, Television: Concept and block diagram of Blackand White television transmission andreception, TV interlace scanning,Television standards, Band requirement, VSB, Composite video signal,Introduction to colour TV

Unit 5. Telephone System 10

Principle, telephone handset, subscriber local loop, Need of telephone exchange,Electronic telephone exchange, Different tones in telephone, DTMF dialer.

Reference books:

1. Principle of Communication Engineering by Anokh Singh, S.chand and company.
2. Communication electronics: Principles and applications by Frenzl, 3rdedition, TMH.
3. Radio engineering(Applied electronics Vol.-II): by G.K.Mitthal, khanna publication.
4. Electronic Communications (4th Edition) Dennis Roddy , John Coolen

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS Pattern Semester –VI
Paper XIII: Power Electronics

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Power Devices 11

Power diode: Construction, switching characteristics and applicationsEffect of reverse and forward recovery time.

Power BJT and MOSFET: Construction, switching characteristics andapplications),IGBT and SIT: Construction, working, applications, Thermal considerationsand heat sinks for power devices

Unit 2. Thyristor 15

SCR: operating principle with two transistor analogy, V-I characteristics,Latching Current (IL) and Holding Current (IH), advantages, disadvantages, andapplications.

GTO and PUT: Construction, working, V-I characteristics, and applications.

Concept of turn on mechanism of SCR: Forward break-over triggering (HighVoltage triggering), dv/dt triggering, thermal triggering, illumination triggering,gate triggering. Triggering circuits: R, RC, UJT and PUT (operation withwaveforms), Concept of turn off mechanism of SCR, Turn OFF methods: Class A, Class B,Class C and Class D, (Working with waveforms), Concept of di/dt, dv/dt and itsprotection circuits.

Unit 3. Controlled Rectifier 12

Concept of Phase control (Firing and conduction angle),Single phase half wave controlled rectifier with resistive and inductive load,Effect of free-wheeling diode,Single phase full wave controlled rectifier with resistive load and inductive load,Three phase full wave controlled rectifier with resistive load (withoutmathematical treatment).

Unit 4. Invertors and Choppers 13

Classification of inverters, Transistor inverter, Series and Parallel Inverter usingSCR, Basic principle of single phase half and full bridge inverter, Concept ofChopper Basic chopper circuit, Step down and step up chopper using SCR,Jones chopper

Unit 5. Applications of Power devices 09

Applications of SCR: Speed control of dc Motor, flasher circuit, battery chargercircuit, emergency lighting system, block diagram and concept of UPS, blockdiagram and concept of SMPS.

Reference Books

1. Power Electronics- M. H. Rashid (PHI)
2. Power Electronics- Dr. P. S. Bimbra, (Khanna Publication)
3. Power Electronics- P. C. Sen (TMH)
4. Thyristor Engineering- M. S. Berde (Khanna Publication)

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester -VI
Paper XIV: Embedded System Design

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Fundamentals of Embedded Systems design 09

Definition of an embedded system, Basic architecture of embedded system,characteristics of embedded systems, Applications of embedded systems.Minimum 89s51 based hardware for general embedded system.

Unit 2. Programming with the C 15

Introduction to C programming: Basic Structure of C program, character set,keywords and identifiers, constants and variables, concept of global declarationand local declaration, data types and data ranges, expressions and operators.Study of IO statements, Control Statements, Arrays, Loops, User`s definedfunctions. Simple examples.

Unit 3. Fundamentals of Embedded C 13

Basic Structure of Embedded C program, Need of Operating System, Concept ofSuper loop. An embedded C programs for

1. Generation of Time delay with and without use of timers.
2. Square wave generation,
3. Programming of I/O port and Serial Port
4. Interrupts.

Unit 4. Interfacing of devices: The Hardware and Software 13

Development of both Hardware and software for interfacing of Switches,Thumbwheel switch, Relays, LEDs, Transistor, Opto-coupler, Seven SegmentDisplay, 16 X 2 LCD, Stepper Motor, ADC 0804/0809 and DAC 0808, DAC byusing PWM technique.

Unit 5. Designing of an Embedded System 10

1. Designing of microcontroller 89s51 based embedded system forMeasurement of Temperature of an environment
2. Designing of microcontroller 89s51 based embedded system forMeasurement of humidity of an environment.
3. Designing of microcontroller 89s51 based embedded system for DC motorcontrol using PWM technique.

(Flowchart of the necessary embedded software is expected only)

Reference Books

1. Embedded C - Michael J Point
2. The 8051 Microcontroller and Embedded Systems – Using Assembly and CMohammadAli Mazidi, Janice GillispieMazidi, Rolin D. McKinlay 2nd Edition, Pearson Education (Prentice Hall)
3. Microcontroller By Ajay Deshmukh

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester -VI
Paper XV: Electronics Instrumentation

Total Marks: 100 Credits: 04(60 Periods)

Unit 1. Fundamental of Signal Conditioning 13

General block diagram for electronics instrument design for measurement.Minimum requirements, Block diagram of dc and ac signal conditioning techniques,Excitation, Grounding and electromagnetic and electrostatic shielding.Signalconditioners, Bridge amplifier,Pre-amplifiers, Instrumentation amplifier,Isolationamplifiers and chopper Amplifiers, Display unit.

Unit 2. Programmable instrumentation amplifiers 13

Need of Programmable instrumentation amplifier, Salient features of ProgrammableInstrumentation amplifiers. Salient features, Block diagram and Pin description ofInstrumentation amplifiers AD620, Salient features, Block diagram and Pindescription of Precision amplifiers AD594/595.

Unit 3. Signal transformation and Data Acquisition System(DAS) 13

Offset compensation, 4-20mA current transmission, Ratiometric and logarithmicconversion. Need of DAS, Single channel DAS, Multi-channel DAS, Data loggers:Basic Operation of data loggers, compact data loggers. Computer based DAS.

Unit 4. Measuring Instruments and Display and Recording Devices 13

Digital multimeter (DMM), Signal and Function generator, Analog CRO, DigitalStorage Oscilloscope, LCR Q Meter(Principle, Block diagram and working)X-Y Recorder, Magnetic recorder, Digital data recorder.

Unit 5. Case Study 08

Study of (Principle, Block diagram and working) PH Meter, Conductivity meter andTemperature meter.

Reference Books

1. Electronic Instrumentation by K.S.Kalsi, TMH Publication.
2. Electronic Measurements by U.A.Bakshi and V.U.Bakshi, Technical Publication.
3. Instrumentation Measurement and Analysis by NakaraChoudhary(TMH)
4. Transducers Interfacing Handbook by DH Sheingold, Analog Devices Inc.
5. A Course in Electrical and Electronics Measurements and Instrumentation by AKSawhney, DhanpatRai Publication.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS Pattern Semester -VI
Paper XVI (DSE-1): Virtual Instrumentation

Total Marks: 100 Credits: 04
(60 Periods)

Unit 1.Fundamentals of Virtual Instrumentation 15

Historical perspectives, Basic concept of Virtual Instrumentation, Importance ofVI, Block diagram and architecture of Virtual Instrumentation, data- flowtechniques, graphical programming in data flow, Comparison between Virtualinstrumentation and Traditional Instrumentation, Advantages of VirtualInstrumentation.

Unit 2. Standard tools for Virtual instrumentation 11

Need of IDE for development of Virtual Instrumentation system, basic featuresof the tools, LABView, Proteus, Circuit Maker, PSPICE. Comparative approach.

Unit 3. Fundamentals of LABVIEW 10

Introduction to LABVIEW the virtual Instrumentation software, VirtualInstrumentation programming techniques, "G" Programming Language.Labview windows, front panel window, Block diagram window, Creating andsaving VI, Terminals, Nodes, Functions, wires etc.

Unit 4. Development of Virtual Instrumentation with LABView 13

The VI and sub-VI loops, charts, arrays, clusters and graphs, case and sequencestructures, formula nodes, local and global variables, string and file IO. Suitableexamples.

Unit 5. Case studies 11

Designing of Virtual Instrumentation using LABVIEW for

1. Data Acquisition Systems for Measurement of physical parameters
2. Temperature controlling

Reference Books

1. Virtual Instrumentation by using LabVIEW- Jovitha Jerome, PHI, New Delhi,2011.
2. Graphical programming Gary Johnson, 2nd Edition, MGH, 1997.
3. LABVIEW for everyone –Lisa K wells and Jeffery Travis PHI 1997.
4. Basic concept of LABVIEW 4-Skoff-PHI 1998.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester -VI
Paper XVI (DSE-2): Modern Communication Systems

Total Marks: 100 Credits: 04
(60 Periods)

Unit 1. Fiber Optic Communication 12

Need of light wave communication, working principle of fiber optic cable,Definition and terminologies: bit rate, baud rate, bandwidth, channel capacity,power calculation Block diagram of Optical Fiber Communication System,Fiber optic cables, types, Splicer and Connectors. Sources and Detectors;Transmitter and receivers,Applications

Unit 2. Satellite Communication 11

Satellite Orbits, Satellite Communication System, Earth Station, andTransponders, Application ofSatellite communication system (TV distribution,surveillance and satellite phones)

Unit 3. Mobile Communication 11

Concept of cell, basic cellular system and its operational procedure, Hand off,power requirements, Block diagram Transmitter, receiver, Frequencysynthesizer, logic unit, control unit.

Unit 4. Microwave and Radar Communication 13

Basics of microwave communication, advantages, Transmission lines,Waveguides and cavity resonators, Microwave semiconductor devices (Gunndiode), microwave tubes (Klystron). RADAR: Concept of radar, Pulsed RadarSystem.

Unit 5. Computer Communication 13

Digital Data Communications Concepts,Modems: Block diagrams ofQPSK andQAM Protocols., Computer Networks: LAN, MAN, WAN. Network Topologies(Star, Ring, and Bus) Concept of Internet, Bluetooth and Wi-Fi and theirstandards.

Reference Books

1. Communication Electronics – Frenzel (TMGH)
2. Analog and Digital Communication Systems – Martin S. Roden
3. Digital and Data Communications – Martin (PHI)
4. Hand Book of Electronic Communications – Miller
5. Optical Fiber Communication - Senior
6. Mobile Communication – Shiller

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur
B.Sc.-III (Electronics)
CBCS PatternSemester –V&VI
List of Experiments

Group A

1. Study of Operational amplifier as band pass / band stop filter
2. Application of PLL (Frequency Multiplication)
3. Design of Regulated Power Supply using IC LM317/337)
4. Design of Log amplifier by using Operational amplifier
5. Study of F to V converter / V to F converter (LM331)
6. Study of SCR firing by UJT
7. Study of Full Wave Controlled Rectifier
8. Design of Light Dimmer circuit by using TRIAC
9. Study of Speed control of motor using SCR
10. Study of SMPS / Study of Chopper circuits (Step- Up)

Group B

1. Data transfer operations using microcontroller
2. Arithmetic operations using microcontroller
3. Logical operations using microcontroller
4. Thumb Wheel and seven segment display interface using microcontrollerusing embedded C
5. Interfacing of stepper motor with microcontroller using embedded C
6. Square wave generation with timer using embedded C
7. Interfacing of ADC/ DAC using embedded C
8. Interfacing of 16×2 LCD display using embedded C
9. Serial communication with PC using embedded C
10. DC motor control with PWM using embedded C

Group C

1. Study of strain gauge (load cell)
2. Study of temperature sensor PT 100.
3. Study of LVDT
4. Study of offset voltage compensation circuit
5. Design of circuit for measurement of electric conductivity of water
6. Design of Light activated turn ON/OFF circuit
7. Design of ON-OFF temperature controller
8. Programmable gain amplifier (AD 620)
9. Programmable gain amplifier (AD 595)
10. Instrumentation Amplifier by using LM324/TL084.

Group D

D1 : Biomedical Electronics

1. Build and test the Bio Potential Amplifier.
2. Study of instrumentation amplifier INA 126.
3. Measurement of Bioelectric Potential
4. Study of PQRS Response
5. Measurement of Heart rate

D2 : Electronics Communication

1. Study of Tuned RF amplifier
2. Study of Tuned IF amplifier

3. Study of amplitude modulation and demodulation
4. Study ofFrequency Modulation
5. Study of PWM

D3 :Modern Communication System

1. Data communication using OFC
2. Study of FSK modulation
3. Time Division Multiplexing
4. Study of DTMF decoder
5. Study of AGC circuit

D4 :Virtual Instrumentation

1. Study of front panel and block diagram windows of LabVIEW.
2. Design and simulation of instrumentation amplifier by usingLabVIEW/Proteus
3. Design and simulation of temperature measurement system by usingLabVIEW/Proteus
4. Simulation of interfacing ADC to microcontroller by usingLabVIEW/Proteus
5. Simulation of interfacing LCD to microcontroller by usingLabVIEW/Proteus

Note :

- Minimum eight experiments from group A to C should be performed by thestudents.
- Group D is Discipline specific elective (DSE-1) group. Students have to opt anytwo sub groups, from D1 to D4, as per elective papers and they have to performminimum 4 experiments, each from elected two sub-groups.

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Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

Choice Based Credit System (CBCS)

Syllabus: Physics

Name of the Course: B.Sc. III (Sem–V & VI)

(Syllabus to be implemented with effect from June 2021)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Syllabus: For B.Sc. III Physics
(CBCS Pattern)
Choice Based Credit System (CBCS) Pattern
To be implemented from Academic Year 2021-22

1. Preamble:

Bachelor of Science (B.Sc.) in Physics is the course disseminating knowledge of the subject from fundamental concepts to state-of-technologies. Indeed, the curriculum encompasses knowledge of various themes such as Mathematical Physics, Classical Mechanics, Atomic & Molecular Physics Materials Science, Quantum Mechanics, and Electronics etc. The Choice Based Credit System (CBCS) is implemented for this course. Out of 4 theory papers, in each semester, 3 papers are of core. However, students have to opt one paper from DSE papers. Also one Add on Skill enhance course is included as SEC. In the practical course of 400 marks there are compulsory experiments for practical course IV, V, VI and VII (Project/ Internship). Moreover, project work is also mandatory in curriculum at last semester to ensure better practical knowledge and hence better job opportunities in Research & industrial sector. The details are mentioned in the syllabus.

2. Objectives of the course:

The aim of the course is to generate trained manpower with adequate theoretical and practical knowledge of physics domain. Due care is taken to inculcate conceptual understanding in basic phenomena, materials, appropriate practical skills suitable for research and industrial needs. Objectives are

- To design the syllabus with specific focus on key Learning Areas.
- To equip student with necessary fundamental concepts and knowledge base.
- To develop specific practical skills.
- To impart training on circuit design, analysis, building and testing.
- To prepare students for demonstrating the acquired knowledge.
- To encourage student to develop skills for accepting challenges of upcoming technological advancements.

3. Nature of theory question paper

The nature of theory question paper is as per university common mode l.Total Marks 80.

Q. 1 Multiple choice questions (One mark each)	16
Q. 2 Short answer question (Any eight)	16
Q. 3 A Short answer question (Any four)	12
B Short answer question (one compulsory)	04
Q. 4 Short answer question (Any four)	16
Q. 5 Long answer question. (Any two)	16
OR	
Q. 5 Answer the following.	16
A.	
B.	

5. Distribution of Practical Marks (400):

Sr. No.	UA (320)		CA (80)	
1.	Practicals (50 x 4 Practicals)	200	Experiment Test (10 + 10)	20
2.	Project (Project-60, Report-10, Oral-10, Presentation-10, Idea/Theme-10)	100	Practical Test (20 + 20)	40
3.	Journal	20	Seminar	10
4.			Industrial visit/ Industrial Case Study / Visit to industrial exhibition /Participation in Conference/ Workshop/ Seminars	10
	Total	320	**Total**	80
			Total	400

A) University Assessment (320):

Practical Marks (50 X 4=200) may be as given below.

- Flexibility should be given to the students to draw diagrams of respective experiments.
- **Project:** Every student should take up a project and submit the report of the work carried out. The project work will be assessed independently at the time of practical examination.
- It is mandatory for the students to produce certified journal at the time of practical examination.

B) College Assessment (80):

- **Experiment Test:** 02 Experiment diagram tests, each of 10 marks.
- **Practical Test:** 02 Practical tests, semester-wise, each of 20 marks.
- **Seminar:** Every student of B.Sc. III, Physics will have to deliver one seminar of at least 10 minutes on any advanced topic in Physics using ICT (power point presentation) and submit the report of presentation, for 10 marks.
- **Industrial visit / Local industry case study / Job training/ Visit to industrial exhibition/Participation in the Conference/ Workshop/seminars** : In order to give the exposure of industry/ Research Institute and advances in the field of Physics, industrial visit should be arranged and submit the report. OR he should submit the report of the case study of local industry or on job training (minimum four days) OR he may visit to an industrial/ Science exhibition OR participate in conference / Seminar / workshop and produce certificate of participation, for 10 marks.

C) Skill Enhancement Course (SEC):

Student has to complete min one of this activity on his own resources and has to produce the certificate of the same. If any official documentation is necessary from institute, it will be provide, e.g. consent letter, etc. The Internship/Industrial Training must have minimum of 240 hours.

Punyashlok Ahilyadevi Holkar Solapur University,Solapur

Faculty of Science

Choice Based Credit System (CBCS)
(w.e.f. 2021-22)
Revised Structure for B.Sc-III Physics

4. Course Structure:

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credit
	Type	Name		L	T	P				
Class :	**B.Sc.- III Semester - V**									
Ability Enhancement Course (AECC)		English (Business English)	Paper II Part A	4	--	--	100	80	20	4.0
Core (Students can opt any one subjects among the three. Subjects excluding interdisciplinary offered at B.Sc II)		DSE 1 A	**Paper IX :** Mathematical Physics and Statistical Physics	4	--	--	100	80	20	4.0
		DSE 2 A	**Paper X :** Solid State Physics	4	--	--	100	80	20	4.0
		DSE 3A	**Paper XI:** Classical Mechanics	4	--	--	100	80	20	4.0
		DSE 4 A	**Paper XII:** Nuclear Physics	4	--	--	100	80	20	4.0
Skill Enhancement Course		SEC 3	**Paper XIII:** Add-on-self learning (On-line Platform: MOOC/SWAYAM Course/ Skill Course)	--	--	--	--	--	--	4.0
Grand Total				**20**	**--**	**--**	**500**	**400**	**100**	**24**
Class :	**B.Sc.- III Semester -VI**									
Ability Enhancement Course(AECC)		English (Business English)	Paper II Part B	4	--	--	100	80	20	4.0
Core (Students can opt any one subjects among the three Subjects excluding		DSE 1 B	**Paper XIV:** Electrodynamics	4	--	--	100	80	20	4.0
		DSE 2B	**Paper XV :** Materials Science	4	--	--	100	80	20	4.0

interdisciplinary offered at B.Sc. II.	DSE 3B	**Paper XVI :** Atomic Physics, Molecular Physics and Quantum Mechanics	4	--	--	100	80	20	4.0
	DSE 4B	**Paper XVII:** Electronics	4	--	--	100	80	20	4.0
SEC									
Total (Theory)			**20**	**--**	**--**	**500**	**400**	**100**	**20**
Core	DSE 1A &1B	Practical IV	--	--	5	100	80	20	4.0
	DSE 2A & 2B	Practical V	--	--	5	100	80	20	4.0
	DSE 3A & 3B	Practical VI	--	--	5	100	80	20	4.0
	DSE 4A & 4B	Practical VII (Project / Internship)	--	--	5	100	80	20	4.0
Total (Practicals)			**--**	**--**	**20**	**400**	**320**	**80**	**16**
Grand Total			**40**	**--**	**20**	**1400**	**1120**	**280**	**60**

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-III	V	500	24	--	--	24
	VI	500	20	400	16	36
Total		1000	44	400	16	60
Grand Total	**1000(T) +400 (P) = 1400**					

Numbers of Papers Theory: Ability Enhancement Course (AECC) : 02
Theory: Discipline Specific Elective Paper (DSE) : 08
Skill Enhancement Courses : 01

Abbreviations:
L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA: College Assessment
CC: Core Course
AEC: Ability Enhancement Course
DSE: Discipline Specific Elective Paper
SEC: Skill Enhancement Course
GE: Generic Elective

***List of Skill Enhancement Courses**

1) Thin film deposition and Characterization Techniques
2) Scientific Research Paper Writing and Publication
3) Solar Panel Installation and Maintenance
4) Laboratory Safety and Disaster Management
5) Medical Physics
6) Energy Resources
7**)** Energy studies

B. Sc. III, Physics, Semester-V

DSE 1 A

Paper-IX: Mathematical Physics and Statistical Physics

Credits: 04

1. Vector theorems and introduction to partial differential equation (10)

1.1 Gauss's theorem
1.2 Green's theorem
1.3 Stoke's theorem
1.4 Differential equation
1.4.1 Types of differential equation
1.4.2 Degree,Order, Linearity, Homogeneity of differential equation
1.4.3 Concept of singular points of differential equation
1.5 Frobenius method of solving differential equation
1.5.1 Legendre differential equation (without solution)
1.5.2 Bessel differential equation (without solution)
1.5.3 Hermite differential equation (with solution)

2. Orthogonal Curvilinear Coordinates (10)

2.1 Introduction to Cartesian, Spherical polar and Cylindrical Coordinate system
2.2 Concept of Orthogonal Coordinate system
2.3 Gradient in Orthogonal Coordinate system
2.4 Divergence in Orthogonal Coordinate system
2.5 Curl in Orthogonal Coordinate system
2.6 Laplacian Operator in Orthogonal Coordinate system
2.7 Extension of Orthogonal Coordinate system in Cartesian, Spherical polar and Cylindrical Coordinate system

3. Basic Concept in Statistical Physics (10)

3.1 Micro and Macro States
3.2 Micro canonical and Canonical Ensemble
3.3 Phase Space
3.4 Accessible microstates
3.5 A Priory Probability
3.6 Thermodynamic Probability
3.7 Probability Distribution
3.8 Entropy and Probability

4. Maxwell Boltzmann Statistics (10)

4.1 Maxwell Boltzmann Distribution Law
4.2 Evaluation of constants α and β
4.3 Molecular Speeds
4.4 Thermodynamic functions in terms of partition function

5. Quantum statistics - I **(12)**

5.1 Bose Einstein Statistics
5.2 Bose Einstein Distribution Law
5.3 Experimental study of black body radiation
5.4 Derivation of Plank's radiation formula
5.6 Deduction of Wein's Formula from Plank's radiation formula
5.7 Deduction of Rayleigh's Jeans Law from Plank's radiation formula
5.8 Deduction of Wein's Displacement Law from Plank's radiation formula
5.9 Stefan's Law from Plank's radiation formula

6. Quantum Statistics - II **(08)**

6.1 Fermi Dirac Distribution Law
6.2 Application to free electrons in metals
6.3 Electron energy Distribution
6.4 Fermi Energy
6.5 Comparison of M.B., F.D. and B.E. statistics

Reference Books: -

1. Theory and problems of vector analysis- Schaum outline series- Murray R, Spiegel
2. Mathematical methods for physics – George Arfken
3. Thermodynamics and statistical physics – Sharma, Sarkar
4. Statistical Mechanics –B.B. Laud
5. Statistical and thermal physics – S. Loknathan
6. Statistical Mechanics – SatyaPrakash, J.P. Agrawal
7. Elementary Statistical Mechanics – Kumar, Gupta
8. An approach to Statistical Physics – Debi Prasad Ray

B. Sc. III, Physics, Semester-V

DSE 2 A
Paper- X: Solid State Physics

Credits: 04

1. **Crystallography** **(10)**
   - 1.1 Lattice and Basis
   - 1.2 Unit cell
   - 1.3 Bravais lattices (2-D, 3-D)
   - 1.4 Inter-planer spacing
   - 1.5 Miller indices
   - 1.6 Packing fraction and co-ordination number for SC, BCC, FCC & HCP structures
2. **X-ray Diffraction by Crystals** **(10)**
   - 2.1 Production of X-rays and its properties
   - 2.2 Reciprocal Lattice and its properties
   - 2.3 Bragg's law in reciprocal lattice
   - 2.4 Powder method of X-ray diffraction for crystal structure
3. **Free Electron Theory** **(12)**
   - 3.1 Properties of metals
   - 3.2 Free electron model (Drude and Lorentz model)
   - 3.3 Electrical, Thermal conductivity of metals and Wiedemann-Franz relation
   - 3.4 Sommerfeld's theory
   - 3.5 Fermi-Dirac distribution
   - 3.6 Fermi energy, degeneracy and non-degeneracy of metals.
4. **Band Theory of Solids** **(12)**
   - 4.1 Formation of bands in solids (PE, KE and total energy of electron in an isolated atom)
   - 4.2 Formation of energy bands (Valence band, conduction band and forbidden energy gap)
   - 4.3 Motion of electron in one dimensional periodic potential (Kronig-Penney model)
   - 4.4 Effective mass of electron
   - 4.5 Difference between metals, semiconductors and insulators
   - 4.6 Hall Effect and its applications

5. Magnetic Materials (08)

5.1 Magnetic terminology

5.2 Classification of magnetic materials

5.1.1) Diamagnetic materials

5.1.2) Paramagnetic materials

5.1.3) Ferromagnetic materials

5.1.4) Anti-ferromagnetic materials

5.1.5) Ferri-magnetic material and ferrites

5.3 Energy loss in the hysteresis

6. Superconductivity (08)

6.1 Superconductor

6.2 Type I and type II superconductors

6.3 Critical temperature

6.4 Effect of magnetic field

6.5 Meissner effect

6.6 Josephson effect

6.7 Applications of superconductors

Reference Books:

1. Introduction to Solid State Physics – Charles Kittel (Wiley)
2. Solid State Physics – S. O. Pillai (NEW AGE INTERNATIONAL PUBLISHERS)
3. Solid State Physics – A. J. Dekker (Laxmi Publications)
4. Solid State Physics – R. K. Puri, V.K. Babbar (S. Chand)
5. Solid State Physics – R. L. Singhal (KNRN Publication)
6. Fundamentals of Solid State Physics – Saxena B. S. and Gupta R.C. (Pragati Prakashan)

B.Sc. III, Physics, Semester-V

DSE 3A,

Paper – XI: Classical Mechanics

Credits: 04

Unit No: 1. Mechanics of a particle and system of particles (10)

1.1 Mechanics of a particle using vector algebra and vector calculus
1.2 Conservation theorems for linear momentum, angular momentum and energy of a particle
1.3 Mechanics of a system of particles, concept of centre of mass
1.4 Conservation theorems for linear momentum, angular momentum and energy of a system of particles
1.5 Application of Newton's law of motion - Projectile motion in resistive medium
1.6 Problems

Unit No: 2. Lagrangian Formulation (12)

2.1 Limitations of Newtonian Formulation
2.2 Introduction of Lagrangian Formulation
2.3 Constraints
2.4 Degrees of freedom
2.5 Generalised coordinates
2.6 Principle of virtual work
2.7 D' Alembert's Principle
2.8 Lagrange's equation from D' Alembert's Principle
2.9 Application of Lagrange's equation to
    i) A particle in space (Cartesian coordinates)
    ii) Atwood's Machine and
    iii) A bead sliding on uniformly rotating wire
    iv) Simple Pendulum
    v) Simple harmonic Oscillator
2.10 Problems

Unit No: 3. Moving Coordinate systems (10)

3.1 Moving origin of coordinates
3.2 Pseudo forces
3.3 Rotating coordinate systems
3.4 Coriolis force
3.5 Foucault's pendulum
3.6 Effects of Coriolis force in nature
3.7 Effect of Coriolis force on freely falling body
3.8 Problems

Unit No: 4. Techniques of Calculus of Variation (10)

4.1 Hamilton's principle
4.2 Deduction of Lagrange's equations from Hamilton's principle
4.3 Applications:
    i) Shortest distance between two points in a plane
    ii) Brachistochrone problem
    iii) Minimum surface of revolution

Unit No: 5. Coupled Oscillations **(10)**

5.1 Frequencies of coupled oscillatory system
5.2 Normal modes and normal coordinates
5.3 Energy of coupled oscillations
5.4 Energy transfer in coupled oscillatory system
5.5 Problems

Unit No: 6. Motion of rigid body **(08)**

6.1 Motion of rigid body in space
6.2 Euler's theorem
6.3 Angular momentum and energy
6.4 Euler's equations of motion

Reference Books:

1. Classical Mechanics: Herbert Goldstein
2. Classical Mechanics: N. C. Rana and P.S. Joag
3. Introduction to classical Mechanics: R. G. Takawale and P.S. Puranic
4. Classical Mechanical: Gupta, Kumar and Sharma
5. Classical Mechanics: P.V. Panat

+B.Sc. III, Physics, Semester-V

DSE – 4A

Paper-XII: Nuclear Physics

Credits: 04

1. Nuclear Structure and Properties (12)

1.1 Composition of nucleus
1.2 Nuclear radius
1.3 Nuclear spin
1.4 Nuclear magnetic moment
1.5 Electric quadrupole moment
1.6 Mass defect
1.7 Binding energy
1.8 Packing fraction
1.9 Liquid drop model of nucleus
1.10 Semi-empirical mass formula

2. Nuclear Reactions (08)

2.1 General scheme of nuclear reactions
2.2 Q-value of nuclear reactions
2.3 Threshold energy
2.4 Cross-section of nuclear reactions (Qualitative)
2.5 Stripping reactions
2.6 Pick-up reactions

3. Particle Accelerators (10)

3.1 Need of accelerator
3.2 Cyclotron
3.3 Limitations of cyclotron
3.4 Phase stable orbit
3.5 Betatron

4. Nuclear Radiation Detectors (10)

4.1 Classification of detectors
4.2 Geiger-Muller counter
   i. Construction and working
   ii. Dead time, recovery time and resolving time
   iii. Self quenching mechanism
4.3 Wilson Cloud chamber
4.4 Scintillation counter

5. Nuclear Energy Levels **(10)**

5.1 Alpha decay- α disintegration energy
5.2 α particle spectra
5.3 Nuclear energy levels
5.4 Beta decay- Experimental study of β decay
5.5 Continuous β - ray spectrum
5.6 Pauli's neutrino hypothesis
5.7 Nuclear energy levels from β decay

6. Elementary particles **(10)**

6.1 Introduction of elementary particles
6.2 Types of interactions
6.3 Classification of elementary particles,
6.4 Properties of particles
6.5 Introduction of quarks,
6.6 Different types of quarks.

Reference Books:

1. Nuclear Physics: Irving Kaplan (Addison Wesley)
2. Nuclear Physics : S.N. Ghoshal (S. Chand Publishing Co.)
3. Nuclear Physics : D.C. Tayal (Himalayan Publishing House)
4. Nuclear Physics : J.B. Rajam (S. Chand Publishing Co.)
5. Concepts of Modern Physics : Arthur Beiser (Tata McGraw Hill Publishing)
6. Atomic and Nuclear Physics : N. Subhramanyam & Brijlal (S. Chand Pub. Co.)
7. Concepts of Nuclear Physics : B.L. Cohen (Tata McGraw Hill Publishing)
8. Nuclear Physics- an Introduction: W.E. Barcham

B.Sc. III, Physics, Semester V
Skill Enhancement Course

SEC 3

Paper XIII:
Add-on-self learning (On-line Platform: MOOC/SWAYAM Course/ Skill Course)

Credits: 04

***List of Skill Enhancement Courses**

1) Thin film deposition and Characterization Techniques
2) Scientific Research Paper Writing and Publication
3) Solar Panel Installation and Maintenance
4) Laboratory Safety and Disaster Management
5) Medical Physics
6) Energy Resources
7**)** Energy studies

B.Sc. III, Physics, Semester VI

DSE 1 B

Physics Paper- XIV: Electrodynamics

Credits: 04

1. Electrostatics and Charged particle dynamics (10)

1.1 Coulomb's law

1.2 Gauss law in differential form

1.3 Poisson's and Laplace's equations

1.4 Applications of Poisson's and Laplace's equation to spherical systems

1.5 Motion of charged particle in constant electric (E) field

1.6 Motion of charged particle in constant magnetic (B) field

1.7 Motion of charged particle in constant crossed uniform electric and magnetic fields

2. Time varying fields (10)

2.1 Electromotive force

2.2 Electromagnetic induction-Faraday's laws

2.3 Lenz's law

2.4 Integral & Differential forms of Faraday's laws

2.5 Self inductance

2.6 Application of self-inductance to solenoid

2.7 Mutual inductance

2.8 Application of mutual inductance to transformer

3. Maxwell's equations (12)

3.1 Magnetic Susceptibility and permeability

3.2 Biot - Savart law

3.3 Derivation of $\nabla.\vec{B} = 0$

3.4 Ampere's law

3.5 Derivation of $\nabla \times \vec{B} = \mu_0 J$ or Differential form of Ampere's law

3.6 Equation of continuity

3.7 Displacement current density

3.8 Maxwell's correction to Ampere's law

3.9 Maxwell's equations for time dependent electric and magnetic fields in vacuum

3.10 Maxwell's equations for time dependent electric and magnetic fields in material medium

3.11 Physical significance (Integral form) of Maxwell's Equations

4. Electromagnetic waves (10)

4.1 Conservation of energy in electromagnetic fields and Poynting's theorem

4.2 Conservation of momentum in electromagnetic fields

4.3 Wave equations for electric and magnetic fields in vacuum

4.4 Plane wave solutions, orthogonality of $\vec{E}$, $\vec{B}$ and propagation vector $\vec{k}$

4.5 Plane E. M. waves in dielectric

4.6 Plane E. M. waves in conductors, Attenuation of wave in metal (skin depth)

5. Reflection and Refraction of E.M. waves (10)

5.1 Boundary conditions for E. M. field vectors ($\vec{D}$, $\vec{B}$, $\vec{E}$ & $\vec{H}$)

5.2 Reflection and refraction of E. M. waves at a boundary of two dielectrics (Normal incidence only)

5.3 Reflection from a conducting plane – normal incidence

5.4 Total internal reflection.

6. Radiation from Electric Dipole (08)

6.1 Electric dipole

6.2 Retarded time and retarded potential

6.3 Electric dipole radiation

6.4 Radiation reaction for electric dipole

Reference Books:

1. Introduction to Electrodynamics (second edition) – David J. Griffiths
2. Introduction to Electrodynamics (third edition) – David J. Griffiths
3. Classical Electrodynamics – J. D. Jackson
4. Classical Electrodynamics – S. P. Puri
5. Electrodynamics – B. B. Laud
6. Foundations of Electromagnetic theory – Reitz and Milford

B.Sc. III –Physics, Semester-VI

DSE 2B

Paper XV: Materials Science

Credits: 04

1. **Materials and their properties:** **(10)**
   - 1.1 Classification of materials
   - 1.2 Organic, inorganic and biological materials
   - 1.3 Properties of materials
     - 1.3.1 Mechanical properties
     - 1.3.2 Thermal properties
     - 1.3.3 Optical properties
     - 1.3.4 Electrical properties
     - 1.3.5 Magnetic properties

2. **Polymer materials:** **(10)**
   - 2.1 Polymers
   - 2.2 Polymerization mechanism
     - 2.2.1 Additional polymerization
     - 2.2.2 Condensation polymerization
     - 2.2.3 Homo-polymer
     - 2.2.4 Co-polymer
   - 2.3 Degree of polymerization
   - 2.4 Defects in the polymers
   - 2.5 Mechanical properties of polymers, deformation, reinforced polymers
   - 2.6 Applications of polymers.

3. **Ceramic Materials:** **(10)**
   - 3.1 Classification of ceramic materials
   - 3.2 Structure of ceramics
   - 3.3 Ceramic possessing
   - 3.4 Properties of Ceramics
   - 3.5 Applications of Ceramics

4. **Composite Materials:** **(8)**
   - 4.1 Fabrication of composites
   - 4.2 Mechanical properties of composites
   - 4.3 Particle-Reinforced Composites
   - 4.4 Fiber-Reinforced composites
   - 4.5 Applications of composites

5. **Biomaterials:** **(08)**
   - 5.1 Bio-Mechanism
   - 5.2 Classification of Biomaterials
   - 5.3 Processing of Biomaterials
   - 5.4 Properties of Biomaterials
   - 5.5 Applications of Biomaterials

6. Nanomaterials: (14)

6.1 Introduction to nano-sized materials and structures
6.2 Brief history of nanomaterials and challenges in nanotechnology
6.3 Significance of nano-size and properties
6.4 Classification of nano structured materials
6.5 Methods of synthesis of nanomaterials
6.5.1 Bottom-up and Top-down approaches
6.5.2 Physical methods: High energy ball milling, Physical vapors deposition, sputter deposition, Ultrasonic spray pyrolysis etc.
6.5.3 Chemical methods: colloidal method, co-precipitation and sol-gel method
6.5.4 Hybrid method: Electrochemical and chemical vapors deposition.

Reference Books:

1. Material science by S.L. Kakani, Amit Kakani, New age international publishers.
2. Materials science and engineering, V. Raghavan, 5th edition, PHI
3. Materials science by R.S. Khurmi, S. Chand
4. Materials science, G.K. Narula, K.S. Narula, V.K. Gupta, Tata McGraw-Hill.
5. Semiconductor physics and devices by S.S. Islam, Oxford university press, 1st edition
6. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, by Thomas Varghese & K.M. Balakrishna, Atlantic publication
7. Introduction to nanoscience and nanotechnology, by Chattopadhyay K.K., Banerjee A.N., PHI
8. Materials science – V. Rajendran & A. Marikani (TMHl).
9. Elements of material Science & engineering.- I.H.Van Vlack (4th Edition.).
10. Nanotechnology: Principles and Practices by Sulbha Kulkarni, Capital Publishing Co.New Delhi.
11. Introduction to nanotechnology, by C. P. Poole Jr. and F. J. Ownes, Willey Publications.
12. Origin and development of nanotechnology by P. K. Sharma, Vista International publishing house.
13. Nanostructure and nanomaterials synthesis, Properties and applications, by G. Cao, Imperials College Press, London.

B.Sc. III –Physics, Semester-VI

DSE 3B
Paper -XVI: Atomic Physics, Molecular Physics and Quantum Mechanics

Credits: 04

1. Atomic Spectra (10)
1.1 Review of quantum numbers
1.2 Electronic configuration of alkali metals
1.3 Spectral notations with examples
1.4 Alkali spectra
1.5 Doublet fine structure of alkali metals
1.6 Spectrum of Sodium
1.7 Selection rules
1.8 Intensity rules

2. Effects of Magnetic and Electric fields on Atomic Spectra (10)
2.1 Anomalous Zeeman effect and its explanation from vector atom model
2.2 Paschen Back effect
2.3 Paschen Back effect in principal series doublet
2.4 Selection rules for Paschen Back effect
2.5 Stark effect of hydrogen
2.6 Weak field Stark effect in hydrogen
2.7 Strong field Stark effect in hydrogen

3. Molecular Spectra and Raman Effect (12)
3.1 Molecular bond
3.2 Rotational energy levels and Rotational spectra
3.3 Vibrational energy levels and Vibrational spectra
3.4 Vibration-Rotation spectra
3.5 Electronic spectra of a diatomic molecule
3.6 Franck-Condon principle
3.7 Raman effect
3.8 Characteristic properties of Raman lines
3.9 Classical theory of Raman effect

4. Quantum Mechanics (08)
4.1 Heisenberg's uncertainty principle (Statement) and its similarity with concept of matter waves
4.2 Physical significance of ψ
4.3 Time dependent and time independent Schrödinger wave equations
4.4 Eigen values and Eigen functions
4.5 Probability current density

5. Application of Schrodinger's time independent wave equation (10)

5.1 Particle in a Box (one and three dimensional cases), its Eigen values and Eigen functions.

5.2 Step Potential (Statement, boundary conditions, Schrodinger's equations in different regions and discussion of results)

5.3 Potential Barrier (Statement, boundary conditions, Schrodinger's equations indifferent regions and discussion of results)

5.4 Potential Well (Statement, boundary conditions, Schrodinger's equations in different regions and discussion of results)

5.5 Linear Harmonics Oscillator – Eigen values and Eigen functions

5.6 Zero point energy

6. Operators (10)

6.1 Operators in quantum mechanics

6.2 Expectation values and properties

6.3 Angular momentum operators

6.4 Commutation properties for components Lx, Ly, Lz

6.5 Commutation for L^2 and Lz operators and their Eigen values

6.6 Schrodinger's equation for hydrogen atom

6.7 Separation of radial and angular parts

Reference Books:

1. Atomic Spectra – H.E. White
2. Molecular Spectroscopy - Banwell
3. Molecular Spectroscopy – Hertzberg
4. Quantum Mechanics – Mathews and Venkateshan
5. Introduction to Quantum Mechanics - Pauling and Wilson
6. Elements of Quantum Mechanics - Kamal Singh and S.P. Singh.
7. Perspectives of Modern Physics – Arthur Beiser
8. Quantum Mechanics – Chatwal Anand
9. Quantum Mechanics – I , The fundamentals- S. Rajasekar, R. Velusamy

B.Sc. III –Physics, Semester-VI
DSE 4B
Paper- XVII: Electronics

Credits: 04

1. Operational Amplifier: (10)

1.1 Block diagram of OP-AMP
1.2 Characteristics of OP-AMP
1.3 OP-AMP parameters
1.4 OP-AMP as inverting amplifier
1.5 OP- AMP as non- inverting amplifier
1.6 Applications of OP-AMP
- 1.6.1 Adder
- 1.6.2 Subtractor
- 1.6.3 Differentiator
- 1.6.4 Integrator
- 1.6.5 Comparator
- 1.6.6 Schmitt's trigger

2. Timer: (08)

2.1 Functional Block diagram of IC 555, its Pin connections
2.2 Operating modes
- 2.2.1 Monostable
- 2.2.2 Astable

2.3 Applications of timer IC 555
- 2.3.1 Linear ramp generator
- 2.3.2 Square wave generator
- 2.3.3 Voltage to frequency converter

3. Silicon Controlled Rectifier (SCR) (10)

3.1 Four-layer PNPN diode
3.2 SCR construction and working
3.3 Characteristics of SCR
3.4 Turn ON and Turn OFF methods of SCR
3.5 Applications of SCR to control the speed of DC motor

4. Diac and Triac (08)

4.1 Construction, working and characteristics of Diac
4.2 Applications of Diac
- 4.2.1 Lamp dimmer
- 4.2.2 Heat control

4.3 Construction, working and characteristics of Triac
4.4 Applications of Triac
- 4.4.1 High power lamp switch
- 4.4.2 Electronic change over power transformer

5. Display Devices **(12)**

5.1 Classification of Displays
5.2 Light emitting Diode displays
5.3 Liquid Crystal Displays and its Important Features
5.4 Other displays
5.4.1 Gas Discharge plasma Displays
5.4.2 Electrophoretic Image Displays (EPID)
5.4.3 Liquid Vapour Display (LVD)

6. Field Effect Transistor **(12)**

6.1 Review of JFET
6.2 Metal Oxide Semiconductor FET (MOSFET)
6.2.1 Schematic symbols and Types of MOSFET-a) D-MOSFET and b) E-MOSFET
6.3 D-MOSFET
6.3.1 Circuit Operation
6.3.2 Transfer Characteristic
6.3.3 Transconductance and input impedance
6.4 E-MOSFET
6.4.1 Circuit Operation
6.4.2 Transfer Characteristic
6.4.3 Transconductance and input impedance

Reference Books:

1. Electronic Principles – Malvino & Leech
2. Basic Electronic – Grob
3. Electronic Circuits and Devices – Allan Mottershed
4. Linear Op-Amp – Ramakanth Gaikwad
5. Principles of Electronics (Eleventh Edition)– V. K. Mehta (S Chand and Co. Ltd.)
6. Basic Electronics Solid State – B. L. Thereja. (S Chand and Co. Ltd.)
7.Electronic Instrumentation – H. S. Kalsi

THIRD YEAR

EDUCATION COMPONENT

SEMESTER

V

AND

VI

: Environmental Education (1/2)

Credits: 02 Periods: 30 Maximum Marks: 50

Internal Assessment Marks: 10 University Assessment Marks: 40

Objectives : To enable the student–teachers to –

1. Develop knowledge and understanding related to concepts of environment and Environmental Education.
2. Create awareness about the effect of environmental problems on human life amongs the secondary school students.
3. Understand co–relation between school subjects and environmental education.
4. Create awareness about effect of population explosion on environment amongst the S.S. students.
5. Create awareness amongs S.S. students to observe, identify and analyse the local environmental problems and suggest remmedial measures.
6. Role of teacher for developing knowledge and understanding amongs the Secondary School students for environmental management, environmental movements and laws of environmental conservation and pollution control with special reference to India.

Unit–I:ENVIRONMENTAL EDUCATION :

a) Concept & meaning of Environmental Education.

b) Objectives, need, importance & scope of Environmental Education.

c) Role of teachers in Environmental Education.

d) Characteristics of Environmental Education Teacher.

Unit–II : METHODOLOGY OF ENVIRONMENTAL EDUCATION :

a) Strategies, curricular & co–curricular activities related to Environmental Education at secondary stage.

b) Project method, Discussion, Problem solving method, Heuristic method, Exhibition.

c) Disaster management: Floods, earthquake, cyclone, landslides, Tsunami.

d) Population explosion: Causes and impact on environment with special reference to India.

Unit–III : ENVIRONMENTAL PROBLEMS & THEIR IMPACT ON HUMAN LIFE :

a) Problems related to pollution & it's effects on human health, control measures of: 1. Air Pollution 2. Water Pollution 3.Soil Pollution

b) Problems related to pollution & it's effects on human health, control measures of :1. Noise Pollution 2. Solid waste Pollution 3. .Radio active

c) Development of awareness about environmental problems among

i) School pupils at secondary stage ii) Local community.

d) Remedial measures of environmental problems.

Unit – IV : ENVIRONMENTAL MANAGEMENT :

a) Climate change, global warming, acid rain, ozone layer depletion, green house effect

b) Environmental ethics: issue & possible solutions

c) Environmental movements & project – Chipko, Apiko, silent valley, Ganga Action plan, Tiger project.

d) 1) Water (Prevention of Pollution) Act.1974, 2) The Air (Prevention of Pollution) Act, 1981, 3) The Environmental (Protection) Act, 1986, 4) The wild life Protection Act, 1972

Sessional work: (Total 10 Marks)

- The student will have to write 3 tutorials Broad questions in Notebook and assessed by Teacher Educator. Out of these three prepared tutorial questions one should write in Exam situation. **(5 Marks)**

- The students has to undertake **one** of the following practical and present the report

(5 Marks)

1) Study of Pollution (cause, effect & remedial measures) due to any one of the following: Industry, Vehicles, rituals, projects such as dairy, poultry, slaughter house, hospital wastes & reports.
2) Study of local environmental problems such as water , air , land & noise pollution.
3) Study of biotic and abiotic factors, food chains, food web & tropical level in any one of the following eco-system pond , river, garden , forest , grassland, cultivated fields & report.
4) Study of common plants, insects, birds of a locality.
5) Study of environmental problems of a locality, suggest solutions for it and report.
6) A visit to sanctuary, valleys, sea- shores & it's report.

LIST OF RECOMMENDED BOOKS

पर्यावरण शिक्षण

१) भांडारकर, के.एम. (२००८) पर्यावरण शिक्षण, नित्यनूतन प्रकाशन, पुणे.

२) कुलकणी, डी.आर. (२००७) पर्यावरण शिक्षण, विद्या प्रकाशन, नागपूर.

३) सावंत प्रकाश (२००९) पर्यावरण शिक्षण , फडके प्रकाशन, कोल्हापूर.

४) पाटील धनराज , ढेरे अमर (२००९) पर्यावरण शिक्षण व अध्यापन पध्दती, फडके प्रकाशन, कोल्हापूर.

५) घाटे निरांजन (२००४) बोध पर्यावरणाचा, मेहता पब्लिकशन, पुणे.

६) UGC (2013) Textbook of Environmental studied for under graduate course, University Press. Hyderabad.

7) Abbasi S.A. (1998) Environmental Pollution and its control congent
   a. International P.B. 340 Pondechorry.

8) Desh Bandu (1999) Environmental Education – Indian Environmental Society . New Delhi.

9) Arunkumar (1999) Environmental Problems and Control (Vol. I , II) Anmol Publication P. Ltd. New Delhi.

10) Dhalliwal G.S. Sandhu G. S. and Pathan P.K. (1996), Fundamental of Environmental Science , Kalyani Publishers. New Delhi.

11) Henvietta, Feck (1981) Introduction to Nutrition macmillian Publisher and Co. New York.

12) Gupta N. L. , Gujar R.K. (1993) sustainable development Vol.I Tawar Publications , New Delhi

13) Kamboji N.S. (1999) Control of Noise Pollution, Deep Publication, New Delhi.

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B.Sc. B.Ed. Semester V

PEDAGOGY OF PHYSICAL SCIENCE PART - I

Credits: 02 **Total Marks: 50**

Objectives: Student teachers will be able to

· Explain the nature of science.
· Specify the goals and objectives of science teaching.
· Review the contributions of major scientists.
· Explore several methods of teaching science.
· Apply various theories science learning and analyze the implications for teaching science.
· Review the science curriculum, syllabus, and text books.
· Explore constructivist practices in teaching of science.
· Create unit plans, lesson plans in an artistic and scientific way.
· Explore the inter-relation between science and other subjects.

Unit I: Nature of Science

A) Nature and scope of science -Scientific method

B) Science as a way of thinking: inquiry, observation, problem-solving, rational thinking, reasoning, science as an empirical body of knowledge.

C) Structure of knowledge: facts, concepts, principles, generalizations, theories.

D) Historical development of physical science with illustrations from topics such as structure of atoms, laws of chemical combinations, stoichiometry, equivalent mass, models of the universe, nature of light, electricity and magnetism etc.

E) Basic branches of physical science and applications of physical science to human life.

F) Correlation between science and other subjects, role of science teacher.

Unit II: Aims and learning objectives of Physical Science

A) Aims of teaching physical science in the school curriculum.

B) Development of process skills of science, scientific attitude and temper by learning Physics and Chemistry as experimental sciences.

C) Science and society– relating physical science with the natural and social environment and technologies relating science to daily life.

D) Values through science teaching-open mindedness, objectivity, truthfulness, critical thinking, logical thinking, development of problem-solving skill, social learning.

E) Ethics of using the knowledge of science and technology.

Unit III: Pedagogical shift, Approaches and Strategies of learning Physical Science

A) Teaching concepts and generalizations: inductive approaches, using advance organizers, problem solving approach, investigatory approach, project method, cooperative learning method.

B) Development of constructivist practices in science teaching, 5E learning model, 7E model, conceptual change model of teaching, challenges in using constructivism in the classroom.

C) Approaches in teaching Science: Cooperative and Collaborative learning approach, problem solving approach, concept mapping, experiential learning, cognitive conflict, inquiry approach, analogy strategy.

D) Facilitating learning: Teacher's role as a facilitator, grouping students, multiple learning experiences, discussing and negotiating ideas, scaffolding, consolidating students' ideas, questioning-techniques and strategies, higher order and metacognitive questioning.
E) Role of learner: each learner as unique individual, involving learner in learning process, role of learner in negotiating and mediating learning, encouraging learner to raise and ask questions.

Unit IV: Planning for Physical science Teaching-learning
A) Importance of planning, unit plan and lesson plan.
B) Anderson and Krathwohl's revised Bloom's taxonomy: knowledge domains and cognitive processes, action words. Types of knowledge- factual, conceptual, procedural and metacognitive knowledge.
C) Elements of physical science lesson plan: learning Objectives, introduction, development, assessment, extended learning, assignment.
E) Planning the lesson by using ICT applications and laboratory materials.

Sessional Activities:
· Presentation on historical development of science concepts with a view to understand the nature of science.
· Pedagogical analysis (units for pedagogic analysis: any unit from VIII, IX or X physical science textbook).
· Presentation on the contributions of Physicists and Chemists to physical science.
· Readings on curriculum initiatives in secondary science with a special reference to NCF 2005.
· Lab demonstration/exploration of science experiments.
· Exploring common mis-concepts in Physical Science by observing science classes or interviewing
science teachers or using VIII and IX textbooks.
· Stating learning objectives for teaching a topic in science.
· Demonstration of different methods of teaching of Physical Science.
· Experimentation of different methods of teaching of Physical Science.

References:
1. Pedagogy of Physical Science, Text book for B. Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B. Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
4. Steve Alsop, Keith Hicks (2007). Teaching Science: A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
5. Judith Bennett (2003) Teaching and Learning Science: A guide to recent research and its applications, Continuum, London.
6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
7. State Textbook in Physics and Chemistry for classes VIII, IX and X.
8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.

9. History of Physics in the 20th Century, Internet Browsing.
10. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.111
11. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc.,
12. Columbus Ohio. 11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children: Methods for Constructing Understanding, Allyn and Bacon, London.
13. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
15. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.
16. Kamala Mukunda, 2009. What did you ask at school today? A Handbook on Child Learning.
17. Donald Schon,(1983) The reflective practitioner, How professionals think in Action Basic Books, ISBN 0465068782
18. Donald A. Schon, (1987) Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions. San Francisco, Jossey-Bass, 1987 ISBN: 978-15-5542-220-2

B.Sc. B.Ed. Semester V
Pedagogy of Mathematics 1

Credits: 02 **Total Marks: 50**

Objectives: On completion of the course the students will have
* Understanding of nature of mathematics and its branches
* Ability to analyze the relationship of mathematics within itself and with other subjects
* Ability to categories mathematical knowledge into factual, conceptual, procedural and meta cognitive knowledge
* Appreciates the contributions made by Indian and other country mathematicians' contribution
* Ability to apply logical reasoning and problem-solving ability in solving various mathematical problems

Unit I: Knowledge about Mathematics

A) Nature of mathematics- abstractness, preciseness, brevity, language and symbolism; Nature of mathematical propositions; Quantifiers- necessary and sufficient conditions (one and two way);

B) structure of mathematics- undefined terms, defined terms, definitions, axioms, postulates and theorem; mathematical theorem and its variants- converse, inverse and contra positive; Pure and Applied mathematics;

C) Branches of mathematics- Arithmetic, algebra, geometry and their diversities; mathematization through- observation, conjecturing, hypothesing, testing and verifying; creation of conceptual knowledge and its importance;

D) Creation of procedural knowledge- derivation of laws/ theorems/ generalizations in mathematics; relationship of mathematics among different branches of science; relationship within and among branches of mathematics;

E) Contribution of Indian and other Mathematician Aryabhatta, Bhaskara, Raman jam, Guass, Euclid, Descarte, Cantor, Pythagoras;

Unit II: Aims and objectives of teaching Mathematics

A) Aims of mathematics- Cultural, disciplinary, moral, social and utilitarian aims;

B) General objectives of teaching mathematics Vis-a-Vis the objectives of secondary education; Major shifts in classroom teaching (societal and technological influence);

C) characteristics of a good instructional objectives; Writing specific objectives of different content categories in mathematics;

D) Unit plan and Lesson plan-its importance and writing unit plan and lesson plan for mathematics lessons using the format.

Unit III: Strategies for learning mathematical concepts

A) Nature of concepts, types of concept, process of concept formation;

B) Moves in teaching concepts- a) Exemplar moves- giving examples and non-examples (with or without reasoning); comparing and contrasting; giving counter example

b) Characterization move definition, stating necessary and/or sufficient condition; concept Attainment Model (Bruner); Advance Organizer Model (Ausubel);
C) Planning and implementation of strategies for teaching various mathematical concepts (secondary level maths).
D) Important skills required to teach in Constructivist mode.

Unit IV: Teaching of Generalization
A) Teaching by exposition- Moves in teaching generalization: - Introductory move, focus move, objective move, motivation move, assertion move, application move, interpretation move, justification move;
B) Planning for expository strategies of teaching generalization.
C) Teaching by guided discovery- nature and purpose of learning by- discovery, inductive, deductive, guided discovery strategies;
D) maxims for planning and conducting discovery strategies;
E) planning strategies involving either induction or deduction or both.

Sessional work:
- Analysis of secondary level mathematics text books to identify various categories of mathematical knowledge presented and its horizontal and vertical linkage among 8, 9 and 10 standard text books.
- Analysing the structure of mathematics present in selected chapter/unit.
- Writing a unit plan for selected unit
- Writing of specific instructional objectives for selected unit
- Writing a lesson plan on selected content area
- Writing a plan for teaching a concept of a generalization using the appropriate moves to teach them.
- Practicum on teaching skills in integrated and constructivist form to be carried out in Block hours allotted.

References:
1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Miffilin
3. Focus Group Report (2005), Teaching of Mathematics, New Delhi, NCERT
4. Iglewiez, Boris and Stoyle, Judith (1973), An Introduction to Mathematical Reasoning, New York, the McMillan company
5. John Stillwell(1989), Mathematics and its History- undergraduate Texts in Mathematics, Newyork,Springer-Verlag New York Inc
6. NCERT, A textbook of Content-Cum-Methodology of Teaching Mathematics, New Delhi, NCERT
7. NCERT(2012), Pedagogy of Mathematics- textbook for Two year B.Ed course, New Delhi

8. Polya george (1957), How to solve it, Garden city, New York, Doubleday
9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education, Sydney, Croom Helm Australia Pty Ltd
10. Servas W and T varga, Teaching school Mathematics- UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal publications Pvt Ltd

B.Sc. B.Ed. Semester V

Pedagogy of Biological Science 1

Credits: 02 **Total Marks: 50**

Objectives: At the end of the programme, students are able to

· Explain the nature of science
· Specify the goals and objectives of science teaching
· Demarcate science from other pursuits of knowledge
· Get a glimpse of the major turning points in the history of biology
· Review the contributions of major biologist
· Apply the learning theories in teaching of biological science
· Review the science curriculum, syllabus, and text books
· Perform content analysis of secondary school biological units
· Write instructional objectives using revised taxonomy
· Plan and develop unit and lesson plans

COURSE CONTENT:

Unit I: Nature of Science

A) Science as a way of thinking: Inquiry, observation, problem-solving, rational thinking, reasoning and scientific attitude; Science as a way of investigation: scientific method, science process skills; Science as an empirical body of knowledge:

B) Structure of Knowledge, Facts, Concepts, principles, Generalisations, theories; Process and Product of Science

C) Historical development of biological Science with special reference to those included in the school curriculum; evolution of biological science as a knowledge field; theories contributing to modern biology (cell theory, theory of evolution by natural selection, gene theory, and homeostasis),

D) Contributions of Indian and International biologist to the knowledge domain of biological science, basic branches of biological science and applications of biology to human life.

E) Science and technology; Science and society; inter-relation between Science and other subjects

Unit II: Theoretical basis of science teaching

A) Applying Learning theories in teaching of biological science: process of concept formation;

B) Development of conceptions in Science, Conceptions, alternate conceptions and misconceptions in science,

C) Role of prior knowledge in constructing new knowledge (Ausubel), Piaget's theories of learning (schema- disequilibrium), Vygotsky's theories-role of language, ZPD and scaffolding in learning, Van Glasersfeld's theory; Spiral curriculum and discovery learning (Bruner), Metacognition,

D) Development of constructivist practices in science teaching,

E) Conceptual change model of teaching.

Unit III: Biological Science Curriculum

A) Aims of teaching biological science in secondary schools

B) Recommendations of major commissions and policies on science teaching

C) The school science curriculum with regard to NCF: major themes in secondary school science

D) Biological science syllabus of secondary schools

E) Analysis of science text books

Unit IV: Planning for Biology Teaching

A) Content Analysis; An analysis of the major themes of secondary school science (facts, concepts, laws, theories); Concept mapping: role and procedure, studying linkages between concepts within the same subject and across subjects

B) Objectives of teaching science using revised Bloom's taxonomy: Knowledge domains and cognitive processes,

C) Types of knowledge- factual, conceptual, procedural and metacognitive knowledge, and action words.

D) Principles of teaching biological science: Science as inquiry, development of process skills of Science, scientific attitude and critical thinking, relating Science to daily life, Science and society.

E) Unit plan and Lesson plan: stating objectives, selecting the content, designing learning experiences, selecting approach/strategy, questioning, assessment and evaluation.

Sessional Activities

· Developing timelines of development of biological knowledge/contributions of biologist

· Historical development of Science concepts- Poster presentation/concept maps

· Analysis and presentation of biological theories and models

· Timelines of current trends and future predictions of biological science

· Background readings on history of science, philosophy of science

· Observation of a biology classroom

· Exploring common misconceptions in Physical Science by observing Science classes or interviewing Science teachers/ from VIII and IX textbook

· Viewing and discussion on documentary on various biologist

· Performing textbook analysis using specified criteria

· Analysis of secondary school science textbook

· Content analysis of selected secondary school biology unit

· Concept analysis and mapping of the selected unit in biology

· Critical review of a few curricular reforms

· Developing a unit plan for a selected biology unit

· Lesson planning using various approaches including BSCS 5E model

· Practicum on teaching skills in integrated and constructivist form to be carried out in Block Hours allotted.

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Lesson Planning Workshop

सरावपाठ नियोजन कृतिसत्र व दिग्दर्शित पाठ

क्रेडिट -१ **गुण-२५** **कालावधी : ५० तास**

उद्दिष्टे : छात्राध्यापकास....

१.शैक्षणिक मूल्यमापन प्रक्रियेची माहिती देणे.

२. शैक्षणिक उद्दिष्टे व स्पष्टीकरणे तयार करण्यास मदत करणे.

३. पाठनियोजन करण्यास मदत करणे.

योग्य कालखंड : सूक्ष्म अध्यापनानंतरचा १ आठवडा

या सरावपाठ नियोजन कृतिसत्रआठवडयात शैक्षणिक मूल्यमापन, उद्दिष्टे व स्पष्टीकरणे, पाठ नियोजन यावर किमान पाच व्याख्याने आयोजित करावीत. यावेळीच पाठाचे निरीक्षण व मूल्यमापन कोणत्या मुद्यांनुसार होणार याची माहिती छात्रध्यापकांना द्यावी.

त्यांनतर प्रत्येक अध्यापन पध्दतीचा किमान एक याप्रमाणे दिग्दर्शन नमुना पाठाचे नियोजन करावे. छात्राध्यापकाने निवडलेल्या दोन अध्यापन पध्दती विषयासंबंधित शालेय विषयावर आधारित प्रत्येकी एक पाठटाचण गटामध्ये तयार करावे व त्यावर गटामध्ये चर्चा करावी.

मूल्यमापन : पाठटाचण १ — **५ गुण**

पाठटाचण २ — **५ गुण**

कृतिसत्र व गटचर्चेतील सहभाग — **५ गुण**

अहवाललेखन — **१० गुण**

अहवाल लेखन : अहवाललेखन प्रमुख्याने कृतिसत्रातील व्याख्यानातील तात्विक भाग, गटचर्चेतील काम, दोन पाठटाचणे व प्रशिक्षणार्थीची मनोगते यांचा अंर्तभाव असावा. प्रशिक्षणार्थी स्वतः स्वतंत्रपणे अहवाल लेखन करण्याबाबतच्या सूचना व प्रेरणा गटप्रमुख शिक्षक प्रशिक्षकांनी द्याव्यात.

दिग्दर्शित पाठ

सरावपाठ नियोजन कृतिसत्रानंतर दिग्दर्शित पाठाचे नियोजन शालेय स्तरावरील विषयानुसार करावे. शिक्षक प्रशिक्षक अध्यापन पद्धतीच्या तासाला या दिग्दर्शित पाठासंदर्भात चर्चा करावी. सर्व छात्राध्यापकांना दोन्ही अध्यापन पध्दतीसंबंधित पाठाचे दिग्दर्शन पाहता येईल असे नियोजन करावे. सर्व दिग्दर्शित पाठ हे माध्यमिक शाळेतील विद्यार्थ्यासमोर घ्यावयास हवेत.दिग्दर्शन पाठापूर्वी प्रत्येक पाठाचे टाचण किमान एक दिवस छात्राध्यापकांच्या निदर्शनास आणावे. विद्यार्थ्यांना ते लिहून घेण्यास सांगावे. पाठानंतर वर्गात चर्चा घडवून आणावी.

Workshop on Teaching Aids
शैक्षणिक साधन निर्मिती कार्यशाळा

क्रेडिट -१ **गुण-२५** **कालावधी :५० तास**

उदिदष्टे : छात्राध्यापकास---

१. विषय अध्यापनासाठी शैक्षणिक साधनांची गरज समजावून देणे.

२. निवडलेल्या विषयानुरुप शैक्षणिक साधन निर्मितीसाठी प्रेरणा निर्माण करणे.

३. अध्ययन अध्यापन प्रक्रियेत अद्ययावत शैक्षणिक साधनांचा उपयोग करण्यासाठी प्रवृत्त करणे.

४. शैक्षणिक साधन निर्मितीसाठी आवश्यक कौशल्ये विकसित करण्यास मदत करणे.

५. शैक्षणिक साधनांची अध्ययन अध्यापन कायातील गरज, महत्व, समजून घेण्यास मदत करणे.

कार्यशाळेचे स्वरुप

शैक्षणिक साधननिर्मिती कार्यशाळेची सुरुवात ६ व्याख्याने होईल. अध्ययन अध्यापन प्रक्रियेत दृक-श्राव्य साधनांचे महत्व गरज यावर आधारित व्याख्यानाचे आयोजन करावे. शैक्षणिक साधन बनविणा-या तज्ज्ञ व्यक्तीचे मार्गदर्शन प्रात्यक्षिक कार्यासाठी ठेवावे. कार्यशाळेसाठी आवश्यक साहित्याचे नियोजन अगोदरच केलेले हवे. शैक्षणिक साधन निर्मितीसाठी शालेय विषयाची पाठयपुस्तके, कागद, रंग, फेव्हीकॉल, कात्री, थर्माकॉल, कार्डशीट , स्केचपेन इत्यादी साहित्य विद्यार्थी संख्येनुसारच हवे.

शैक्षणिक साधननिर्मिती कार्यशाळेतील तात्विक भागावरील व्याख्यानानंतरच गटवार प्रात्यक्षिक कामाचे नियोजन हवे. शक्यतो अध्यापन पद्धतीवर गट विभागणी करुन प्रत्येक अध्यापकाने शालेय स्तरावरील निवडलेल्या दोन विषयाची दोन शैक्षणिक साधने तयार ठरावीत. शैक्षणिक साधने तयार करताना दृक-श्राव्य साधनांचे विविध प्रकारानुसार विविध प्रकारची साधने तयार करावीत. छात्राध्यापकांची विषय, इयत्ता, आशयानुरुप विविध साधने तयार करण्यासाठी प्रयत्न करावेत.

अहवालात तयार केलेल्या शैक्षणिक साधनांचा हेतू, महत्व व उपयुक्तता व तयार करण्याची प्रक्रिया थोडक्यात लिहावी.

मूल्यमापन-

शैक्षणिक साधननिर्मिती कृतीसत्रातील छात्राध्यापकांचा सहभाग तसेच तयार केलेल्या दोन शैक्षणिक साधनांचा दर्जा ठरवून २५ गुणांपैकी मूल्यमापन करावे.

शैक्षणिक साधन-१-	१० गुण
शैक्षणिक साधन-२-	१० गुण
अहवाल	०५ गुण

Practice Teaching and Internship

सरावपाठ नियोजन व शालेय आंतरवासिता

क्रेडिट -४ **गुण-१००** **कालावधी : २०० तास**

For Semester –II Internship + Practice Lesson (8) = 60+40 = 100 Marks

उद्दिष्टे : छात्राध्यापकास....

१. शाळेतील आंतरक्रियात सहभागी होण्यास मदत करणे.
२. बुलेटिन तास, परिपाठ, फलक लेखन या उपक्रमाचे नियोजन व आयोजन करणे.
३. शाळेतील समाजसेवा आर.एस.पी./एम.एम.सी.यापैकी एका उपक्रमाचे नियोजनकरून अहवाल लिहण्यास मदत करणे.
४. शाळेतील शारीरिक शिक्षण व आरोग्य शिक्षण, कार्यानुभव, या विषयासाठी कार्यक्रम राबविण्यास मदत करणे.
५. कृतिसंशोधनाचा आराखडा व कृतिसंशोधन कार्यवाही करण्यास मदत करणे.
६. अध्यापन पध्दतीशी संबंधित प्रात्यक्षिके राबविण्यास मदत करणे.

सरावपाठ प्रशिक्षण (सत्र २,३,४)

सरावपाठ प्रशिक्षण हे प्रामुख्याने शालेय आंतरवासिता कालखंडात घ्यावयाचे आहे.

उद्दिष्टे : छात्राध्यापकास....

१. वर्गअध्यापन कार्यासाठी आवश्यक अशा अध्यापन पध्दती, तंत्रे व क्लुप्त्या याविषयी महिती मिळविण्यास मदत करणे.
२. पाठ नियोजन तत्वानुसार विविध पाठांचे नियोजन करण्यास मदत करणे.
३. अध्यापनाचा सराव देवून अध्यापन पध्दती आत्मसात करण्यास मदत करणे.
४. वास्तव परिस्थितीत अध्यापन कार्याची संधी देवून त्याची परिणामकारकता आजमविण्यास मदत करणे.
५. अध्यापन पध्दतीनुसार व इतर अध्यापनाची पाठ निरीक्षण करण्यास संधी देणे.

प्रात्यक्षिकासाठी आवश्यक आधारप्रणाली : पाठयपुस्तके, शैक्षणिक साधने, पाठ टाचण, निरीक्षण, नोंद तक्ते, सरावपाठ शाळांचे पूर्ण सहकार्य व सुविधांची उपलब्धता, शाळेतील शिक्षकांचे सहकार्य.

प्रत्येक सत्रानुसार पूर्ण करावयाचे पाठसंख्या व एकूण गुण- १५०

सत्र	पाठाचे प्रकार						एकूण
	सुट्टे पाठ	अध्यापन प्रतिमान पाठ	ज्ञानरचनावाद	आशययुक्त अ.पध्दती	सलग सराव	आय. सी. टी. चा वापर	
१	---	---	----	----	---	---	००
२	८	---	---	---	---	---	०८
३	---	---	---	४	८	४	१६
४	---	२	४	---	---	---	६
एकूण	८	२	४	४	८	४	३०

सुट्टे सराव पाठ आशययुक्त अध्यापनपध्दतीनुसार पाठ ,अध्यापन प्रतिमानेनुसार पाठ घेताना आय.सी.टी. व ज्ञानरचनावादाचा जास्तीजास्त उपयोग करावा.

छात्रसेवाकाल स्वरूप,कार्यवाही व मूल्यमापन

पाठसंख्या व पाठाचे प्रकारः ४० गुण. या छात्रसेवाकालात ८ सराव पाठ घेणे .या सराव पाठांचे गुण सरावपाठांच्या १०० गुणांपैकी दिले जातील

१. शालेयस्तरावरील विषयाचे अध्यापन पध्दतीनुसार प्रत्येकी ४ याप्रमाणे दोन अध्यापनपध्दतीचे ८ पाठ घेणे.

छात्रसेवाकाल उपक्रमः : पुढीलपैकी सर्व उपक्रम या छात्रसेवाकालात राबवावेत. या उपक्रमाचे विद्यार्थ्यांची उपस्थिती, सहभाग, पूर्वनियोजन व तयारी, उत्स्फूर्तता, अहवाल लेखन,सादरीकरणास १५ पैकी गुण द्यावेत. **(एकूण गुण :६०)**

१. इ.५वी ते ९ वी पर्यतच्या एका शालेय विषयाच्या मानव अधिकार/ मूल्यशिक्षणावर आधारित आशयाची निवड करून पाठनियोजन करावे. पाठनियोजन करताना आवश्यक पध्दती, तंत्र, क्लृपत्या किंवा प्रतिमानाचा वापर करून प्रत्यक्ष पाठ घेवून कार्यवृतांत लिहावा. वृतांत लेखनात उद्दिष्टे, पूर्वतयारी, कार्यवाही, शैक्षणिक साधन निर्मिती व उपयोग, स्वतःस मिळवलेले प्रत्याभरण यांचा उल्लेख करावा. विद्यार्थी पाठ घेताना पर्यवेक्षण करावे
२. शारीरिक शिक्षणासाठी पुढीलपैकी किमान एका उपक्रमाची निवड छात्रध्यापकानी करावी. वैयक्तिक अथवा सांघिक खेळ, अथवा खेळाच्या स्पर्धा , योगशिक्षण/आरोग्यशिक्षणाशी संबंधित उपक्रम/ व्याख्यान/ प्रात्यक्षिक, सांघिककवायत/घुंगरूकाठी, डंबेल्स्, इ. साधनाद्वारे कवायत यापैकी एका वर्गासाठी कवायत करावी. वरील उपक्रमाच्या अहवालमध्ये त्याची उद्दिष्टे कार्यवाही, साधनाचे संघटन, अंमलबजावणीत आलेले अडथळे व प्राप्तझालेली यशस्वीता या बाबत वृतांत लिहावा. मार्गदर्शकांनी विद्यार्थ्यांना उपक्रम घेण्यासाठी मार्गदर्शन करावे.
३. शाळेतील माजी विद्यार्थी संघटना / पालक संघ/ विद्यार्थी समिती याचा अभ्यास करणे व माहिती लेखन करणे.
४. आपल्या अध्यापन पध्दतीनुसार कोणत्याही एका विषयातील आशयांची निवड करा. आशयाला उपयुक्त शैक्षणिक साधन तयार करा. पाठ घेताना प्रत्यक्ष शैक्षणिक साहित्य वापरून झालेल्या परिणामावर स्वतःचे मत लिहा. शैक्षणिकसाधन निर्मितीचे उद्दिष्टये, पूर्वतयारी, साहित्य निर्मितीसाठी येणारा खर्च, उपयोग, यामुद्दयाचा विचार करावा.

PUNYASHLOK AHILLYADEVI HOLKAR

SOLAPUR UNIVERSITY,

SOLAPUR

SKILL ORIENTED COURSE FOR

B.Sc. B.Ed. PROGRAMME

(SEMESTER - V)

INTRODUCED FROM THE

ACADEMIC YEAR

2021-22

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

SKILL ORIENTED COURSE FOR B.Sc. B.Ed. W.E.F. 2021-22

O. Ed.:

- The regular fulltime Skill Oriented Course is of twelve week duration.
- The Skill Oriented course has been framed so as to satisfy the essential compliances of **National Education Policy (NEP): 2020 and University Grants Commission (UGC) notification.** Also has added features making the course relevant to global demands, and socio-cultural needs.
- The university has adopted Choice Based Credit System (CBCS) and grading system.
- The Skill Oriented course curriculum is of 100 marks, 60 periods of work (assuming period of 60 minute), and 04 credit points.

The General Objectives of Skill Oriented Course are:

1. To increase the life coping skills and employment worthiness of the students.
2. Increasing the competitiveness of future teachers.
3. Closing the gap between skill required by the schools and skills people possess for employment generation.
4. To prepare Skillful teachers, administrators and supervisors for staffing of the Primary, Secondary and Higher Secondary schools.
5. To prepare professional personnel required for staffing of the Primary, Secondary and Higher Secondary schools.

O. Ed.: STANDARD OF PASSING

1) To pass the Skill Oriented course examination, a candidate must obtain at least 50% marks in MCQ theory paper.

2) A candidate must obtain at least 50% marks in Activities or practical's.

3) A candidate must obtain at least 50% marks in Viva-voce. And50%in the aggregate of all the MCQ theory paper, Activities or practicals and Viva-voce. Such a candidate shall be declared to have passed the examination.

- 20MarksforUniversityAssessmentmeans MCQ Theory paper.(Skill Oriented Course)
- 80Marks for Internal Assessment of Skill Oriented course by College Assessment in which 70 Marks are for Activities or practical's and10 Marks are for Viva-voce mention in the syllabus.

CREDIT AND GRADING SYSTEM

Award of Grade:

(a) A student shall pass the course if he/she gets any grade in the range from "O" to "C".

(b) The student has to secure a minimum 4.0 Grade Points Grade C) in Skill Oriented course. A student who secures less than 4.0points will be declared Failed in Skill Oriented course.

- **Conversion of Skill Oriented Course marks into Grades: 10-Point scale for courses having passing criterion of 50%**

Table A

Sr. No.	Range of Marks	Grade	Grade Point
1	80-100	O: Outstanding/Excellent	10
2	75-79	A+: Very Good	09
3	70-74	A: Good	08
4	65-69	B+: Above Average	07
5	60-64	B: Average	06
6	55-59	C+: Satisfactory	05
7	50-54	C: Pass	04
8	00-49	F: Fail	00

Note: The Student shall appear any one course of the following four skill oriented courses.

1. **Stress Management**
2. **The Art of Public Speaking**
3. **Psychological Testing and Assessment**
4. **Technology Embedded Teaching**

PUNYASHLOKAHILYADEVIHOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Skill Oriented Course w. e. f. 2021 - 22

Title of the Course: Stress Management

- Eligibility of the course **: B.Sc. B.Ed. Semester-V**
- Total credit of the course **: 04 Credit**
- Total marks of the course **: 100 Marks**
- Weightage to practical work (marks) **: 80 Marks**
- Weightage to Theory work (marks) **: 20 Marks**
- Duration of the course **: 12 weeks (60 Hours)**

Aim of the course: To develop the skillful and Enrich stress management administrator.

Learning Outcomes: After Successful completion of this course, the students will be able to:

1. Understand the nature of stress.
2. Comprehend the psychological and physiological effects of stress.
3. Assess individual risk factors as related to stress (behavioral, emotional, physical, spiritual)
4. Understand and learn how to use various techniques and determine the most appropriate method to aid in managing our reaction to stress.
5. Develop the ability to tap personal strengths for preventing stress and achieving meaningful goals.
6. Accept the responsibility of taking charge of your own levels of stress.
7. Identify and understand the signs and symptoms of stress.
8. Develop coping skills that will enable the student to control his/her level of stress.
9. Learn apply stress management techniques in day to day life.

Course Content:

Module 01: Fundamentals of Stress Management

- Stress: Meaning and Concept,
- Nature and Scope
- Differentiate term Pressure, Tension and Stress

Module 02: Understanding the Stress Management Process

- Human and Stress: Types of Stress
- Sources of Stress (Internal & External)
- Stress: Causes, Symptoms and Consequences

Module03: Life Skill Education

- Life skill Education: Concept and Need
- Types of Life Skills

- Relation between Life Skill and Stress

Module04: Strategy and Techniques of Stress Management

- Strategy of Managing Stress (Individual and Group)
- Stress reliving technique (Individual and Group)
- Laws of Stress less Life, Mental Exercises
- Stress Reliving Therapy

List of the Activities: Following activities are used by teacher educator for implementation of the Skill- oriented course.

Sr. No.	Activities
01	Project related to Individual Hobby (Performing Stress Release)
02	Practices based on YOGA.
03	Sharing of self-experiences related to stress management and presentation of report in the group of three students.
04	Progressive muscle relaxation session and submission of report about its impact on individual performance. (Individual report should be submitted)
05	Technique to develop and strengthen your inner salience
06	Group Discussion on SWOT
07	Identify and Understand the personal reasons behind stress
08	Short-Term Stress-Relief Strategies You Can Do Anywhere
09	Talk and Walk Exercise
10	Identify your happy hour and do any activity and compare other hours activity.

* **Teacher educator also may be uses different activities as per strategy and techniques of Stress management. This list is just for reference.**

Course Lay out

Week	Content	Place	Hours
Week 01	▪ Stress: Meaning and Concept, ▪ Nature and Scope	Classroom	05
Week 02	▪ Differentiate term Pressure, Tension and Stress ▪ Understanding the Stress Management Process	Classroom	05
Week 03	▪ Human and Stress: Types of Stress ▪ Sources of Stress (Internal & External) ▪ Stress: Causes, Symptoms and Consequences	Classroom	05
Week 04	▪ Life Skill Education: Concept and Need ▪ Types of Life Skills ▪ Relation between Life Skill and Stress	Classroom	05
Week 05	▪ Strategy of Managing Stress (Individual and Group) ▪ Stress are living technique (Individual and Group)	Indoor Stadium	05
Week	▪ Laws of Stress less life Mental Exercises	Indoor	05

06	▪ Stress Reliving Therapy	Stadium / Hall	
Week 07	▪ Project related to Individual Hobby (Performing Stress Release) ▪ Practices based on YOGA. ▪ Feedback on Discussion / Demonstration	Indoor Stadium / Hall	05
Week 08	▪ Sharing of self-experiences related to stress management and presentation of report in the group of three students. ▪ Progressive muscle relaxation session and submission of report about its impact on individual performance. (Individual report should be s submitted) ▪ Feedback on Discussion / Demonstration	Indoor Stadium / Hall	05
Week 09	▪ Technique to develop and strengthen your inner salience. ▪ Group Discussion on SWOT ▪ Identify your happy hour and do any activity and compare other hours activity. ▪ Feedback on Discussion / Demonstration	Indoor Stadium / Seminar Hall	05
Week 10	▪ Identify and understand the personal reasons behind stress. ▪ Short-Term Stress-Relief Strategies You Can Do Anywhere ▪ Talk and Walk Exercise ▪ Feedback on Discussion / Demonstration	Indoor Stadium	05
Week 11	▪ Practice and revision of assessment of Stress Management under the supervision of educator. ▪ Evaluation Process includes: ▪ Practical Activity	Indoor Stadium / Seminar Hall	05
Week 12	▪ Evaluation Process includes: ▪ Practical Activity ▪ Viva Voce	Indoor Stadium	05
	▪ Theory Test or exam	Classroom	

Evaluation system or process of the course:

Sr. No.	Course Nature	Particular	Marks
01	Theory course	MCQ test at the end of the course	20
02	Practical Activity evaluation	Strategy of Managing Stress (Individual and Group)	60
03	Practical Activity evaluation	Stress reliving technique (Individual and Group)	10
04	Viva Voce	Viva Voce related to Practical Activity	10
TOTAL MARKS			**100**

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- Murphy, J. & McMahan, I. (2000) The Power of Your Subconscious Mind
- National Institute for Occupational and Safety and Health (NIOSH) Publication, No. 2003-114d (DVD "Working with Stress"), 2002
- Secret of Concentration (DVD) Speaker- A.P.J. Abdul Kalam
- Developing Inner Strength: The Vivekananda Way (DVD) Ramkrishna Math, Pune
- Who Am I? (A Documentary Film on Personality Development) Ramkrishna Math, Pune
- गोर्लेशिवराज (२००९) मजेतजागावकसं? पुणे,ग्रंथायनप्रकाशन.
- गोर्लेशिवराज (२००९) मजेतरहावकसं? पुणे,ग्रंथायनप्रकाशन.
- सरश्री (२००७) स्वसंवादाचीजादूपुणे,तेजज्ञानप्रकाशन.
- सरश्री (२००७) विचारनियमपुणे,तेजज्ञानप्रकाशन.
- स्वामीसुबोधानंद (२००३) हेजीवनारीलाक्सप्लीजबंगलोर, सुधिन्द्रप्रकाशन.
- http://www.mentalhelp.net
- http://www.mayoclinic.org
- http://www.helpguide.org
- http://www.onlyhealthy.com

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PUNYASHLOKAHILYADEVIHOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Skill Oriented Course w.e.f. 2021 - 22

Title of the Course: The Art of Public Speaking

- Eligibility of the course **: B.Sc. B.Ed. Semester-V**
- Total credit of the course **: 04 Credit**
- Total marks of the course **: 100 Marks**
- Weightage to practical work (marks) **: 80 Marks**
- Weightage to Theory work (marks) **: 20 Marks**
- Duration of the course **: 12 weeks (60 Hours)**

Aim of the course: To develop the public speaking skills and be a successful public speaker of any professional fields.

Learning Outcomes: After Successful completion of this course, the students will be able to:

1) Provide you with a basic background in the theories and principles of public speaking, as well as practical experience with the basic types of speeches.
2) Develop speech preparation and presentation techniques, audience awareness and self-awareness.
3) Gain confidence to speak publicly in a variety of situations.
4) Give you the opportunity to develop and strengthen skills in preparing and presenting public oral presentations in a variety of situations.
5) Gain confidence as a public speaker.
6) Develop an understanding of audience analysis.
7) Prepare successful massages and Develop effective delivery.
8) Increase understanding and integration off the basic principles practices and techniques of effective public speaking.
9) Explore principles of listening and perception in order to enhance speaking abilities.
10) Prepare student to deliver different types of speeches effectively.

Course Content:

Module 01: Intro to Public Speaking

- Public Speaking: Meaning , Need and Importance
- Characteristics and principles of Public Speaking
- Factors affection on public speaking (Internal& External)
- Importance of Gestures & Body Posture.

Module 02: Script Writing and Delivery Aesthetics of Speech

- Script Writing: meaning , Need and Importance

- Script Writing (Types & Techniques)
- Delivery: The Aesthetics of Speech.

Module 03: Voice and Public Speaking Activities

- Voice: Importance of Tone & Speed
- Way and methods for improving voice quality
- Strategy for voice rehearsing & controlling
- Activities for endurance
- Activities for Stage courage

Module 04: References, Audience, Supporting Aids and Ethics of Public Speaking

- References: Meaning, Need & Importance
- Selection & Modification of References
- Knowing Your Audience
- Supporting Aids: Selection, Need & Importance
- Ethics of Public Speaking

List of Activities: Following activities should be conducted by teacher educator for implementing of the skills oriented course.

Sr. No.	Activities
01	The Speech of Introduction- Introduce yourself
02	The Speech of Introduction- Introduce another person
03	The Special Occasion Speech
04	Evaluation of a well known speaker
05	Conducting any one programme in a group of three students
06	Oral critiques of speeches in class
07	Field Experience- Speeches outside classroom
08	Qualitative analysis of any political leader speech
09	Professional Speech
10	Participation in Public Speaking Competition

*Teacher educator also may conduct different activities as per availability; this list is just for reference.

Course Lay out

Week	Content	Place	Hours
Week 01	• Public Speaking: Meaning , Need and Importance • Characteristics and principles of Public Speaking	Classroom	05
Week 02	• Factors affection on public speaking (Internal& External) • Importance of Gestures & Body Posture.	Classroom	05

Week 03	• Script Writing: meaning , Need and Importance • Script Writing (Types & Techniques) • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 04	• Delivery: The Aesthetics of Speech. • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 05	• Voice: Importance of Tone & Speed • Way and methods for improving voice quality • Strategy for voice rehearsing & controlling • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 06	• Activities for endurance • Activities for Stage courage • Any relevant activity (Planning , Execution, feedback, Report)	Classroom/ Field of study	05
Week 07	• References: Meaning, Need & Importance • Selection & Modification of References • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 08	• Knowing Your Audience • Any relevant activity (Planning , Execution, feedback, Report)	Classroom/ Field of study	05
Week 09	• Supporting Aids: Selection, Need & Importance • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 10	• Ethics of Public Speaking • Any relevant activity (Planning , Execution, feedback, Report)	Classroom	05
Week 11	• Practice and revision under the supervision of teacher educator • Any relevant activity (Planning , Execution, feedback, Report)	Classroom/ Field of study	05
Week 12	• Evaluation Process includes: 1. Submission of reports of concerned activities. 2. Viva Voce	Classroom	05
	• Theory Test or exam	Classroom	

Evaluation system or process of the course:

Sr. No.	Course Nature	Particular	Marks
01	Theory course	MCQ test at the end of the course	20
02	Practical Activity Evaluation	Any Six activities	60
03	Practical Activity evaluation	Evaluation of a television personality	10
04	Viva Voce	Viva Voce related to Practical Activity	10
TOTAL MARKS			**100**

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PUNYASHLOKAHILYADEVIHOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Skill Oriented Course w.e.f. 2021 - 22

Title of the Course: Psychological Testing and Assessment

- Eligibility of the course **: B.Sc. B.Ed. Semester-V**
- Total credit of the course **: 04 Credit**
- Total marks of the course **: 100 Marks**
- Weightage to practical work (marks) **: 80 Marks**
- Weightage to Theory work (marks) **: 20 Marks**
- Duration of the course **: 12 weeks (60 Hours)**

Aim of the course: To develop the skillful and Enrich psychological testing administrator.

Learning Outcomes: After successful completion of this course, the students will be able to:

1. Clarify the concept of Psychological testing.
2. Justify the Difference between Psychological Assessment and Psychological Testing.
3. Elaborate the Purpose and Characteristics of a Good of Psychological Testing.
4. Justify Types or classification of Psychological Tests.
5. Clarify concept of psychology test manuals and Validity, reliability of psychology tests.
6. Elaborate administration and scoring system of psychological testing.
7. Clarify Verbal, non-verbal, performance psychological tests and Explain Role of Administrator in Psychological test application.
8. Administered the different psychological tests.
9. Prepare the psychological test report and Give Feedback & counseling after psychological testing.
10. Create or develop the skills essential for Psychological testing.

Course Content:

Module 01: Fundamentals of Psychological testing

- Meaning of Psychological Testing
- Difference between Psychological Assessment and Psychological Testing
- Purpose of Psychological Testing
- Characteristics of a Good Psychological Test

Module 02: Understanding the Psychological testing process

- Types or classification of Psychological Tests
- Psychology Test Manuals: concept
- Validity and reliability of psychology tests
- Administration and scoring of Psychological testing
- Interpretation and conclusion of Psychological tests

Module 03: Assessment of Psychological tests

- Different Verbal Psychology tests
- Different Non-Verbal Psychology tests
- Different Performance Psychology tests
- Cognitive, Emotional, Behavioral and Executive functioning ability Testing
- Role of Administrator in Psychological test application

Module 04: Report writing of Psychological tests

- Ethics in Psychological testing
- Preparation of report of psychological tests
- Use of Technology in Psychological testing
- Feedback and counseling after psychological testing

List of the Psychology Tests: Following test are used by teacher educator for implementation of the skill oriented course.

Sr. No.	Verbal / Non verbal Tests	Performance Tests
01	Interest Inventory: Palsane	Alexander Pass along Test: Intelligence
02	Study habit Inventory: Palsane	Whipple's Cards: Imagination
03	Adjustment Inventory: Palsane	Kamat's Cards
04	Scientific Aptitude test: k.k.Aggarwal	Bhatia's Block Design Test
05	Teacher Value Inventory: S.P. Ahluwalia	Koh's Block Design Test
06	Creativity Test: Paasi	Minsota Block Packing Test
07	Non verbal group Intelligence test: A.O. Impisungha	Kamat's Cards
08	Mental Health Check list: P. Kumar	
09	Self Confidence Inventory: Gupta	
10	Reasoning ability test: I.N. Dubey	
11	Social Intelligence test: N.K. Chaddha & Usha Ganesan	
12	Education Aspiration Inventory: Pradeep Kumar	
13	Logical Thinking Test: S. Tiwari & S. Kumar	
14	Computer attitude test: Taheera Khatun & Manik Sharma	
15	Teaching Aptitude Test: Jai Prakash & R.P. Shrivastava	
16	Problem solving test: Paasi & Usha Kumar	
17	Socio Economic status scale: Bharadwaj	
18	Emotional Intelligence test: Hyde Pethe & Dhar	
19	Anxiety scale: A. Kumar	
20	Personality test: Medha Kumthekar	

*** Teacher educator also may be uses different psychology tests as per availability. This list is just for reference.**

Course Lay out

Week	Content	Place	Hours
Week 01	• Meaning of Psychological Testing • Difference between Psychological Assessment and Psychological Testing	Classroom	05
Week 02	• Purpose of Psychological Testing • Characteristics of a Good Psychological Test	Classroom	05
Week 03	• Types or classification of Psychological Tests • Psychology Test Manuals: concept • Validation and reliability of psychology tests	Educational Psychology Laboratory	05
Week 04	• Administration and scoring of Psychological testing • Interpretation and conclusion of Psychological tests • Different Verbal Psychology tests	Educational Psychology Laboratory	05
Week 05	• Different Non-Verbal Psychology tests • Different Performance Psychology tests • Cognitive, Emotional, Behavior and Executive functioning ability Testing • Role of Administrator in Psychological test application	Educational Psychology Laboratory	05
Week 06	• Ethics in Psychological testing • Preparation of report of psychological tests • Use of Technology in Psychological testing • Feedback and counseling after psychological testing	Educational Psychology Laboratory	05
Week 07	• **Demonstration by Teacher Educator** • Actual Administration of Test 01& 02 • Assessment of Test 01& 02 • Preparation of report Test 01& 02 • Feedback Demonstration of Test 01 & 02	Educational Psychology Laboratory	05
Week 08	• **Demonstration by Teacher Educator** • Actual Administration of Test 03 & 04 • Assessment of Test 03 & 04 • Preparation of report Test 03 & 04 • Feedback Demonstration of Test 03 & 04	Educational Psychology Laboratory	05
Week 09	• **Demonstration by Teacher Educator** • Actual Administration of Test 05 & 06 • Assessment of Test 05 & 06 • Preparation of report Test 05 & 06 • Feedback Demonstration of Test 05 & 06	Educational Psychology Laboratory	05
Week 10	• **Demonstration by Teacher Educator** • Actual Administration of Test 07& 08 • Assessment of Test 07& 08	Educational Psychology Laboratory	05

	• Preparation of report Test 07& 08 • Feedback Demonstration of Test 07& 08		
Week 11	• Practice and revision of administration & assessment of tests under the supervision of educator. • Evaluation Process includes: 11. Practical Activity	Educational Psychology Laboratory	05
Week 12	• Evaluation Process includes: 12. Practical Activity 13. Viva Voce	Educational Psychology Laboratory	05
	• Theory Test or exam	Classroom	

Evaluation system or process of the course:

Sr. No.	Course Nature	Particular	Marks
01	Theory course	MCQ test at the end of the course	20
02	Practical Activity evaluation	Verbal or Non-verbal Test Administration, Assessment (any Six test)	60
03	Practical Activity evaluation	Performance Test Administration, Assessment (any one test)	10
04	Viva Voce	Viva Voce related to Practical Activity	10
TOTAL MARKS			**100**

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- http://lib.oup.com.au/he/psychology/samples/shum_psychologicalassessment_sample.pdf
- https://www.magadhuniversity.ac.in/download/econtent/pdf/Psychological%20test%20-%20Preety%20Shekhar.pdf

Skill Oriented Course Developed by:

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PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Skill Oriented Course w. e. f. 2021 - 22

Title of the Course: Technology Embedded Teaching

- Eligibility of the course **: B.Sc. B.Ed. Semester-V**
- Total credit of the course **: 04 Credit**
- Total marks of the course **: 100 Marks**
- Weightage to practical work (marks) **: 80 Marks**
- Weightage to Theory work (marks) **: 20 Marks**
- Duration of the course **: 12 weeks (60 hours)**

Aim of the course: To develop the skillful and enrich Technology Embedded Teacher.

Learning Outcomes: After successful completion of this course, the students will be able to:

1. Explains the concept of Computer Network and internet
2. Clarify the types, uses of Browser
3. Understand meaning, elements and types of Multimedia.
4. Be getting acquainted with developing multimedia and E-learning.
5. Be getting acquainted with mobile learning and learning Management Systems.
6. Understand the concept and use of Wiki, Blog, and Social Network.
7. Understand the role of ICT in Assessment.
8. Preparing a tool for creating e-portfolio.
9. Understand the ways of creating electronic Content.
10. Understand the use of various Google Apps.
11. Understand the use of various online learning platforms.

Course Content:

Module 01: Computer – Network, Internet Software

- Computer Network – LAN, WAN.
- Internet – Concept, Accessing, Navigating, Searching, Selecting, Evaluating, Saving and Bookmarking Safe Practices.
- Browser -Types, Uses, Plug-in and Extensions, Search Strategies.
- Application Software and its educational applications, PDF Creator.

Module 02- Multimedia and E-Learning

- Multimedia-Meaning, Elements, Types.
- Developing Multimedia, Tools for Creating and Using Multimedia.
- E-learning-Concept and Characteristics, Tools &Technologies.
- Mobile learning, Learning Management Systems (LMS)

Module 03: ICT in Practice Lesson and Assessment

- Wiki, Blog, creating you tube channel, Social Network.
- Constructivist Learning and ICT, Project Based Learning, Virtual Field Trip.
- Role of ICT in Assessment, Computer Assisted Assessment.
- Tools for creating e-portfolio, Advantages of e-portfolio.

Module 04: E-Content & Teacher Professional development

- Electronic Content- Designing and Development, Audio and Video-Creating and Editing. (OBS studio)
- Google Apps- Google form, Google Classroom, Google site.
- Teacher Professional Development – Concept, Online Learning Platforms -MOOCs, SWAYAM, Social Media, Web-conferencing.
- Online videos/Teaching channels, Teacher Portfolio, Teleconferencing – EDUSAT Experiment.

List of Activities:

Following activities should be conducted by teacher educator for implementation of the skill oriented course

Sr. No	**Activity**
1	Preparation of a power point presentation using online and offline references on a school topic and Create PDF document through various PDF creator.
2	Developing a multimedia e-content for any school subject.
3	Create multimedia presentation on any topic in education
4	Online Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
5	A critical study of some e-learning courses and enrolling and completing some free e-learning courses
6	LMS experience- hands on various features of LMS
7	Creating account in wiki space/Wikipedia/media wiki and adding/editing content
8	Developing an educational blog in www.blogger.com, or www.edublog.com
9	Create you tube channel and upload your educational videos.
10	Use ICT for Constructivist Learning and Project Based Learning by selecting any topic.
11	Field visit to the EDUSAT or other ICT center and take part in teleconferencing

12	Organize web conferencing using Skype/Google+
13	Developing an electronic assessment portfolio
14	Preparation of an evaluation tool / Feedback form for online registration/feedback, Google form and Google Classroom with carrying various educational activities.
15	Prepare a list of Educational websites, Research papers etc. that are useful in Education.
16	Collection of e-resources and Reporting. (Text- Books, Articles, Reports, Theses; Audio and Video files related to education).

Course Lay out

Week	Content	Place	Hours
01	• Computer Network – LAN, WAN. • Internet – Concept, Accessing, Navigating, Searching, Selecting, Evaluating, Saving and Bookmarking Safe Practices.	Classroom ICT Lab.	05
02	• Browser -Types, Uses, Plug-in and Extensions, Search Strategies. • Application Software and its educational applications, PDF Creator. **Any Relevant activity**-Planning, Execution, Report and Feedback. 1. Preparation of a PPT	Classroom ICT Lab	05
03	• Multimedia-Meaning, Elements, Types. • Developing Multimedia, Tools for Creating and Using Multimedia. **Any Relevant activity**-Planning, Execution, Report and Feedback. 2. Developing a multimedia e-content for any school subject. 3. Create multimedia presentation on any topic in education	Classroom ICT Lab.	05
04	• E-learning-Concept and Characteristics, Tools &Technologies. • Mobile learning, Learning Management Systems (LMS) **Any Relevant activity**-Planning, Execution, Report and Feedback. 4. Online Interview of computer hardware engineer/ICT specialist 5. A critical study of some e-learning courses 6. LMS experience- hands on various features of	Classroom ICT Lab	05
05	• Wiki, Blog, creating you tube channel, Social Network. **Any Relevant activity**-Planning, Execution, Report and Feedback. 7. Creating account in wiki space/Wikipedia/media wiki	Classroom ICT Lab	05

	8. Developing an educational blog 9. Create you tube channel and upload your educational videos.		
06	• Constructivist Learning and ICT, Project Based Learning, Virtual Field Trip. **Any Relevant activity-**Planning, Execution, Report and Feedback 10. Use ICT for Constructivist Learning and Project Based Learning 11. Field visit to the EDUSAT or other ICT center 12. Organize web conferencing using Skype/Google+	Classroom ICT Lab Field visit	05
07	• Role of ICT in Assessment, Computer Assisted Assessment. • Tools for creating e-portfolio, Advantages of e-portfolio **Any Relevant activity-**Planning, Execution, Report and Feedback 13. Developing an electronic assessment portfolio	Classroom ICT Lab	05
08	• Electronic Content- Designing and Development, Audio and Video-Creating and Editing. (OBS studio) • Google Apps- Google form, Google Classroom, Google site **Any Relevant activity-**Planning, Execution, Report and Feedback 14. Preparation of an evaluation tool / Feedback form	Classroom ICT Lab	05
09	• Teacher Professional Development – Concept, Online Learning Platforms -MOOCs, SWAYAM, Social Media, Web-conferencing **Any Relevant activity-**Planning, Execution, Report and Feedback 15. Prepare a list of Educational websites, Research papers etc. that are useful in Education.	Classroom ICT Lab	05
10	• Online videos/Teaching channels, Teacher Portfolio, Teleconferencing – EDUSAT Experiment. **Any Relevant activity-**Planning, Execution, Report and Feedback 16. Collection of e-resources and Reporting. (Text- Books, Articles, Reports, Theses; Audio and Video files related to education).	Classroom ICT Lab	05
11	• Practice and revision of all assessment of Activities under the supervision of teacher educator. • Evaluation Process includes: 14. Practical Activities	Classroom ICT Lab	05

12	• Evaluation Process includes: 15. Practical Activities 16. Viva Voce	Classroom ICT Lab	05
	• Theory Test or exam	Classroom	

Evaluation system or process of the course:

Sr. No.	Course Nature	Particular	Marks
01	Theory course	MCQ test at the end of the course	20
02	Practical Activity evaluation	Any Seven Activities	70
03	Viva Voce	Viva Voce related to Practical Activity	10
TOTAL MARKS			**100**

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Guidance and Counseling (1/2)

Credits: 02 Periods: 30 Maximum Marks: 50

Internal Assessment Marks: 10 University Assessment Marks: 40

COURSE OBJECTIVE: To enable the student to:

1) Understand concept, need and view point of guidance.
2) Understand principles and problems of different types of guidance.
3) Understand concept and needs and guidance for the children with specialneeds.
4) Understand the concept and process of Counselling.
5) Acquaint the student with the aim and principles of guidance programme.
6) Develop an understanding of various procedures of organizing various services.

UNIT I: GUIDANCE

a) Concept, Assumptions, Issues and Problems of guidance.
b) Need, Scope and Significance of guidance.
c) Types of guidance- Educational, Vocational, Personal and Group guidance.
d) Role of teacher in guidance.

UNIT II: EDUCATIONAL GUIDANCE AT VARIOUS LEVLES OF EDUCATION.

a) Guidance at Secondary school level. (Life skill, Life long learning, Carrer)
b) Guidance and curriculum, Guidance and class room learning.
c) Approaches to career guidance, Vocationalization of secondary education and Career development.
d) Problems and needs of children with Special needs.

UNIT III: COUNSELLING

a) Concept, Nature and Principles of Counselling.
b) Counseling approaches- Directive and Non directive.
c) Characteristics of Client –Counselor.
d) Individual and Group Counselling.

UNIT IV: COUNSELLING PROCESS

a) Preparation for Counselling –Reading, Pre-Counseling interview, case history.

b) Steps in process of Counselling.

c) Variables affecting Counselling process.

d) Counselling interview.

Sessional work: (Total 10 Marks)

- The student will have to write 3 tutorials Broad questions in Notebook and assessed by Teacher Educator. Out of these three prepared tutorial questions one should write in Exam situation. **(5 Marks)**
- The students has to undertake **one** of the following practical and present the report **(5 Marks)**

PRACTICALS:

Any Two of the following:

a) Test the Intelligence of IX class students by a Group test of Intelligence.

b) Test the creativity of secondary school students by a Psychological test of creativity

c) Prepare of two individuals profiles.

d) Assess the Adjustment of IX class students by an Adjustment inventory.

e) Conduct two case studies.

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Reference Books:

1) Bhatnagar, Asha and Gupta, Nirmala (Eds)(1999), Guidance and Counselling, Vol.
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3) Cormier, L. & Hackney, H. (1987). The Professional Counsellor. Englewood Cliffs,New Jersey: Prentice Hall.
4) Bhangale S.D. Guidance and Counselling, Prashant Publication, Jalgaon.
5) Corey G. (1986), Theory and Practice of Counselling and Psychotherapy, 3rd E.
6) Nelson, Richard (2012) Basic Cousilling Skills. SAGE Pub. India. Pvt. New Delhi

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८) शै.व व्या.मागदर्शन व समुपदेशन, (२०१०) डॉ.अरविंद दुनाखे/डॉ.लिना देशपांडे , नित्यनूतन प्रकाशन, पुणे.

९) मागदर्शन व समुपदेशन,(२००९), गुळवणी मेघा, नित्यनूतन प्रकाशन, पुणे.

B.Sc. B.Ed. Semester VI

PEDAGOGY OF PHYSICAL SCIENCE 2

Credits: 02 **Total Marks: 50**

Objectives:

· Enable the students to write the unit plans and lesson plan as per the norms of NCF 2005.
· Applying the different teaching methods based on a constructivist point of view.
· Enable the students to observe the lesson systematically.
· Selecting the learning resource and effective use of the same.
· Using of ICT in physical science teaching and learning.
· Explore various assessment strategies for evaluating learning in Physical science.
· Explore various professional development opportunities.
· Plan and conduct action research in secondary schools.
· Identify various teaching- learning resources.
· Develop skills of facilitation as they teach in simulated situations.
· Reflecting the methods in the class.

COURSE CONTENT:

Unit I: Learning Resources in Physical Science

A) Print resources: Textbook as a learning resource, criteria for evaluation of a textbook, handbooks, teacher resource books, laboratory manuals, science journals and magazines, encyclopedia, newspaper.

B) Dale's cone of experience and its use in teaching- learning. Developing and using resources such as charts, models, science kits, posters, science parks.

C) Science laboratories: designing, management, and safe practices. Making low-cost equipment from locally available resources, using the immediate environment and the community resources for teaching of physical science.

D) Exploring and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics.

E) ICT integration in physical science teaching: different forms of ICT and its application in science education.

Unit II: Need and Importance of Assessment for Learning Physical Science

A) Learning standards in science, process and product assessment in Physical Sciences, importance of metacognition and reflection in assessment, importance feedback in facilitating learning.

B) Meaning of the terms test, examination, measurement, assessment and evaluation in proper context, Continuous and Comprehensive Evaluation (CCE) and its features.

C) Assessment and evaluation as intertwined process of classroom experiences performance-based assessment, planning assessment framework, Learning Indicators (Lis) and its types, developing LIs for activity, presentation, group work, assignments etc.

D) Recording and reporting of learning evidences – measurement of students' achievement – marks and grading.

Unit III: Tools and Techniques Assessment for Learning Physical Science

A) Tools and technique of assessment-- assessment of written and oral work, project work, laboratory work, field trips, journal writing, concept map; assessment of learners with special needs.

B) Use of observation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in physical science.

C) Use of rubrics, and portfolio assessment in Physical Science, diagnosing learning difficulties and misconception in Physical Science.

D) Use of ICT in assessment.

E) Constructing different types test items in Physical Science at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development of Physical Science teachers

A) Professional competencies of a physical science teacher.

B) Need for updating content and pedagogical competencies, pre-service and in-service courses and initiatives, agencies to nurture the best teachers, NCERT activities for teachers.

C) Participation in science fairs, exhibitions, and science club activities, Planning contextual activities- celebration of science day, birthdays of great physicists and chemists, seminars, conferences, online sharing, distance learning,

D) membership to organizations- NSTA, IPA, IAPT, Indian Chemical Society, INSC. NCERT publications and journals

E) Teacher as a Researcher: meaning of research and its importance, action research versus research, selecting the problem for action research, format of research plan, action research in physical sciences, steps in action research, examples of action research from the primary, secondary, and higher secondary levels.

Sessional Activities:

· Design and development of unit test.
· Developing rubrics for laboratory work, assignment, field trip, project etc.
· Facilitating the development of digital portfolio by a couple of school students.
· Designing and implementing science lab experiments.
· Text book analysis for content organization/ validness of curriculum mentioned in NCF 2005.
· Analysis of process skills and planning lessons for developing process skills.
· Identifying, selecting, and evaluating various media for chosen unit.
· Case studies of successful teacher leaders.
· Presentation and discussion on sample action research studies.
· Planning and conducting an action research.
· Debates on various ethical issues.
· Visit to a special school, observation of inclusion strategies in regular classroom.
· Development of teaching portfolio.
· Analysis of teacher competency framework of various organization.
· Study of a science professional organization.
· Review of an action research article/teaching of Physical science related research

article.
· Organizing a science exhibition.
· Formation of a science club and conducting various activities.
· School visit to study the CCE practice.
· Conducting field trips to science museum, science park, botanical garden.
· Writing unit plan for at least 2 units of secondary science.
· Writing lesson plan for at least 2 topics of secondary science.
· Classroom Experience 2: Classroom Observation for studying teacher's facilitation skills and how student work is distributed (with emphasis on pedagogical aspects strategies/ materials used).
· Preparing and demonstrating low cost/improvised teaching aids based on Class VII, VIII and IX class Physical Science.
· Simulated teaching of class VII-X topics.
· Developing and analysing a Physical Science achievement test.
· Develop an assessment rubric in Physical Science.
· Visit to a Science museum / Science park /Science teacher resource centres.
· Organize a seminar related to Science day. Developing an action research plan for teaching-learning Physical Science.

References:

1. Pedagogy of Physical Science, Text book for B.Ed, Part I, NCERT
2. Pedagogy of Physical Science, Text book for B.Ed, Part II, NCERT
3. National Curriculum Framework 2005, NCERT, New Delhi.
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6. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
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8. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
9. History of Physics in the 20th Century, Internet Browsing.
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14. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
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and Astronomy, University of Maryland, College Park, MO 20742.
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B.Sc. B.Ed. Semester VI
PEDAGOGY OF MATHEMATICS 2

Credits: 02 **Total Marks: 50**

Objectives: On completion of the course the students will have
* Understanding of nature of teaching proof and problem solving in mathematics
* Ability to analyse the purposes of teaching algebra and geometry
* Ability to select suitable tools for mathematical construction and measurements
* Appreciates the usefulness of mathematics in day today activity in various fields
* Adopt different strategies to meet the diversified needs of learners and appreciates the availability of various learning resources in mathematics Decision making ability to use appropriate assessment tools for mathematical assessment

COURSE CONTENT:

Unit I : Teaching of Proof and Teaching of Problem-solving

A) Meaning and nature of Proof; kinds of proof- direct, proof by mathematical induction, proof by contradiction, proof by contrapositive, proof by cases, proof by counter examples;
planning and teaching of various theorems in mathematics (secondary level)

B) Problem-solving

Definition of problem, problem solving; Meaning and nature of Problem solving, strategies of problem solving- Means-ends analysis, backtracking, backward movement, heuristics;
Polya's Problem solving steps; solving various mathematical problems

Unit II: Teaching of Algebra and Geometry

A) Introduction of basic ideas of algebra- variable, constant, coefficient, expression, equation;
B) Nature and purpose of teaching algebra;
C) Contextualization of practical situation into algebraic expressions or equations (mathematization);
D) solving various algebraic relations problems of secondary level.
E) Nature of geometry; purpose of teaching geometry; construction of different geometrical figures; Role of geometry in comprehending mathematics as whole; developing skills in selecting, drawing, using appropriate geometrical instruments and its utility in real life situation; scale drawing; topology and its application in mathematics.

Unit III: Meeting diverse needs of learners (Gifted and Slow learners) and Learning resources in mathematics

A) Gifted child in mathematics- their characteristics, identification and enrichment programmes.
B) Slow learners in mathematics- their characteristics, identification and remedial measures; overcoming dyscalculia and dysgraphia problems in mathematics and their remediation.
C) Creation of **visual aids**-charts, models, graphs; usage of **graphical tools**- calculator, logo, cabri, geogebra, sketch pad, ready reckoners; selection and integration of tools in relation to content and learning environment;

D) **Audio-visual aids**- animations, film shows; mathematics lab; mathematics club; e-resources and open and free software;
E) **Community resources** library, museum, theatre, knowledgeable person or experts

Unit IV: Assessment of learning in mathematics

A) Selection of appropriate tools for formative and summative assessment; diagnosing the learning difficulties of learners (Error analysis- procedural errors, conceptual errors, computational errors) and providing remedial measures (Peer tutoring, direct instruction, mentoring); creation of rubric, portfolios, Criterion reference test, Norm referenced test based on set criteria; construction, administration, scoring, interpretation of a unit test and providing feedback to learners.
B) For all the Pedagogical transactions the following content knowledge (8th, 9th , 10th, 11th, and 12th standard syllabus) to be made use of, and these can be revised as per the change in curriculum of respective state or changes in CBSE syllabus or in NCERT text books.
C) Arithmetic: Number system, Ratio and Proportion, Fractions, Commercial mathematics and Data handling, sets, Matrices
D) Algebra: Polynomials, Graphical representations of various equations, trigonometry,
E) Geometry: Lines and angles; Triangles and its related theorems; polygons; analytical geometry, Differential calculus; Integration, Trigonometry; graph theory; computing using ICT.

Sessional work:

- Selecting any one of the theorem and teaching it by adopting the strategies of teaching proof
- Selecting any one kind of problem in mathematics and demonstrate its procedure of solving
- Selecting a topic in algebra or in geometry and teaching it using appropriate learning resources
- Construction of unit test (administration, scoring, statistical analysis and reporting) on a selected unit
- Analysing the errors committed by learners at secondary level, in regular test and analysing its causes and suggesting various remedial measures for it

References:

1. Butler and Wren (1965), The Teaching of Secondary Mathematics- Fourth Edition, London, McGraw Hill Book company
2. Cooney T J and others (1975), Dynamics of Teaching Secondary School Mathematics,Boston: Houghton Miffilin
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9. Robert B Davis (1984),Learning Mathematics-The cognitive approach to Mathematics Education, Sydney, Croom Helm Australia Pty Ltd
10. Servas W and T Varga, Teaching school Mathematics, UNESCO source book
11. T V Somashekar, G Viswanathappa and Anice James (2014), Methods of Teaching Mathematics, Hyderabad, Neelkamal Publications Pvt Ltd

B.Sc. B.Ed. Semester VI

PEDAGOGY OF BIOLOGICAL SCIENCE 2

Credits: 02 **Total Marks: 50**

Objectives

· Explain various methods and strategies of biology teaching
· Use various approaches to facilitate learning
· Integrate ICT in biology teaching
· Develop and use various learning resources in biology teaching
· Construct unit test in biology
· Explore various assessment strategies for evaluating learning in biology
· Explore various professional development opportunities
· Plan and conduct action research in secondary schools

COURSE CONTENT:

Unit I: Methods and Strategies for Facilitating Learning:

A) Teaching concepts and generalisations, inductive approaches, using advance organisers, problem solving approach, investigatory approach, project method, cooperative learning method

B) Facilitating learning: questioning-techniques and strategies, higher order and metacognitive questioning, scaffolding-techniques and strategies, discussions/dialogue Strategies for creating an inclusive biology classroom

C) Laboratory approaches- inductive, deductive, verification and problem-solving Using field trips, projects, quiz, exhibition, science fair, science clubs/nature clubs/eco clubs, study tours, observation of environment related days in learning biology

D) ICT integration in biology teaching: use of wiki, blog, social networking, social book marking, webquest, virtual field trips, e-learning, flipped learning and MOOC in biology learning

Unit II: Learning Resources in Biology Teaching

A) Textbook as a learning resource, Handbooks, Teacher Resource books, laboratory manuals, Encyclopaedia, newspaper

B) Developing and using Charts, models, science kits posters, worksheets, museum, botanical garden, national parks, aquaria, and herbarium

C) Science laboratories: designing, management, and safe practices

D) Making low-cost equipment from locally available resources, using the immediate environment and the community resources for teaching of biological science

E) Developing and using digital resources: websites, videos, games, simulations, mobile apps, presentations, OER, interactive multimedia resources, e-books, podcasts, digital concept maps, and digital graphics

Unit III: Assessment in Science

A) Learning standards in Science, process and product assessment in biology, importance of metacognition and reflection in assessment, importance feedback in facilitating learning Use of observation, questioning, concept mapping, rating scales, worksheets, reflective journals/diary, peer and self-assessment in biology

B) Use of rubrics, and portfolio assessment in biology, Diagnosing learning difficulties and misconception in biology
C) Techniques of assessing laboratory and project work, Use of ICT in assessment, Strategies for continuous and comprehensive evaluation in biology
E) Constructing different types test items in biology at different levels of taxonomy, preparation of blue print/table of specification and constructing unit test.

Unit IV: Professional development
A) Professional competencies of a biology teacher need for updating content and pedagogical competencies, teacher as a lifelong learner.
B) Various in-service courses and agencies available for biology teachers to develop their professional competencies, Professional development activities: seminars, conferences, online and offline courses, teacher exchange, competitions, publications, development of teaching portfolio
C) Role of professional associations in professional development
D) Developing professional competencies in dealing with gender issues, equity and inclusion, ethical issues, environmental issues, human health and population, Action research, reflection and evidence-based practice in science teaching, Importance of self-directed professional development
E) Teacher leadership: using transformative pedagogical practices

Sessional Activities
· Enrolling and completing a mooc related to science
· Converting one unit of secondary biology in to mooc format
· Developing and trying out flipped learning in school
· Design and development of unit test
· Developing rubrics for laboratory work, assignment, field trip, project etc.
· Facilitating the development of digital portfolio by a couple of school students
· Designing and implementing a science lab experiments
· Analysis of process skills and planning lessons for developing process skills
· Development of concept map for a given unit/facilitating concept mapping among school students
· Celebration of science days
· Developing graphics for a particular unit
· Identifying, evaluating and selecting various media for chosen unit
· Case studies of successful teacher leaders
· Presentation and discussion on sample action research studies
· Planning and conducting action research
· Debates on various ethical issues
· Visit to a special school, observation of inclusion strategies in regular classroom
· Development of teaching portfolio
· Analysis of teacher competency framework of various organization
· Study of a science professional organization
· Developing a self-directed professional development plan

· Review of an action research article/teaching of biological science related research article
· Organizing a science exhibition
· Formation of a science club and conducting various activities
· School visit to study the CCE practice
· Conducting field trips to science musem, science park, botanical garden
· Writing reflective journal

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25. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
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EPC 3: Critical Understanding of ICT (1/2)

Credits: 02 Periods: 30 Maximum Marks: 50

Internal Assessment Marks: 50 University Assessment Marks: 00

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Objectives:

1. To enable student teachers to understand importance of ICT in day to day life.
2. To enable student teachers to acquire essential skills of ICT in order to integrate ICT in teaching, learning, evaluation, administration, teaching material development & developing collaborative networks for sharing and learning in schools and colleges.
3. To motivate student teachers to judiciously use ICT for facilitation for their own development and development of the society.
4. Provide student teachers opportunities of using online and offline resources for their individual learning.
5. To create net savvy attitude of sharing knowledge resources for betterment of the world.
6. To help student teachers to construct knowledge using ICT and become a lifelong learner.
7. To empower student teachers to become responsible citizens of the modern – technology based world.

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Syllabus of the course:

Unit1: Introduction to computer fundamentals, major elements in a computer system and properties of computers.

Unit2: Application software: O. S., Microsoft Word, Microsoft Excel, Microsoft Power point its facilities and uses.

Unit3: Internet, Email- requirements, registration, benefits and limitations. Social Websites their uses & limitations. Use of various Google apps for educational purpose.

Unit 4: Microsoft Publisher and its facilities. Computer care – viruses and safety measures.

Course Evaluation:

An objective test of 10 marks on the course content.

Any eight of the following practical each carrying 5 marks.

Practicals:

1. Preparation of a word document such as letter, bio-data/ CV/ resume, application, report, question paper, etc.
2. Preparation of a spreadsheet using functions and commands, diagrams / charts/ graphs
3. Preparation of a power point presentation using online and offline references on a school topic
4. Email registration and sending / receiving Email with attachment.
5. Preparation of a newsletter/ brochure / invitation card/ visiting card/ website
6. Critical evaluation of a website
7. ICT project on any one of the pertinent topic / concept assigned to the student by the teacher such as cybercrime and cyber security.
8. Preparation of a power point presentation / video presentation on observance of special day.
9. E publication of an article / report / note / research / survey.
10. Preparation of an evaluation tool / Feedback form for online registration/feedback
11. Word / Excel/ DBMS file preparation on students' profile in any school / college class.
12. Organization of special lecture / guest lecture on a pertinent topic of ICT and its digital notes.
13. Video interview / organization of video conference and digital report.

14. Education blogs creation and application.
15. Creating e-group/forum for educational interaction
16. Preparing e-port folio on one's own learning in ICT / Preparing e-port folio of Students of the B. Ed. class

References: (The references are suggestive. Teachers are advocated to identify, use such other and online resources. Online and web based references may be used as and when required.)

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