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 Syllabus

Name of the Course: B.Sc. I (Sem–I & II)

(Syllabus to be implemented from w.e.f. June 2019)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science

Choice Based Credit System (CBCS)

(w.e.f. June 2019- 2020)

Preamble

Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing under graduate degree, PAH Solapur University has implemented Choice Based Credit System (CBCS) at under graduate 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 maybe 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. It is 80+20 pattern of evaluation. It is applicable for theory and practical as well.

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Choice Based Credit System (CBCS)
(w.e.f. June 2019-2020)

• **Title of the Course**: B.Sc. Part-I

• **Subject**: Entrepreneurship

• **Introduction**: This course provides a broad overview of entrepreneurship and aims to produce expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using entrepreneurship. The course structure is technology-centric where students basically learn technology and are taught necessary basic subjects for that purpose.

• **Objectives of the course**: The objectives of B. Sc. Entrepreneurship (Entire) course are:

1. To provide an intensive & in-depth learning to the students in field of entrepreneurship.
2. Beyond learning and understanding the techniques, the course also addresses the underlying problems of disciplines in today's scientific and changing business world.
3. To develop awareness & knowledge of different organization requirements and subject knowledge through varied subjects and training methodology in students.
4. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

• **Advantages of the Course**: Entrepreneurship has tremendous job potential. The successful students will be able to establish trading, industrial, managerial skills and consultancy organizations in pharmaceuticals, paper, fermentation, food processing & preservation, agriculture, environment protection and also their own industry for micro propagation of commercially important plants in vitro, transgenic plants, vaccine production, clinical pathology, genetic counseling, human karyotyping etc. Students may be able to establish Multinational companies dealing with production of tissue cultured and genetically modified plants, food products, leather, dairy, beverages, pharmaceutical, chemical Industries, agribusiness, Environment protection. In addition they would be able to seek opportunities in Medical & Scientific Research Organizations; Universities in India & aboard.

• **Eligibility and Admission**: A Candidate passing 10+2 with Biology or Math's as one of the subject and passed from state syllabus / CBSE / equivalent with minimum passing percentage of 45% aggregate for open category and 5 % relaxation in the aggregate for all reserved categories candidates as per the government rules and regulations. Admission is based on first come first serve basis.

• **Duration**: The duration for this program is of 3 years with semester pattern (06 Semesters)

• **Medium of Instruction**: English

• **Syllabus Structure**:

• The University follows semester system.

• An academic year shall consist of two semesters.

• Each B.Sc. course shall consist of three years i.e. six semesters.

• B.Sc. Part-I Entrepreneurship shall consist of two semesters: Sem. I and Sem II

In semester I, there will be four core subjects. Each subject is having two papers of 50 marks for each. Similarly in Semester II there will be four core subjects. Each subject is having two

papers of 50 marks for each. English will be as Ability Enhancement Course (AECC) in both semesters I and II. English paper carries 100 marks in each semester.

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-I Entrepreneurship sem I & II the internal assessment will be based on Internal tests, Home assignment, Viva, Seminar, Group discussion etc. as given below. Practical course examination of 100 marks for each course shall be conducted at the end of IInd 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 out of two examiners, both examiners will be internal. Both examiners will be appointed by the College. 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 20 marks and external evaluation (University assessment) of 80 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 – I: Theory: (100 marks)-University Examination (80 marks): theory papers: 9
Internal Continuous Assessment: (20 marks)-Scheme of marking: 10 marks – Internal test; 10 marks – Home assignment / seminars / viva/ industry visit/ group discussion.

Semester – II: Theory: (100 marks)-University Examination (80 marks): theory papers: 9
Internal Continuous Assessment: (20 marks)-Scheme of marking: 10 marks – Internal test; 10 marks – Home assignment / seminars / viva/ industry visit/ group discussion.

Practical Examination: (100 marks): University Examination (80 marks): No. of practical course: 4
Internal Continuous Assessment: (20 marks)
Scheme of marking: 10 marks – Internal test on any two practical; 10 marks – Lab Journal/Viva, attendance, attitude etc.

• **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.

• **ATKT**: Candidate passed in all papers, except 5 (five) papers combined together of semester I and II of B.Sc. Part-I Entrepreneurship examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Microbiology .

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Structure for B. Sc-I Entrepreneurship (Entire)
Choice Based Credit System (CBCS)
w.e.f. 2019-20

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.- I Semester – I Theory**									
AEC	English (communication skill)	Paper- I		4.0			100	80	20	4.0
Core	DSC 1A	Paper I: Entrepreneurship and the world of business		2.5	--	--	50	40	10	4.0
		Paper II: Economics for manager and managerial accounting		2.5	--	--	50	40	10	
	DSC 2A	Paper I: Fundamental of inorganic chemistry		2.5	--	--	50	40	10	4.0
		Paper II: Fundamental of organic chemistry		2.5	--	--	50	40	10	
	DSC 3A	Paper I: Fundamental of microbiology		2.5	--	--	50	40	10	4.0
		Paper II: Basic techniques in microbiology		2.5	--	--	50	40	10	
	DSC 4A	Paper I: Cell Biology		2.5	--	--	50	40	10	4.0
		Paper II: Animal and plant physiology		2.5	--	--	50	40	10	
Total			**24**	--	--	**500**	**400**	**100**	**20**	
Class :	**B.Sc.- I Semester – II Theory**									
AEC	English (communication skill)	Paper- II		4.0			100	80	20	4.0
Core	DSC 1B	Paper-III : Principles of marketing and management accounting		2.5	--	--	50	40	10	4.0
		Paper-IV: Cost accounting and project management		2.5	--	--	50	40	10	
	DSC 2B	Paper-III: Fundamental of physical chemistry		2.5	--	--	50	40	10	4.0
		Paper-IV: Fundamental of analytical chemistry		2.5	--	--	50	40	10	
	DSC 3B	Paper-III: Fundamental of industrial microbiology		2.5	--	--	50	40	10	4.0
		Paper-IV : Basics techniques in industrial microbiology		2.5	--	--	50	40	10	

	DSC 4B	Paper-III: Basics of Biomolecules	2.5	--	--	50	40	10	4.0
		Paper-IV: Basics of Metabolism	2.5	--	--	50	40	10	
	Democracy, Elections and Good Governance		3.0			50	40	10	NC
Total (Theory)			**27**	--	--	**550**	**440**	**110**	**20**
Practical Syllabus									
Core	DSC 1 A & 1B	Laboratory Course I Entrepreneurship science	--	--	4	100	80	20	4.0
	DSC 2 A & 2B	Laboratory Course II Industrial chemistry	--	--	4	100	80	20	4.0
	DSC 3 A & 3B	Laboratory Course III Industrial microbiology	--	--	4	100	80	20	4.0
	DSC 4 A & 4B	Laboratory Course IV Industrial Biotechnology	--	--	4	100	80	20	4.0
Total (Practical)					**16**	**400**	**320**	**80**	**16**
Grand Total			**51**		**16**	**1450**	**1160**	**290**	**56**

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	550	22	--	--	22
	VI	550	22	400	16	38
Total		2850	112	1100	44	156

B.Sc. Programme:

Total Marks : Theory + Practical's = 2850 +1100 =3950
Credits : Theory + Practical's = 112 + 44 = 156
Numbers of Papers Theory: Ability Enhancement Course (AECC) : 05
Theory: Discipline Specific Elective Paper (DSE) : 08
Theory: DSC : 14
Skill Enhancement Courses : 04
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

Semester I

DSC 1A
Entrepreneurship Science
Paper-I
Entrepreneurship and The World of Business

Marks-50 **Period-45 L**

Unit I	**Introduction to Entrepreneurship**	**09**
	Entrepreneurship- Concept, Evolution, Functions, Characteristics, Types, Need and Importance- Role of entrepreneurship in economic development- entrepreneurship development process- factors impacting emergence of entrepreneurship- Barriers to entrepreneurship- Managerial Vs. Entrepreneurial approach- Innovation and Entrepreneurship.	
Unit II	**The World of Business**	**09**
	Meaning, Definition, Characteristics or Features of Business- Objective & Scope of Business- Classification of Business Activity- Types of business organization.	
Unit III	**Business Planning**	**09**
	Meaning of Business Plan- Business Plan Process- Advantages of Business Planning- Marketing Plan- Production plan- Organization Plan- Financial Plan- Final Project Report- Preparing a Model Project Report for starting a New Venture.	
Unit IV	**Institutions Supporting Entrepreneurship**	**09**
	A brief overview of financial institutions in India- Central level and state level institutions- SIDBI- NABARD- IDBI- SIDCO- Indian Institute of Entrepreneurship- DIC- Single Window- Latest Industrial Policy of Government of India.	
Unit V	**Women and Rural Entrepreneurship**	**09**
	Women Entrepreneurship- Meaning- Need- Scope- Growth of Women Entrepreneurship- Problems faced by Women Entrepreneurs- Special Scheme for Women Entrepreneurs, Role of SHG IN Women Entrepreneurship Development. Rural Entrepreneurship- Meaning- Need- Scope- Problems faced by Rural Entrepreneurs- Entrepreneurship development in rural area- Special Schemes for Rural Entrepreneurs.	

Reference books

Entrepreneurship

1. Entrepreneurial Development - S.S. Khanka
2. Entrepreneurial Development - Satish Taneja & Dr.S.L. Gupta
3. Entrepreneurial Development - P.C. Shejwalkar
4. Dynamics of Entrepreneurial Development - Vasant Desai.
5. Fundamental of Entrepreneurship – Dr. A.K. Gavai

The world of business

1. General Commercial Knowledge - P.K. Ghosh & Y.K. Bhushan
2. Modern Business Organization & Management - S.A. Sherlekar

DSC 1A

Entrepreneurship Science

Paper-II

Economics for Manager & Managerial Accounting

Marks-50 **Period-45 L**

	Section – A	
Unit I	**I. Business Economics**	**09**
	Introduction to Economics and Business Economics- Meaning, Nature & Scope- Basic problem of economy.	
	II. Demand and demand analysis	
	Meaning of demand, law of demand, and schedule of demand. Demand analysis- meaning, importance, types of elasticity of demand.	
Unit II	**I. Production Function**	**09**
	Meaning of production function- Factors of production- Long run and Short run production function- Return to scale- economies and diseconomies of scale.	
	II. Market Analysis	
	Meaning and types of market- Perfect competition market and imperfect competition market.	
	Section – B	
Unit III	**Book Keeping and Accountancy**	**09**
	Accounting: Meaning, Definition, Nature & scope of accounting- Branches of accountancy- Basic Accounting terminologies- users of accounting information and their needs- Concepts & Conventions- Double entry system of accounting.	
Unit VI	**Recording of transaction**	**09**
	Origin of transactions- source documents (invoice, cash memo, pay in slip, cheque), preparation of vouchers - cash (debit and credit) and non cash (transfer). Books of original entry: format and recording – Journal, cash book, other day books.	
Unit V	**Final account for sole proprietorship**	**09**
	Preparation of final statements- Trial balance, Need & adjustments, trading and profit & loss account, Balance Sheet.	

Managerial Economics

1. Managerial Economics in a Global Economy - Dominick Salvotole.
2. Introduction to Economics - Samulson & Nordhams
3. Managerial Economics – Mahajan

DSC 2A
Industrial Chemistry
Paper-I
Fundamentals of Inorganic Chemistry

Marks-50 **Period-45L**

Unit I	**Nature of Chemical Bonding** 1. Types of Chemical bonds. Covalent, Ionic, Coordinate, Metallic, Hydrogen, Van der Walls forces. 2. Valence Bond Theory Hybridisation, Need of Hybridisation, Types of Hybridisation. Formation of molecules with sp, sp^2, sp^3 hybrid orbitals such as $BeCl_2$, BF_3, CH_4 3. Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O.	**09**
Unit II	Molecular orbital Theory (a) Atomic and Molecular orbitals. (b) L.C.A.O. Principle (c) Bonding, Antibonding and Nonbonding Molecular orbitals. (d) Conditions for successful overlap (e) Different types of overlap. s-s, s-p_x, p_x - p_x and p_y- p_y or p_z- p_z (f) Energy level sequence of molecular orbitals for n = 1 and n = 2 (g) M. O. Diagrams for - i) Homonuclear diatomic molecule. H_2, Be_2, C_2, N_2 and O_2 ii) Heteronuclear diatomic molecules CO and NO Comment on a) bond order, b)stability and c) magnetic properties for above molecules.	**09**
Unit III	**Ionic Solids** 1. Ionic Bonding (a) Formation of ionic bond, (b) Energetics of ionic bonding : Ionisation potential, Electron affinity and Lattice energy. (c) Characteristics of ionic compounds. (d) Born-Haber Cycle for Alkali metal halide (NaCl). (Numerical Problems are expected) (d) Fajans Rule 2. Radius ratio and crystal structure. (a) Definition : Radious ratio $\left(r^+/r^-\right)$, Coordination number, Stoichiometry and unit cell. (b) Concept and calculation of radious ratio $\left(r^+/r^-\right)$ for ionic solid with octahedral geometry. (c) Radious ratio effect on geometry. (d) Crystal structure of Rock salt(NaCl) and CsCl w.r.t. unit cell, radious ratio, coordination number and stoichiometry.	**09**
Unit IV	**Environmental Pollution : Air Pollution** 1) Terms used in pollution: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD), T.O.C. (Total organic carbon) 2) Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution. 3) Sources of pollution 4) Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards. 5) Air quality standards	**09**

	6) Sampling of Air 7) Acid rain	
Unit V	**Environmental Pollution: Water Pollution** 1) Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account) 2) Treatment of water: A) Potable Water: Parameters of potability of water Step I: Removal of suspended matter : a) Prolonged storage b) Screening c) Sedimentation d) Coagulation e) Filtration Step II: Removal of germs and bacteria- Physical and Chemical method. Physical Methods : a) Boiling b) Exposure to UV or Sunlight c) Distillation. Chemical Method : a) Chlorination b) Fluorination c) Ozonisation d) Aeration e) Use of $KMnO_4$ B) Industrial Water: Mention names of the methods only, Ion exchange method in detail. 3)Analysis of water pollution 4) Monitoring techniques and methodology 5) Hardness, chloride, alkalinity 6) Sulfide, nitrite, iron Mg. 7) Sodium potassium, pesticides, surfactants etc.	**09**
	Reference Books : 1) Advanced Inorganic Chemistry - Cotton and Wilkinson 2) Inorganic Chemistry - J. E. Huheey 3) Concepts and models of Inorganic Chemistry - Douglas & Mc-Daniel 4) Principles of Inorganic Chemistry - Puri, Sharma 5) New Concise Inorganic Chemistry - (ELBS) - J. D. Lee 6) Text book of Inorganic Chemistry - P. L. Soni 7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu 8) Theoretical Principles of Inorganic Chemistry - G. S. Manku 9) Principles of Inorganic Chemistry - Puri, Sharma & Kalia 10) Environmental pollution analysis - S.M. Khopkar 11) Environmental Chemistry - A.K. De 12) Environmental Chemistry - Harry W. Vanloon, Stephin J.Duffy, Oxford University Press 13) Environmental Chemistry - S.S. Dara	

DSC 2A Industrial Chemistry
Paper-II
Fundamentals of Organic Chemistry

Marks-50 **Period-45L**

Unit I	**Chemistry of Hydrocarbon 10** **A) Alkanes** : - 1. Methods of formation with special reference to Wurtz reaction, Kolbe reaction and decarboxylation of carboxylic acid. 2 Mechanism of free radical halogenation of alkanes. 3 Cycloalkanes - Nomenclature methods of formation (a) Internal Wurtz reaction (b) Distillation of calcium or barium salt of dicarboxylic acid. 4 Chemical properties of cyclopropane (i) Free radical substitution of chlorinein presence of light. (ii) Action of HBr and conc. H_2SO_4 iii) Catalytic reduction by H_2/Ni **B)Alkenes:** 1 Nomenclature of alkenes. 2 Methods of formation of alkenes with mechanism i) By dehydration of lower alcohols. ii) By dehydrohalogenation of lower alkyl halides. 3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation,Oxidation with KMnO4, Polymerisation of alkenes - ethylene and propylene **Chemistry of Hydrocarbon** **C) Dienes** :1.Nomenclature and classification of dienes. 2. Isolated, Conjugated and cumulated dienes. 3. Butadiene - Methods of formation, polymerisation, 1 : 2 & 1 : 4 additions and Diels-Alder reaction. **D) Alkynes** : - Nomenclature, Acidity of alkynes. 2. Electrophilic and Nucleophilic addition reactions, Hydroboration, Oxidation, 3. Oxidation and polymerisation.	**09**
Unit II	**Chemistry of Aromatic compounds** 1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds. 2 a) Kekule structure of benzene b) Resonance structures of benzene. c) Molecular orbital picture of benzene. d) Representation of benzene ring. 3. Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's $(4n + 2)\ \pi$ rule. Applications of Huckel's rule to napthalene, anthracene, pyrrole, furan, thiophene and pyridine. 4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration,sulphonation, halogenation and Friedel - Craft's reactionalkylation and acylation.	**09**
Unit III	**Qualitative and Quantitative elemental analysis** 1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur 2 Quantitative analysis of - i) Carbon & hydrogen by Combustion method ii) Nitrogen by Kjeldahl's method iii) Halogen and sulphur by Carius method. 3 Determination of molecular weight of an acid by titration method & Base platinichloride method. 4 Empirical formula and molecular formula determination. (Numerical Problems Expected)	**09**
Unit IV	**Pharmaceuticals**	**09**

	1. Introduction 2. Qualities of ideal drugs 3. Methods of classification of drugs 4. Classification based on therapeutical action	
Unit V	**Synthetic Dyes** 1. Introduction, Chromophore, auxochrome 2.Qualities of good dye 3.Classification based on constitution & methods of applications. 4. Witt's theory, colour & constitution.	**09**
	Reference books: 1) Organic Chemistry : Hendrickson, Cram, Hammond. 2) Organic Chemistry : Morrison & Boyd 3) Organic Chemistry : Volume I & II I.L. Finar 4) Organic Chemistry : Pine 5) Advanced Organic Chemistry : Sachinkumar Ghosh 6) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl 7) A Guide book to Mechanism in organic Chemistry : Peter Sykes 8) Text book of Organic Chemistry : P. L. Sony 9) Practical Organic Chemistry : By A. I. Vogel 10) Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March 11) Organic Chemistry : M.R. Jain 12) Organic Chemistry : J. M. Shaigel	

DSC 3A Industrial Microbiology
Paper-I
Fundamentals of Microbiology

Marks-50 **Period-45L**

Unit I	**History and Development of Microbiology:** Development of microbiology as a discipline, Spontaneous generation vs. biogenesis. Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming Role of microorganisms in fermentation, Germ theory of disease, Development of various microbiological techniques and golden era of microbiology, Development of the field of soil microbiology: Contributions of Martinus W. Beijerinck, Sergei N. Winogradsky, Selman A.Waksman Establishment of fields of medical microbiology and immunology through the work of Paul Ehrlich, Elie Metchnikoff, Edward Jenner.	**09**
Unit II	**Taxonomy:** Systems of classification, Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms. Aim and principles of Bacterial classification, systematics and taxonomy, concept of species, taxa, strain; Differences between eubacteria and Archaebacteria.	**09**
Unit III	**General characteristics of different groups:** Acellular microorganisms (Viruses, Viroids, Prions) and Cellular microorganisms (Bacteria, Algae, Fungi and Protozoa) with emphasis on distribution and occurrence, morphology, mode of reproduction and economic importance. Study of bacterial ultra-structures- Size, shape, arrangement, Cell wall, cell membrane, flagella, Nuclear equivalent, Ribosome, capsule with functions.	**09**
Unit IV	**Microbial growth:** Definitions of growth, Turbidostat, chemostat. Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth, Growth curve. Microbial growth in response to environment introduction only -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic. Microbial growth in response to nutrition and energy – Autotroph/Phototroph, heterotrophy.	**09**
Unit V	**Control of micro-organisms:** Definition of sterilization, disinfectant, antiseptic, germicide, antimicrobial agents. Physical agent of sterilization– Temperature (Dry heat, moist heat, incineration & boiling), Desiccation, Filtration, Radiation Chemical agents of Sterilization – Alcohols, Phenols, Halogens, gaseous agents (ethylene oxide, formaldehyde, Nitrous oxide, Ozone.	**09**
	References: 1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education 2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition 3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited 4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International. 5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers. 6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company. 7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.	

DSC 3A Industrial Microbiology
Paper-II
Basic Techniques in Microbiology

Marks-50 **Period-45L**

Unit I	**Microscopy:** Construction, Working, Principles & Application of- Bright Field Microscopy, Dark Field Microscopy, Phase Contrast Microscopy, Fluorescent Microscopy, Confocal microscopy, Scanning and Transmission Electron Microscopy.	**09**
Unit II	**Nutrition and Culture media:** components of media, natural and synthetic media, chemically defined media, complex media, selective, differential, indicator, enriched and enrichment media. Living media- Eggs, cell lines, animals.	**09**
Unit III	**Cultivation and Isolation Techniques:** Serial dilution, Streak plate, Pour plate, Spread plate. Cell Enumeration Techniques- Direct methods, DMC, Neubauer chamber, Indirect Methods- SPC/TVC, Membrane filter technique. Maintenance and preservation/stocking of pure cultures; cultivation of anaerobic bacteria.	**09**
Unit IV	**Stains and staining procedures:** Difference between dye and stain. Classification of stains – acidic, basic and neutral. Theories, Procedures and mechanisms of – Simple staining, Differential staining, Gram staining, Acid fast staining, Negative staining, special staining- capsule, cell wall, metachromatic granules.	**09**
Unit V	**Microbial Biochemical Tests:** Media composition, mechanism and significance- IMViC test, Catalase test, Starch hydrolysis test, casein hydrolysis test, urea hydrolysis test, sugar utilization test, nitrate reduction test, triple sugar iron agar test, oxidase test, coagulase test etc.	**09**
	References: 1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education 2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition 3. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited 4. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International. 5. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T.Brown Publishers. 6. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company. 7. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.	

DSC 4A
Industrial Biotechnology
Paper-I
Cell Biology

Marks-50 **Period-45L**

Unit I	**Cell**: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.	**09**
Unit II	**Membrane Vacuolar system, cytoskeleton and cell motility**: Structure and function of microtubules, Microfilaments, Intermediate filaments. Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.	**09**
Unit III	**Lysosomes**: Vacuoles and micro bodies: Structure and functions **Ribosomes**: Structures and function including role in protein synthesis. **Mitochondria**: Structure and function, Genomes, biogenesis. **Chloroplasts**: Structure and function, genomes, biogenesis Nucleus: Structure and function, chromosomes and their structure.	**09**
Unit IV	**Extracellular Matrix**: Composition, molecules that mediate cell adhesion, membrane receptors for extra cellular matrix, macromolecules, regulation of receptor expression and function. Signal transduction.	**09**
Unit V	**Cancer**: Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer.	**09**
	References: 1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. 2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition.Lippincott Williams and Wilkins, Philadelphia. 3. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASMPress & Sunderland, Washington, D.C.; Sinauer Associates, MA. 4. 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.	

DSC 4A
Industrial Biotechnology
Paper-II
Animal and Plant Physiology

Marks-50 **Period-45 L**

Unit I	**Digestion and Respiration:** Digestion: Mechanism of digestion & absorption. Composition of bile, Saliva, Pancreatic, gastric and intestinal juice **Respiration**: Exchange of gases, Transport of O_2 and CO2. **Circulation:** Composition of blood, Plasma proteins & their role, blood cells, Haemopoisis, Mechanism of coagulation of blood. Mechanism of working of heart	**09**
Unit II	**Muscle physiology and osmoregulation**: Structure of cardiac, smooth & skeletal muscle, Physical, chemical & electrical events of mechanism of muscle contraction. **Excretion**: modes of excretion, Mechanism of urine formation. **Nervous and endocrine coordination**: Mechanism of generation & propagation of nerve impulse, Neurotransmitters Mechanism of action of hormones (insulin and steroids), **Different endocrine glands**– Hypothalamus, pituitary, pineal, thymus, thyroid, parathyroid and adrenals, hypo & hyper-secretions.	**09**
Unit III	**Plant Anatomy:** The shoot and root apical meristem and its histological organization, simple & complex permanent tissues, primary structure of shoot & root, secondary growth, growth rings, leaf anatomy (dorsi-ventral and isobilateral leaf) **Plant water relations and micro & macro nutrients:** Plant water relations: Importance of water to plant life, diffusion, osmosis, plasmolysis, imbibition, guttation, transpiration, stomata & their mechanism of opening & closing. Micro & macro nutrients: criteria for identification of essentiality of nutrients, roles and deficiency systems of nutrients	**09**
Unit IV	**Carbon and nitrogen metabolism:** Photosynthesis- Photosynthesis pigments, concept of two photo systems, photphosphorylation, calvin cycle, CAM plants, photorespiration, **Nitrogen metabolism**- inorganic & molecular nitrogen fixation, nitrate reduction and ammonium assimilation in plants.	**09**
Unit V	**Growth and development:** Growth and development: Definitions, phases of growth, growth curve, growth hormones (auxins, gibberlins, cytokinins, abscisic acid, ethylene), Physiological role and mode of action, seed dormancy and seed germination, concept of photoperiodism and vernalization.	**09**
	References: 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,Inc. **3.** Dickinson, W.C. 2000 Integrative Plant Anatomy. Harcourt Academic Press, USA. **4.** Esau, K. 1977 Anatomy of Seed Plants. Wiley Publishers. **5.** Fahn, A. 1974 Plant Anatomy. Pergmon Press, USA and UK. **6.** Hopkins, W.G. and Huner, P.A. 2008 Introduction to Plant Physiology. John Wiley and Sons. **7.** Mauseth, J.D. 1988 Plant Anatomy. The Benjammin/Cummings Publisher, USA. **8.** Nelson, D.L., Cox, M.M. 2004 Lehninger Principles of Biochemistry, 4th edition, W.H. Freeman and Company, New York, USA. **9.** Salisbury, F.B. and Ross, C.W. 1991 Plant Physiology, Wadsworth Publishing Co. Ltd. **10.** Taiz, L. and Zeiger, E. 2006 Plant Physiology, 4th edition, Sinauer Associates Inc. MA, USA.	

Semester II

DSC 1B
Entrepreneurship Science
Paper-III
Principles of Marketing & Management accounting

Marks-50 **Period-45L**

Unit I	**Overview of marketing & Marketing environment**	**09**
	Definition of market & types of marketing, Marketing, origin of marketing Nature & scope of marketing. Selling Vs marketing **.**Nature of marketing environment, Need & importance of environment analysis, External uncontrollable forces, Internal forces	
Unit II	**Market segmentation & Marketing research**	**09**
	Market Segmentation: Meaning & criteria for market segmentation, Selecting the market segmentation, Advantages of segmentation, Benefits of market segmentation. **Marketing research:** Importance of marketing research, Scope & limitations of marketing research, Advantages & limitations of marketing research, Marketing research process. **E-marketing:** Introduction, objectives, History and features of E-marketing- Benefits and problems of E-Marketing- E-marketing tools.	
Unit III	**Management Accounting**	**09**
	Meaning- Objective- Nature- Scope- Limitations- Functions of Management Accountant- Responsibility Accounting.	
Unit IV	**Working Capital**	**09**
	Introduction- Meaning- Concepts- Need and importance- Classification- Determinants of working capital- Problems on working capital.	
Unit V	**Financial Statement Analysis**	**09**
	Introduction- Meaning- Types of Financial Statement Analysis. Ratio Analysis- Meaning- Importance- Types of Ratio- Problem on each ratio.	

Marketing Management

1. Marketing Management Analysis, Planning, Implementation
And Control - Philip Kotlar
2. Marketing Management - Philip Kotlar
3. Fundamental Marketing - W.J.Stanton
4. Fundamental Marketing - M.J. Etzes.
5. Fundamental Marketing - B.J. Walker
6. Fundamental Marketing - S.A. Sherlekar

Management Accounting

1. Management Accounting - J. Made Gowda
2. Principles of Management Accounting - S.N. Maheshwari
3. Management Accounting - Guru Prasad Murthy
4. Practical Problems in Management Accounting - RS Kulshreshta,SC Gupta
5. Management Accounting Practical Problem - Dorai Raj S.N.

DSC 1B

Entrepreneurship Science

Paper-IV

Cost accounting and Project management

Marks-50 **Period-45L**

Unit I	**Cost Accounting**	
	Meaning- Objective- Importance- Limitations of Financial Accounting- Cost Accounting and Financial Accounting- Methods of Costing with advantages and disadvantages- Techniques of Costing.	**09**
Unit II	**Cost Concepts and Classifications**	**09**
	Meaning of Cost- Cost Unit- Cost Centre- Classification of Costs- Elements of Cost- Preparation of Cost Sheet- Problems on Cost Sheet.	
Unit III	**Small Scale Industries (SSI^s)**	**09**
	Meaning- Definition- Features- Objectives of SSI^s- Relationship between Small Scale and Large Scale Industries- Importance of SSI^s- Roll of SSI^s in Indian Economy- Problems of SSI^s- MSME Act- Government of India Recent Policies regarding SSI^s.	
Unit IV	**Project Management**	**09**
	Concept of Project and Project Management- Characteristics of Projects- Classification of Project- Importance of Project Management- Project Selection Process- Project Life Cycle- Project Manager- Roles and Responsibilities of Project Manager.	
Unit V	**Developing a Project Plan**	**09**
	Meaning- Significance- Contents of Project Report- Project Appraisal- Methods of Project Appraisal- Tools and Techniques for Project Management.	

Cost Accounting

1. Cost Accounting - Jain & Narang
2. Cost Accounting - Bhar
3. Cost Accounting – Jawahar

Small Scale Industries

1. Small Scale Industries - Vasant Desai
2. Project Management - Nagarajan
3. Project Management: A Development Perspective - B.B. Goel
4. Dynamics of Entrepreneurship Development - Vasant Desai
5. Entrepreneurship - Madhurima Lall
6. Entrepreneurship - Shikha Sahai
7. Entrepreneurship Development - S.S. Khanka Srivastaba S.B.A. Practical Guide to Industrial
8. Entrepreneurship Sultan Chand and Sons, New Delhi.
9. Prasanna Chandra: Project Preparation, Appraisal, Implementation, Tata McGraw Hill, New Delhi. Holt : Entrepreneurship - New Venture Creation : Prentice hall of India

DSC 2B Industrial Chemistry
Paper-III
Fundamentals of Physical Chemistry

Marks-50 **Period-45L**

Unit I	**Dimensions and Units** 1) Atomic weight molecular weight, equivalent weight, mode 2) Composition of liquid mix and gaseous mixture, stoichiometry 3) Calculations of percentage (W/W), (W/V), (V/V) 4) Different methods of determination of concentration 5) Mole of fraction and atomic fraction. (Simple numerical problems are expected)	**09**
Unit II	**Reaction Kinetics** 1. Chemical Kinetics and its scope, Rate of reaction, Definition and units of rate constant. 2. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst. 3. Order and Molecularity of reaction, Zero order reaction and its example :Photochemical union of H_2 and Cl_2	**09**
Unit III	**First order reaction:** 1. Derivation of Rate constant. Characteristics of first order reaction. Examples : i) Decomposition of oxalic acid 2. Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction. Examples : i) Reaction between $K_2S_2O_8$ and KI 3.Pseudounimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid 4.Methods to determine the order of reaction :a) Integration method b) Graphical method c) Half change method, d) Ostwald's isolation method (Numerical Problems Expected) 5. Energy of Activation	**09**
Unit IV	**Study of Gaseous State** 1. a) Ideal and Non ideal gases b) Deviation from ideal behavior. (Only Boyle's law) c) Causes of deviation, van der Waal's equation, explanation of real gas behavior by van der Waal's equation. 2. Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants. 3. Liquification of gases, Joule-Thomson effect. (Numerical Problems expected)	**09**
Unit V	**Properties of Liquid** 1. Introduction, additive & constitutive properties. 2. Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer 3. Surface tension:- Determination of surface tension by Drop –Weight method 4. Parachor:-Macleod equation & its modification by Sugden, applications of parachor in the determination of molecular structures as benzene, quinone, NO2 group & PCl5 (Numerical problems not expected).	**09**
	Reference Books: 1) Mathematical preparation of Physical Chemistry : F. Daniel Mc-Graw Hill Book Com. 2) Elements of Physical Chemistry : S. Glasstone and D.Lewis (D.Van Nostrand Co.Inc) 3) Physical Chemistry : W. J. Moore (Orient Longman) 4) Principles of Physical Chemistry : Maron Prutton 5) University Chemistry : B. H. Mahan (Addision - Weseley Publ. Co.) 6) Chemistry Principle & Applications : P.W. Atkins, M. J. Clugsto, M.J. Fiazer, R. A. Y. Jone (Longman) 7) Physical Chemistry : G. M. Barrow (Tata Mc-Graw Hill) 8) Essentials of Physical Chemistry : B. S. Bahl & G.D. Tuli (S. Chand) 9) Physical Chemistry : A. J. Mee. 10) Physical Chemistry : Daniels - Alberty. 11) Principles of Physical Chemistry : Puri - Sharma (S. Nagin)	

	12) Text Book of Physical Chemistry : Soni Dharmarha 13) University General Chemistry : CNR. Rao (McMillan) 14) Chemistry : Sienko - Plane (Recent Edn,.) 15) Physical Chemistry Through problems :Dogra and Dogra (Wiley Eastern Ltd.,) 16) Physical Chemistry : S. Glasstone. 17) Basic Chemical Thermodynanics : V. V. Rao	

DSC 2B Industrial Chemistry
Paper-IV
Fundamentals of Analytical Chemistry

Marks-50 **Period-45L**

Unit I	**Fuels** 1) Types of fuels, testing of fuels i.e. calorific value, heating value. 2) Octane number, flash point, fire point & applications. 3) Introduction of petroleum 4) Constituents and refining of petroleum i.e. fractionation of crude oil. 5) Natural gas, (C1 to C4) strain run, gasoline (C5 to C12), kerosene. 6) Diesel & Residual oil. 7) Cracking 8) Reforming, hydro forming, isomerisation.	**09**
Unit II	**Industrial Polymer** 1) General idea of polymers 2) Types of polymers, homogeneous & heterogeneous polymers, classification based on a) origin b) composition c) method of vulcanization d) physical properties e) elastomers f) thermoplastic g) thermo settings. 3) Linear, branched & cross linked polymers 4)Addition polymers, polyethylene, polypropylene, pvc, orlon, teflon, polystyrene 5) Condensation polymers, terylene, nylon-66, resin, bakelite & melamine 6) Synthetic elastomers - styrene, butadiene, nitrilerubber, Buna-s, Buna-N, rubbers vulcanization.	**09**
Unit III	**Thermodynamics** 1) Enthalpy, heat capacity 2) Spontaneous process, non spontaneous process 3) Second law of thermodynamics, Carnot theorem (Numerical problems are expected from heat engine, head of reaction cycle)	**09**
Unit IV	**Thermochemistry** 1) Heat of mixing Hess' Law, Heat of decomposition. 2) Carnot's cycle & its efficiency, Kirchhoff's equation, Joule Thompson effect. (Simple numerical problems are expected)	**09**
Unit V	**Chemistry in day to day life** 1 Types of water, desalination, Fresh water, Dissolved Oxygen and water quality. 2 Milk : Definition, Chemical composition of milk of different species such as cow, buffalo and goat. **Adulteration in milk** like Sugar, Urea, Starch. 4 Essential nutrients for plants, Classification, Major, minor & trace their sources and forms. 5 Importance of Inorganic Compounds as Medicine- Antacid products Na_2CO_3, $Al(OH)_3$, $AlPO_4$, $Mg(OH)_2$, Cis –platin	**09**
	Reference Books 1) Chemistry - Central Science, Brown, Lemay, Bursten 8th Edition. 2) Outline of Dairy Technology - Sukumar De Oxford university Press. 3) Introduction to Agronomy & soil water management - V. G. Vaidya, N.R. Sahastrabudhye. 4) Principles of Soil Science - M. M. Raj, Millian Co. of India, Bombay 1977 5) Inorganic Medicinal & Pharmaceutical Chemistry- Block, Roche, Soine – Wilson, Varghese Publishing House. 6. Industrial Chemistry - B.K. Sharma 7. Engineering Chemistry - Paradkar 8. Physical Chemistry - G.M. Barrow, International Student Edition, 9. Polymer Chemistry - Govarikar 10. Polymer Chemistry - Bill Meyer 11. Text Book of Physical Chemistry - Puri & Sharma 12. Thermodynamics for Chemist - S.Glasstone 13. Thermodynamics - Rastogi & Mishra	

DSC 3B
Industrial Microbiology
Paper-III
Fundamentals of Industrial Microbiology

Marks-50 **Period-45L**

Unit I	**Introduction to fermentation:** Brief history and developments in industrial microbiology, Types of fermentation processes - solid state, liquid state, batch, fed-batch and continuous. Types of fermenter – laboratory, pilot-scale and production-scale, Components of fermenter and typical continuously stirred tank bioreactor. Factors involved in fermenter design Types, Design, Construction, Working & Application of fermenter, Factors affecting on fermentation process.	**09**
Unit II	**Industrial Strains and Fermentation Medium:** Primary and secondary screening, Assay- Metabolic response, Enzymatic and turbidometric, Media Formulation- - Principles, Raw Materials Used, Criteria for Selection of Raw Materials, Media Ingredients: Water, Carbon source, Nitrogen source, Minerals, Vitamins, and Growth Factors, Precursors, Inhibitors, Inducers, Cell Permiability modifiers, and Antifoam Agents. Ingredients- molasses, corn steep liquor, sulfite waste liquor, whey & Yeast extract.	**09**
Unit III	**Sterilization:** Need for Asepsis, Protected Fermentation, Medium sterilization-Use of High Pressure Steam: D value and its significance, factors affecting D Value, Batch and Continuous sterilization- Use of Filtration: Mechanism of Filtration, Types of Filters- Fixed pore and non fixed pore Filters, Sterilization of Fermenter, feed, Liquid waste, air and Exhaust air.	**09**
Unit IV	**Inoculum Development:** General Principles, Development of Inoculum For- Yeast Processes, bacterial Processes and Mycelial Processes. Preservation and maintenance of industrial strains. Scale up of fermentation process.	**09**
Unit V	**Strain improvement:** Strain improvement for the selected organism: mutation and screening of improved cultures, random and strategic screening methods, strategies of strain improvement for primary, secondary metabolites, Use of recombinant DNA technology, protoplast fusion techniques for strain improvement, Production of recombinant molecules in heterologus system, Studies of auxotrophs, strain improvement by UV/Chemicals method, Selection of improved Strain.	**09**
	References: 1. Brock, Biology of microorgasnisms 2. Text book of microbiology by C.H. Pelzar. 3. Text book of Microbiology By T.Bapat Phadake Publication. 4. Text book of Industrial Microbiology By L.E. Casida. 5. Principles of Fermentaion Technology by Whithakar. 6. Bergey's Manual of systematic bacteriology Vol-IV 7. Text book of Industrial microbiology By A.H. Patel	

DSC 3B

Industrial Microbiology

Paper-IV Basic techniques in Industrial Microbiology

Marks-50 **Period-45L**

Unit I	**Computerized Fermenter Control and Monitoring:** Aseptic Operation and Containment, achievement and Maintenance of Asepsis, Control of Process parameters: Temp., Ph, Dissolved oxygen, Pressure and Foam	**09**
Unit II	**Down Strem Processing:** Cell Harvesting, Broth conditioning, Foam separation, Sedimentation, Filtration, Centrifugation, Cell Disruption: Mechanical methods and Non Mechanical Methods, Product Concentration: Liquid-Liquid extraction, Precipitation, Solubilization, Product recovery: Chromatography, Membrane Processes: Ultra filtration, Reverse Osmosis- Liquid Membranes, Finishing stages- Crystallization and Drying.	**09**
Unit III	**Product Quality and Safety:** Introduction, Quality assurance, Principles of Bioassay, Sterility testing, Pyrogen testing by LAL test, Manufacturing and Environment safety, Containment, Clean room environment.	**09**
Unit IV	**Effluent Treatment:** dissolved oxygen concentration, strengths of fermentation effluents, treatment and disposal of effluents, by-products, Water usage and recycling and effluent treatment methodologies.	**09**
Unit V	**Fermentation economics:** A case study, market potential for product and fermentation, product recovery cost, Entrepreneurship, plan for industry, product selection process, site selection, finance, feasibility, excise and legal aspects.	**09**
	References: 1. Brock, Biology of microorgasnisms 2. Text book of microbiology by C.H. Pelzar. 3. Text book of Microbiology By T.Bapat Phadake Publication. 4. Text book of Industrial Microbiology By L.E. Casida. 5. Principles of Fermentaion Technology by Whithakar. 6. Bergey's Manual of systematic bacteriology Vol-IV 7. Text book of Industrial microbiology By A.H. Patel	

DSC 4B
Industrial Biotechnology
Paper-III
Basic Biomolecules

Marks-50 **Period-45L**

Unit I	**Amino acids & Proteins:** Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.	**09**
Unit II	**Carbohydrates:** Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.	**09**
Unit III	**Lipids:** Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.	**09**
Unit IV	**Nucleic acids:** Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.	**09**
Unit V	**Enzymes:** Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites. **Vitamins**: Structure and active forms of water soluble and fat soluble vitamins, deficiency diseases and symptoms.	**09**
	References: 1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co. 2. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants.American Society of Plant Biologists. 3. Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4th Edition, WH Freeman and Company, New York, USA. 4. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons. 5. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.	

DSC 4B
Industrial Biotechnology
Paper-IV
Basic Metabolism

Marks-50 **Period-45L**

Unit I	**Concept of Metabolism**: Principles of bioenergetics-Standard free energy change, metabolic roles of ATP-Phosphoryl group transfer, nuleotidyl group transfer. Experimental approaches to study of metabolism; Primary and secondary metabolism. Energetics.	**09**
Unit II	**Carbohydrates metabolism:** Glycolysis, alcoholic and lactic acid fermentation, Pasteur Effect, gluconeogenesis, Coricycle, glucose-alanine cycle, futile cycle. TCA cycle, HMP shunt, glycogenolysis & glycogen synthesis.	**09**
Unit III	**Lipid metabolism**: Mobilization of triglycerides, metabolism of glycerol, β-oxidation of saturated, monounsaturated and poly-unsaturated fatty acids, even and odd chain fatty acids. Ketogenesis and significance.	**09**
Unit IV	**Amino Acid:** Biodegradation of amino acids – deamination, transamination, decarboxylation, urea cycle including its regulation. Biosynthesis of amino acids, Disorders of amino acid metabolism (phenylketonuria, alkaptonuria, Biologically active amines.	**09**
Unit V	**Nucleic Acid Metabolism:** Recycling of Purine and Pyrimidine nucleotides by salvage pathways. Lesch-Nyhan syndrome & Gout.	**09**
	References: **1.** Voet & Voet, 2000 Biochemistry, John Wiley, New York **2.** Zubay, 1995, Biochemistry, Brown Publishers. **3.** Lehninger, 2000, Principles of Biochemistry, CBBS Publishers. **4.** I.Stryer, 2002. Biochemistry, W.H.Freeman	

Practical Annual

DSC 1 A & 1B
Laboratory Course I
(Entrepreneurship Science)

(100 marks)

1.	To Collect information of any five entrepreneurs.
2.	To Collect newspaper cutting related to business.
3.	To study recent government policies regarding development of entrepreneurship.
4.	To study any two rural businesses.
5.	To study the procedure to obtain financial resources from various institutions under DIC Scheme.
6.	To study on successful women entrepreneurs.
7.	Exercise on market survey.
8.	Exercise on market segmentation.
9.	To study E-marketing strategies of any two organisation.
10.	Exercise on ratio analysis of any organization.
11.	Exercise on journal entries.
12.	Exercise on ledger accounts.
13.	To collect source documents required for accounting.
14.	Exercise on final account.
15.	Exercise of cost sheets.
16.	Exercise of job cost sheets.
17.	To study problems of small scale industry.
18.	To prepare project report on market analysis.
19.	To prepare project report on technical analysis.
20.	To prepare project report on financial analysis.

Industrial visits:
1 (one) visits in first term,
1 (one) visits in second term
Visit to Institutions:
1 (one) visit in semester-I
1 (one) visit in Semester-II

During visit following observations must be done.
1. To see plant or factory, Interaction with concerned officers, supervisor and workers.
2. Questioners should be supplied to students about manufacturing process, accounting section, administration section or any other department

DSC 2 A & 2B

Laboratory Course II
(Industrial Chemistry) 100 M

1. Calibration of burette, pipette and beryl pipette
2. Preparation of 100 ml of 0.1 N $KMnO_4$ and its standardization.
3. Preparation of 0.1 N HCl by density calculation & its standardization.
4. Study of flash point & fire point of given solvent fuel.
5. Viscosity measurement using Oswald's Viscometer.
6. To determine the strength of aniline in the given solution in g/dm^3
7. Study of soaping point.
8. Preparation of *m*-dinitrobenzene
9. Preparation of nitro derivative of salicylic acid.
10. Separation of amino acids by thin layer chromatography
11. Determination of hardness of water.
12. Determination of D.O.
13. Determination of acidity, alkalinity of water
14. Determination of saponification value of oil
15. Determination of acid value in bleaching powder
16. Determination of available chlorine in bleaching powder
17. Determination of chloride in water by Mohr's method.
18. Determination of heat solution of $CuSO_4$
19. Estimation of iron from the cement (Volumetrically)
20. Separation of metal ions (Cu^{+2}, Co^{+2}, Ni^{+2}) by paper chromatography.
21. Kinetics of 1^{st} and 2^{nd} Order reaction.
22. Density of given liquid by Pyknometer.

Reference Books:

1) Practical book of Physical Chemistry : Nadkarni, Kothari & Lawande.
2) Experimental Physical Chemistry : A. Findlay.
3) Systematic Experimental Physical Chemistry : S.W. Rajbhoj, Chondhekar (Anjali Pub.)
4) Experiments in Physical Chemistry : R.C.Das and B. Behra. (Tata Mc. GrawHill)
5) Advanced Practical Physical Chemistry : J. B. Yadav (Goel Publishing House)
6) Practical Physical Chemistry : B. D. Khosala (R. Chand & Sons.)
7) Experiments in Chemistry : D. V. Jahagirdar
8) Vogel's Text Book of Quantitative Chemical Analysis, (Longman) ELBS. Edition
9) Vogel's Text Book of Qualitative Chemical Analysis, (Longman) ELBS. Edition
10) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
11) Comprehensive Practical Organic Chemistry preperation and Quantitative Analysis. V.K. Ahluwalia, Renu Agarwal, University Press. Distributor - Orient Longman Ltd.,
12) A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni, Dastane Ramchandra and Co. Pune

DSC 3A & 3B

Laboratory Course III
(Industrial Microbiology) 100 M

1. Study of Compound Microscope
2. Demonstration of Laboratory Equipments: Incubator, Autoclave, Hot Air Oven, Centrifuge, Laminar Air flow, Colony counter.
3. Monochrome staining
4. Negative staining
5. Gram staining
6. Hanging drop technique
7. Cell wall staining
8. Metachromatic granule staining
9. Mounting & Identification of Fungi
10. Isolation of *E. coli* on differential media
11. IMViC test
12. Casein hydrolysis test
13. Starch hydrolysis test
14. Catalase test
15. Urea hydrolysis test
16. Sugar utilization test
17. Nitrate reduction test
18. Triple sugar iron agar test
19. Isolation of bacteria using Streak plate technique
20. Isolation of bacteria using Spread plate technique
21. Enumeration of microorganisms from Soil by SPC (Pour Plate technique)
22. Antibiotic producer screening from soil
23. Penicillin disk diffusion assay
24. Penicillin end point determination assay (MIC)
25. Growth curve

DSC 4A & 4B
Laboratory Course IV
(Industrial Biotechnology) 100 M

1. Finding the coagulation time of blood
2. Determination of blood groups
3. Counting of mammalian RBCs
4. Determination of TLC and DLC
5. Determination of Haemoglobin
6. Qualitative tests for Carbohydrates, lipids and proteins
7. Preparation of stained mounts of anatomy of monocot and dicot's root, stem & leaf.
8. Demonstration of plasmolysis by *Tradescantia* leaf peel.
9. Demonstration of opening & closing of stomata
10. Demonstration of guttation on leaf tips of grass and garden nasturtium.
11. Separation of photosynthetic pigments by paper chromatography.
12. Demonstration of aerobic respiration.
13. Preparation of root nodules from a leguminous plant.
14. Separation of Amino acids by paper chromatography
15. To study the effect of pH on the activity of salivary amylase enzyme.
16. To study the effect of temperature on the activity of salivary amylase enzyme.
17. To study the effect of inhibitor (Inorganic phosphate) on the activity of salivary amylase enzyme.
18. Estimation of blood glucose by glucose oxidase method.
19. Principles of Colorimetry**:** Verification of Beer's law
20. Estimation of protein to study relation between absorbance and % transmission.
21. Preparation of buffers.