Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022

'B++'Grade (CGPA2.96)

Name of the Faculty: Science &Technology

Syllabus as per NEP 2020

B.Sc. in Geoinformatics (Hons.)

B.Sc. I (Sem. I and II)

(Syllabus to be implemented from June 2025)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty: Science & Technology
Choice Based Credit System (CBCS) (w.e.f. June 2024)

~ About National Education Policy (NEP) – 2020 ~

With the directions and guidelines issued by **Government of Maharashtra resolution dated 20th April 2023 and 16th May, 2023** regarding the implementation of NEP at UG and PG level, the Punyashlok Ahilyadevi Holkar Solapur University, Solapur has taken decision to implement NEP 2020 with Choice Based Credit System (CBCS) at Undergraduate level and Post Graduate level. This has been done to achieve the goals and objectives set in NEP-2020 such as- worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate and post-graduate degree.

The CBCS provides an opportunity for the students to select from the prescribed courses comprising core, elective/minor or skill based. 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 performance of candidates. In order to bring uniformity in evaluation and computation of Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

Outline of NEP:

The structure of the Three/Four-year bachelor's degree programme allows the opportunity to the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning in different institutions. The structure allows students to learn various components like:

(a) Major (Core) Subject (DSC): This comprises of Mandatory & Elective Courses for students to achieve:

- Minimum 50% of total credits corresponding to Three/Four - year UG Degree- Mandatory Courses are offered in all four years;
- 2 credit courses on Major Specific IKS shall be included under Major;
- Elective courses of Major will be offered in the third and/or final year;
- Vocational Skill Courses, Internship/Apprenticeship, Field Projects, Research Projects related to Major

(b) Minor Subject (18-20 Credits)

- The Minor subjects may be from the different disciplines of the same faculty of DSC Major (Core) or they can be from different faculty altogether;
- The credits of Minor subjects shall be completed in the first three years of UG Programme

(c) Generic/ Open Elective Courses (OE) (10-12 credits)

- GE/OE are to be offered in I and/or II year;
- Faculty-wise baskets of OE shall be prepared.
- OE/GE is to be chosen compulsorily from faculty other than that of the Major or as per the directions issued by NEP-Steering Committee

(d) Vocational and Skill Enhancement Courses (VSEC)

i) Vocational Skill Courses (VSC): (8-10 credits): Includes Hands on Training corresponding to the Major and/or Minor Subjects:

- To be offered in first three years;
- Wherever applicable vocational courses include skills based on advanced laboratory Major practical's

ii) Skill Enhancement Courses (SEC): (06 credits)

- To be offered in I and II year;
- To be selected from the basket of Skill Courses approved

(e) Ability Enhancement Courses (AEC), Indian Knowledge System (IKS) and Value Education Courses (VEC): (14 Credits) **i) AEC:** (08 credits)

- To be offered in I and II year
- English: 04 Credits and Modern Indian Language: 04 credits
- To be offered from the Basket approved. The focus for both languages should be on linguistic and communication skills.

ii) IKS: (2 Credits)

- To be offered in I Year
- Courses on IKS to be selected from the basket of IKS courses approved

iii) VEC: 04 Credits • To be offered in I year

- Value Education Courses (VEC) such as Understanding India, Environmental Science/Education, and Digital and Technological Solutions.

(f) Field Projects/ Internship/ Apprenticeship/ Community Engagement and Service corresponding to the Major (Core) Subject, Co-curricular Courses (CC) and Research Project

•Internship/Apprenticeship corresponding to the Major (Core) Subject: (8 Credits)

- Field Projects/Community Engagement and Service (CEP) corresponding to the Major (Core) Subject (minimum 4-6 credits)
  -To be offered in II and III years of UG Degree Programmes.
- Co-curricular Courses (CC 8-credits) such as Health and Wellness, Yoga education, sports and fitness, Cultural Activities, NSS/NCC and Fine/ Applied/Visual/ Performing Arts: offered in I and/or II year
- Research Projects: (12 credits)
  -To be offered in the final year for 4-year Honor's with Research UG Degree
- **CREDIT:**
- Credit is a numerical value that indicates students work load (Contact Hours, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. 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.
- **Theory: '**15 contact hours' for theory course constitute 'one credit'
- **Practical/Tutorial: '**30 contact hours' for practical course constitute 'one credit'.
- **Workshop based activities/Skill based activities:** Minimum 30 contact hours per credit in a semester is required
- **Internship/On-Job Training: '**30 contact hours' per credit in a semester is required (1 credit/week)
- **Community Engagement and Service-CEP/Field Project:** 30 contact hours per credit in a semester is required
- **Credit Framework under Three/Four Years UG Programme with Multiple Entry and Multiple Exit Options:**

The minimum and maximum credit structure for different levels under three- or four-year UG Programme with multiple entry and multiple exit options are as given below:

Levels	Code	Qualification Titles	Credit Requirements		Semester	Year
			Minimum	Maximum		
4.5	100-199	UG Certificate	40	44	2	1
5.0	200-299	UG Diploma	80	88	4	2
5.5	300-399	Three Year Bachelor's Degree	120	132	6	3
6.0	400-499	Bachelor's Degree Honours OR Bachelor's Degree-Honours with Research	160	176	8	4
	500-599	First Year PG & or PG Diploma	40	44	2	1
6.5	600-699	PG Degree	80	88	4	2
8.0	700-799	Ph.D.	16+ Ph.D. Work		---	---

2. CHOICE BASED CREDIT SYSTEM (CBCS):

Each course carries a defined number of credits. The credits are based on the course structure, including the teaching mode and the number of contact hours for lecture, tutorial, and practical classes. One hour of theory/tutorial teaching per week equals one credit, and two hours of laboratory/demonstration

classes per week equals one credit. Credits are considered based on the number of contact hours, course content, teaching methodology, allotted maximum marks.

While calculating the grading, one credit is equal to 25 marks in a semester. Thus, 4 credit courses will receive 100 marks, 2 credit courses will receive 50 marks, and a single credit course will receive 25 marks. The proportion of marks earned in a course and the credits given to that course will be used to calculate the Semester Grade Point Average (SGPA) or Cumulative Grade Point Average (CGPA).

General Education credit refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching [lecture or tutorial] or two hours of practical work/field work per week. Accordingly, one Credit would mean equivalent to 15 hrs' of theory or 30 hrs' of workshop/ lab/Internship/OJT/FP/CEP/CC work per semester. For ease of calculation, break-up of credits with respect to general education component is as in table below:

Table 1: Break-Up of Credits and contact hours per credit is as follows

Sr. No.	One Credit	Number of Contact Hours
1	Theory	15 Contact Hours
2	Practical	30 Contact Hours
3	Experiential learning including relevant experience and professional levels acquired	30 Contact Hours

3. DEFINITIONS OF KEYWORDS:

a) **Academic Year**: Two consecutive (one odd + one even) semesters constitute one academic year.

b) **Choice Based Credit System (CBCS):** The CBCS will provides options for students to select courses from the prescribed courses (core, open elective, discipline elective, ability and skill enhancement language, soft skill courses and so on).

c) **Course**: Usually referred to as 'papers' is a component of a programme. All courses need not carry the same weight. The courses will define learning objectives and learning outcomes. A course will be designed to comprise Contact Hours / tutorials / laboratory work / field work / project work / vocational training / viva / seminars / term papers / assignments/ presentations / self-study or a combination of some of these.

d) **Credit-Based Semester System (CBSS)**: Under the CBSS, the requirement for awarding a degree /diploma /certificate is prescribed in terms of the number of credits to be earned.

e) **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week in a semester. One credit is equivalent to one hour of lecture or tutorial or two hours of practical work/field work per week in a semester. It will generally be equal to 15 hours of instructions.

f) **Grade Point**: It is a numerical weight allotted to each letter grade on a 10-point scale.

g) **Credit Point**: It is the product of grade points and the number of credits for a course.

h) **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, D and F.

i) **Programme**: A programme leading to the award of a degree, diploma, or Certificate.

j) **Semester**: Each semester will consist of over 15 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be generally scheduled from June to November and even semester from January to May.

k) **Semester Grade Point Average (SGPA)**: It is a measure of performance of work done in a semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the full course credits taken during that semester. It shall be expressed up to two decimal places.

l) **Cumulative Grade Point Average (CGPA)**: It measures the overall cumulative performance of a student over all the semesters of a programme. The CGPA is the ratio of total credit points secured by a student in various courses in all the semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

m) **Transcript or Grade Card or Certificate:** Based on the grades earned, a graded certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science and Technology
NEP Choice Based Credit System (CBCS) (W.e.f. June 2024)
Title of the Programe: B.Sc. Part-I
Subject: Geoinformatics

Preamble:

The **B.Sc. Geoinformatics** program aims to equip students with comprehensive knowledge and technical skills in spatial data collection, processing, analysis, and application using modern geospatial technologies such as Remote Sensing (RS), Geographic Information Systems (GIS), Global Navigation Satellite Systems (GNSS), and Digital Cartography.

With the growing demand for spatial solutions in sectors like urban planning, agriculture, disaster management, water resource management, environment monitoring, and infrastructure development, this program is designed to bridge the knowledge gap and prepare students for both professional roles and advanced studies.

It integrates **theoretical foundations**, **technical applications**, and **hands-on training** using industry-standard tools, fostering spatial thinking and problem-solving capabilities. The course will also emphasize **interdisciplinary applications** and **project-based learning**, in alignment with national development goals and sustainability principles.

Moreover, the study of Geoinformatics equips students with applied knowledge drawn from disciplines such as Geography, geology, climatology, physics, statistics, computer sciences, Agriculture and life sciences . This interdisciplinary approach fosters a multifaceted understanding of environmental issues and solutions.

The syllabus for Geoinformatics is meticulously designed to ensure the holistic development of students' personalities. It provides avenues for exposure to Discipline-Specific Courses, Generic Elective Courses, Value Enhancement Courses, and Skill Enhancement Courses. Through hands-on practical sessions and innovative instructional methods, students acquire specialized skills that are pertinent to their academic and professional pursuits, thus preparing them to tackle real-world challenges effectively.

Course outcomes:

After completing the course, the student will be able to

- **Foundational Knowledge**: Demonstrate an understanding of fundamental principles of remote sensing, GIS, GPS/GNSS, cartography, and spatial data management.
- **Technical Skills**: Acquire practical skills in using software and tools such as QGIS, ArcGIS, ERDAS Imagine, ENVI, and GPS equipment.
- **Spatial Problem Solving**: Apply geospatial technologies to analyze and solve real-world problems across various domains such as environment, urban planning, agriculture, and disaster management.
- **Data Interpretation**: Interpret satellite images and spatial data for accurate decision-making and planning.
- **Communication & Reporting**: Communicate spatial information effectively using maps, reports, and presentations for diverse audiences.
- **Ethics & Sustainability**: Understand the ethical implications of geospatial data usage and promote sustainable development through responsible geoinformatics practices.
- **Teamwork & Leadership**: Function effectively as a member or leader in multidisciplinary teams to achieve project goals.
- L**ifelong Learning**: Develop a foundation for pursuing higher education, competitive exams, or certifications in geospatial sciences..

- **Interdisciplinary Approach:** The interdisciplinary nature of Geospatial technology education will enable graduates to integrate knowledge from various fields, such as zoology, botany, geology, geography, and sociology, to address complex geographic issues comprehensively.
- **Research and Innovation:** Students will have the opportunity to engage in research projects, exploring cutting-edge topics in earth science and contributing to the advancement of knowledge in the field.
- **Career Opportunities:** Completion of a B. Sc in Geoinformatics opens up a wide range of career opportunities in sectors such as GIS consulting, resource management, conservation organizations, government agencies, non-profit organizations, academia, and private industry.
- **Global Citizenship:** Graduates will emerge as environmentally conscious global citizens, equipped with the skills, knowledge, and values necessary to contribute positively to environmental sustainability and address pressing environmental challenges facing society.

Eligibility and Admission: A Candidate passing 10+2 passed from state syllabus / CBSE /equivalent with minimum passing percentage of as per the directives of the higher education and PAH Solapur University, Solapur.

Duration: The duration for this program is of 3 years with semester pattern (06 Semesters) and 4 Years with 08 semesters as B. Sc (Hons.)

Medium of Instruction: English

Program Structure:

The University follows semester system. An academic year shall consist of two semesters

B.Sc. Part-I Geoinformatics shall consist of two semesters: Semester I and Semester II.

For B.Sc. Part-I Geoinformatics Sem I & II, the internal assessment will be based on Internal tests, home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as given below.

Scheme of Evaluation

As per the norms of the grading system of evaluation, out of 50 marks, the candidate has to appear for continuous/ internal assessment of 20 marks and external evaluation (University assessment) of 30 marks.

P.A.H. Solapur University, Solapur Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in AC Meeting on -------

4-Year Multidisciplinary UG Program with DSC as a Major

(4-Year Bachelor of Science (Honors)/ (Honors with Research)

B.Sc.- I (Geoinformatics)

Level	Sem.	Faculty / Major / DSC	VSC/ SEC	GE/OE	AEC, IKS, VEC	CC	Total Credits	Cumulative Credits
4.5	I	DSC 1-1 (2+2) DSC 2-1(2+2) DSC 3-1(2+2)	SEC 1 (2)	GE /OE1-(2)	IKS (2) L1-1(2) VEC 1(2) (Constitution of India)	-	22	44
	II	DSC 1-2 (2+2) DSC 2-2(2+2) DSC 3-2(2+2)	SEC 2(2)	GE /OE2-(2)	L1-2 (2) VEC 2(2) (Environmental Studies)	CC 1 (2)	22	

SEM –I

S. No.	Course Type	Course Code	Paper Title	Credit
1.	DSC	DSC 1-1	**Introduction to Geoinformatics**	2
2.	Practical based on DSC1-1	Practical Lab -I	**Practical Lab – I**	2
3.	DSC	DSC 2-1	Other than Geoinformatics	2+2
4.	DSC	DSC 3-1	Other than Geoinformatics	2+2
5.	SEC	SEC 1	Mapping of Earth's System and Environmental Process	2
6.	GE /OE1	GE /OE1	Earth and Earth Surface Processes	2
7.	IKS	IKS	Indian Knowledge System	2
8.	AEC	L1-1	English	2
9.	VEC	VEC 1	Constitution of India	2
			Total	**22**

SEM II

10.	DSC	DSC 1-2	**Fundamental of Cartography**	2
11.	Practical based on DSC 1-2	Practical Lab - II	**Practical Lab - II**	2
12.	DSC	DSC 2-2	Other than Geoinformatics	2+2
13.	DSC	DSC 3-2	Other than Geoinformatics	2+2
14.	GE /OE2	GE /OE 2	Divisions of the Environment	2
15.	SEC	SEC 2	Environment and Society	2
16.	AEC	L1-2	English	2
17.	VEC	VEC 2	Environmental Studies	2
18.	CC1	CC1	Community Engagement & Services	2
			Total	**22**

Abbreviations

OE: Generic/ Open Electives Skill Enhancement Courses
VSC: Vocational Skill Courses
SEC: Skill Enhancement Courses
AEC: Ability Enhancement Courses
VSEC: Vocational Skill and
OJT: On Job Training
FP: Field projects
CC: Co-curricular Courses
RP: Research Project
IKS: Indian Knowledge System

P.A.H. SOLAPUR UNIVERSITY, SOLAPUR B.Sc. I: Geoinformatics (As per NEP2020)						
Semester– I						
Coarse Type	Coarse Code	Title of Paper	Distribution of Marks			Total Credits
			IA	UA	Total	
Minor	DSC1-1	Introduction to Geoinformatics	20	30	50	2
Minor Practical	PRDSC1-1	Practical based on DSC1-1	20	30	50	2
Major	DSC2-1	To be selected from Basket (Other than Environmental Science)	20	30	50	2
Major Practical	PRDSC2-1	Practical based on DSC2-1	20	30	50	2
Major	DSC3-1	To be selected from Basket (Other than Environmental Science)	20	30	50	2
Major Practical	PRDSC3-1	Practical based on DSC3-1	20	30	50	2
GE/OE	GE-1/OE-1	Earth and Earth Surface Processes	20	30	50	2
SEC	PRSEC 1	Mapping of Earth's System and Environmental Process	20	30	50	2
IKS	IKS **Generic**	General Indian knowledge system	20	30	50	2
AEC	L1-1	English	20	30	50	2
VEC	VEC1	Indian Constitution and Democracy	20	30	50	2
Total Marks +Credit for Semester–I			**220**	**330**	**550**	**22**
Semester-II						
Minor	DSC1-2	Fundamental of Cartography	20	30	50	2
Minor Practical	PRDSC1-2	Practical based on DSC1-2	20	30	50	2
Major	DSC2-2	To be selected from Basket (Other than Environmental Science)	20	30	50	2
Major Practical	PRDSC2-2	Practical based on DSC2-2	20	30	50	2
Major	DSC3-2	To be selected from Basket (Other than Environmental Science)	20	30	50	2
Major Practical	PRDSC3-2	Practical based on DSC3-2	20	30	50	2
GE/OE	GE-2/OE-2	Divisions of the Environment	20	30	50	2
SEC	PRSEC-2	Environment and Society	20	30	50	2
CC	CC1	Co-curricular Courses	20	30	50	2
AEC	L1-2	English	20	30	50	2
VEC	VEC2	Environmental Studies	20	30	50	2
Total Marks +Credit for Semester-II			**220**	**330**	**550**	**22**
Total Marks + Credit for Semester-I			220	330	550	22
Total Marks + Credit for Semester-II			220	330	550	22
Total Marks and Credit			**440**	**660**	**1100**	**44**

Abbreviations:

GE/OE: Generic/ Open Electives	**FP:** Field projects
VSEC: Vocational Skill and Skill Enhancement Courses	**CC:** Co-curricular Courses
SEC: Skill Enhancement Courses	**RP:** Research Project
AEC: Ability Enhancement Courses	**IKS:** Indian Knowledge System

SEM -I

DSC 1- 1(Theory)

Title of the Paper –INTRODUCTION TO GEOINFORMATICS

Credits: 02 Total Marks: 50 Contact Hrs: 30

Course Objectives

1. Introduce students to the fundamental concepts of Geography and its application in everyday life.
2. Familiarize students with Geographic Information Systems (GIS), its components, evolution, and practical applications.
3. Develop an understanding of spatial problems and the role of GIS in addressing them.
4. Equip students with knowledge of cartography as a foundational element in spatial science and GIS.

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Explain the significance of geography and spatial thinking in real-world contexts.
2. Define GIS and describe its key components, workflows, and evolution.
3. Identify and analyze spatial problems using GIS functionalities and tools.
4. Understand the integration of cartography with GIS for effective spatial data representation.

Unit No.	Title of topic and contents	Contact Hours
I	Geography - Geography in Everyday Life, Geography as Spatial Science, Spatial Problems and Geography, Geography, Cartography and GIS	15
II	GIS- Definition of GIS, Components of GIS, Procedure and Workflows Evolution of GIS, Functionalities and Capabilities of GIS	15

References

1. Tomlinson, R. F. (2003). Thinking About GIS: Geographic Information System Planning for Managers. ESRI Press.
2. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015).Geographic Information Science and Systems. John Wiley & Sons.
3. CP Lo Lo, C.P. and K.W. Yeung (2009). Concepts and Techniques of Geographic Information Systems. India: PHI Learning Private Ltd.
4. Burrough P.A . (1986). Principles of Geographic Information Systems for Land Resource Assessment. New York: Oxford University Press.
5. Bolstad, P. (2019). GIS Fundamentals, A First Text on Geographic Information Systems. Sixth Edition, Michigan: XanEdu Publishing Inc.

6. Environmental Systems Research Institute (ESRI). Website: https://www.esri.com
7. UN Food and Agriculture Organization (FAO). https://www.fao.org
8. National Aeronautics and Space Administration (NASA). https://earthdata.nasa.gov
9. Goodchild, M. F. (1992). "Geographical information science." International Journal of Geographical Information Systems, 6(1), 31-45.
10. Government of India (Department of Space & NRSC). https://bhuvan.nrsc.gov.in 11. World Health Organization (WHO). https://www.who.in

DSC 1 - 1(Practical-I)
Title –Introduction to Geoinformatics
Credits: 02 Total Marks: 50 Practical: 60 Contact Hrs

course objective:

1. Introduce students to the practical aspects of Geoinformatics through hands-on experience.
2. Familiarize students with open-source GIS software such as QGIS, Surfer, Diva-GIS, SAGA, and GRASS.
3. Develop skills to explore and operate GIS software interfaces and tools.
4. Teach spatial data handling and management techniques.
5. Provide practical exposure to geomorphic modelling and natural resource mapping in India.

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

1. Recognize and describe geomorphic models related to rivers and oceans.
2. Analyze and interpret the distribution of natural resources using spatial data.
3. Operate various open-source GIS software and their user interfaces.
4. Perform basic GIS functions including spatial data visualization and management.
5. Apply geoinformatics tools to solve real-world geographic problems using digital methods.

Practical titles / content	Contact Hours
1. Study of geomorphic models of River, Ocean 2. Distribution of Natural resources in India 3. Introduction to open sources software Q-GIS, Surfer, Diva-GIS, SAGA and GRASS 4. Exploration of user interface and basic tools of GIS software, 5. Spatial data management using GIS software	04/week

References

1. Geospatial Data Science Techniques and Applications" by Raj Singh and Michael F. Goodchild.
2. Introduction to Geographic Information Systems" by Kang-Tsung Chang.
3. GIS Tutorial Basic Workbook" by Wilpen L. Gorr and Kristen S. Kurland.
4. Mastering ArcGIS" by Maribeth Price.
5. Essentials of Geographic Information Systems" by Jonathan Campbell and Michael Shin.

GE/OE -1: Generic/Open Elective - I
Title of the paper – EARTH AND EARTH SURFACE PROCESSES
Credits: 02 Total Marks: 50 Contact Hrs: 30

About the Course:
The "Earth and Earth Surface Processes" paper covers the fundamental concepts related to the Earth's structure and the processes that shape its surface. This paper as well as course often combines lectures with practical fieldwork or laboratory exercises to provide hands-on experience in understanding Earth's dynamic systems.

Course Outcomes:
The outcomes of the course are to equip students with a comprehensive understanding of how Earth's processes shape its surface and impact the environment. Here's a general idea of what you might achieve by the end of the course :

- **Understanding Earth's Structure**: Gain knowledge about the Earth's internal layers and their properties, and how these layers influence surface processes. Understanding of plate tectonics, including how tectonic plates move, interact, and lead to geological phenomena such as earthquakes, volcanic activity, and mountain building
- **Knowledge of Weathering and Erosion**: Learn the mechanisms of physical and chemical weathering, as well as erosion processes, and how they contribute to landscape formation and changes over time.
- **Sediment Analysis**: Acquire skills in identifying different types of sediments and understanding sedimentary processes and environments. Be able to interpret sedimentary rock layers and their historical implications. Gain the ability to analyze and interpret various landforms created by different geological processes, including river systems, glacial landscapes, and coastal features.
- **Application of Geomorphological Concepts**: Apply principles of geomorphology to real-world scenarios, including understanding how natural and human-induced processes modify landscapes.
- **Fieldwork Skills**: Develop practical skills in field observation, data collection, and analysis related to Earth surface processes. Understand the impact of human activities on Earth's surface processes and how to mitigate negative effects through sustainable practices.

Unit No.	Title of topic and contents	Contact Hours
I	**History of Earth:** Formation and composition of core, mantle, crust, atmosphere and hydrosphere; chemical composition of Earth; geological time scale and major changes on the Earth's surface. Movement of lithosphere plates; mantle convection and plate tectonics, sea floor spread; earthquakes; volcanic activities; orogeny; origin of the main geomagnetic field; continental drift, Pangaea and present-day continents, Minerals and rocks: Minerals and important rock forming minerals, rock cycle, Rock laws; rock types and structures, weathering and erosion process.	15
II	**Earth surface processes:** Atmosphere: Composition of atmosphere, physical and optical properties, circulation; interfaces: atmosphere–ocean interface, atmosphere–land interface, ocean– land interface, rivers and geomorphology; types of glaciers, glacier dynamics, formation of Peninsular Indian Mountain systems - Western and Eastern Ghats, Vindhyas, Aravalli's, etc. Formation of the Himalaya; development of glaciers, perennial river systems, formation of Indo-Gangetic Plains	15

Textbooks and Reference Books:

1. Bridge, J., & Demicco, R. 2008. Earth Surface Processes, Landforms and Sediment deposits. Cambridge University Press.
2. Duff, P. M. D., & Duff, D. (Eds.). 1993. Holmes' Principles of Physical Geology. Taylor & Francis.
3. Gupta, A. K., Anderson, D. M., & Overpeck, J. T. 2003. Abrupt changes in the Asian southwest monsoon during the Holocene and their links to the North Atlantic Ocean. Nature 421: 354-357.
4. Gupta, A. K., Anderson, D. M., Pandey, D. N., & Singhvi, A. K. 2006. Adaptation and human migration, and evidence of agriculture coincident with changes in the Indian summer monsoon during the Holocene. Current Science 90: 1082-1090.
5. Keller, E.A. 2011. Introduction to Environmental Geology (5th edition). Pearson Prentice Hall.
6. Krishnan, M. S. 1982. Geology of India and Burma. CBS Publishers & istributors.
7. Leeder, M., Arlucea, M.P. 2005. Physical Processes in Earth and Environmental Sciences. Blackwell Publishing.
8. Pelletier, J. D. 2008. Quantitative Modelling of Earth Surface Processes (Vol. 304). Cambridge: Cambridge University Press. Chicago.

SEC -1: Skill Enhancement Course Practical- I
Title of the Practical paper – MAPPING OF EARTH'S SYSTEM AND ENVIRONMENTAL PROCESS
Credits: 02 Total Marks: 50 Practical: 60 Contact Hrs

About the Course:
The practical course "Mapping of Earth's System and Environmental Process" focuses on hands-on skills and techniques for creating and analysing maps related to Earth's systems and environmental processes. The course aims to provide practical experience in mapping and spatial analysis, essential for careers in geology, environmental science, and related fields.

Course Outcomes:
The outcomes of the practical paper "Mapping of Earth's Systems and Environmental Processes" typically include:

1. Field Data Collection: Skills in collecting and recording spatial and environmental data through field surveys and observational techniques.
2. Data Analysis and Interpretation: Capability to analyze spatial data to identify patterns, trends, and relationships in Earth's systems and environmental processes.
3. Cartographic Design: Competence in designing clear, accurate, and informative maps that effectively communicate spatial information and analysis results.
4. Application to Environmental Management: Understanding how to apply mapping techniques to real-world environmental issues, including resource management, hazard assessment, and conservation planning.
5. Proficiency in Mapping Tools: Ability to use Geographic Information Systems (GIS), remote sensing technology, and other mapping tools to create and analyze various types of maps.
6. Problem-Solving Skills: Enhanced ability to solve practical problems related to Earth's systems and environmental processes using mapping and spatial analysis techniques.

These outcomes aim to equip students with practical skills for careers in environmental science, geology, and related fields, focusing on the effective visualization and management of spatial and environmental data.

Sr.No.	Practical titles / content	Contact Hours
	1. Study of Topographic map 2. Study of signs, symbols, directions and legends / indexing for mapping 3. Preparation of profile / section and determination of slopes of different directions. 4. Study of toposheets and contour mappings 5. Study of Model for continental drift 6. Identification of rocks and minerals. 7. Study and interpretation of Geological time scale. 8. Study of landscapes of urban, semi-urban and rural areas. 9. Overview of Google Earth and mapping 10. Overview of Remote sensing images and mapping 11. Overview of various GIS software's and their applications in mapping	04 / week

SEM -II

DSC 1- 2 (Theory)

Title of the Paper – fundamental of Cartography

Credits: 02 Total Marks: 50 Contact Hrs: 30

Course Objectives

This course aims to:

1. Introduce the fundamental concepts of cartography, Mapping and distinguish between conventional and digital cartography.
2. Explain the types and uses of maps, and the principles of map scale and familiarize students with geographic and projected coordinate systems.
3. Provide foundational knowledge of map projections and their properties.

Learning Outcomes

Upon completion of this course, students will be able to:

1. Define cartography and explain its relevance in geography and identify and differentiate between various types of maps and scales.
2. Interpret and apply different coordinate systems in map reading and preparation.
3. Understand and explain different types of map projections and their uses and analyze spatial information using the basic principles of cartography.

Unit No.	Title of topic and contents	Contact Hours
I	Cartography: Introduction, Types - conventional and digital cartography, Map: Introduction, Uses of maps, Types of maps - based on scale (large and small), based on functions (physical and cultural) and Series of maps: open series maps & defense series maps Definition and Types of scale - Verbal, Fractional and Graphical	15
II	Coordinate System: Introduction, Geography coordinate System and Projected coordinate System	15

Reference

1. Fundamentals of Cartography by R.P. Mishra, Concept Publishing Co
2. Text Book of Practical Geography by Md. Zulfequar Ahmad Khan, Concept Publishing Company
3. http://www.nrsc.gov.in/Earth_Observation_Applications_Carbon_Studies.html
4. http://www.nnrms.gov.in/index.htm
5. http://kartoweb.itc.nl/geometrics/map%20projections/understanding%20map%20project ions.pdf

DSC 1 - 2 (Practical-II)

Title of the Paper – Fundamental of Cartography
Credits: 02 Total Marks: 50
Practical: 60 Contact Hours

This course aims to:

1. Introduce students to practical aspects of cartography and map reading.
2. Develop skills in understanding and applying different types of scales and projections.
3. Train students in identifying and interpreting various types of maps and map features.
4. Equip students to read and analyze Survey of India (SOI) toposheets and understand their symbols.
5. Prepare students for basic field visit planning through cartographic knowledge.

Learning Outcomes

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

1. Identify and index toposheets accurately.
2. Differentiate and apply various types of scales including verbal, fractional, and graphical.
3. Recognize and classify different types of maps such as physical and cultural maps.
4. Interpret contour patterns and SOI toposheet symbols (natural and artificial features).
5. Demonstrate understanding of basic map projections and their practical uses.
6. Apply cartographic skills in preparing for and conducting field-based geographical studies.

Practical titles / content	Contact Hours
1. Indexing of Toposheet 2. Types of Scale i) Verbal, ii) Fractional and iii) Graphical 3. Types of maps i) Physical ii) Cultural 4. Study of Contours 5. Study of SOI toposheet- Symbol Reading (Natural and Artificial) 6. Study of Preliminary/ Basics of preparation of field visits 7. Projection	04/week

References/Books

1. GIS Fundamentals: A First Text on Geographic Information Systems" by Paul Bolstad.
2. Getting to Know ArcGIS" by Michael Law and Amy Collins.
3. Geospatial Data Science Techniques andApplications" by Raj Singh and Michael F. Goodchild.
4. Introduction to Geographic Information Systems" by Kang-Tsung Chang.
5. GIS Tutorial 1: Basic Workbook" by Wilpen L. Gorr and Kristen S. Kurland.

GE-2/OE-2: Generic/Open Elective - II
Title of the paper: DIVISIONS OF ENVIRONMENT
Credit: 02 Total Marks: 50 Contact Hrs: 30

Course Objective
The course includes understanding of basics of environment, biotic and abiotic factors, segments or divisions of environment includes atmosphere, hydrosphere, lithosphere and biosphere.

Course Learning Outcome
Upon completion of the course, students will become aware of the importance of segments or divisions of environment. They also will know the fundamentals of environmental science as applied to the interaction between human activity and the divisions of the environment in terms of Atmosphere, Hydrosphere, Lithosphere and Biosphere.

Unit	Title of topic and contents	Contact Hrs
I	Divisions or segments of the environment and their interactions, Factors Biotic and Abiotic factors- types. **a) Atmosphere:** Chemical composition and thermal structure; heat budget and earth's albedo. Weather and climate, Weather Elements atmospheric pressure, temperature, relative humidity, precipitation, wind; Major climatic zones of the world, Agro- climatic zones of India. **b) Hydrosphere:** Definition, Importance and characteristics. Lentic and	15

	Lotic systems Ice-caps, oceans, rivers, lakes, pond and ground water, Hydrologic cycle. Human usage of surface and Ground water, Water as a resource and its availability, types ofaquifers and springs. Ground water potential. Water Budget.	
II	**c) Lithosphere:** Definition, structure and scope internal structure of earth; Different kinds of minerals and rocks - Igneous, metamorphic and sedimentary formation and types; Major landforms, Soil formation, soil profile and classification. Physical, chemical, mineralogical and biological properties of soil. Soil Biota. **d) Biosphere:** Definition and extent, Biomes types, characteristics, diversity and density Tundra, Taiga, Temperature and Deciduous Forest, Grassland, Desert, Tropical rain forest; A brief introduction to biogeography; India's biogeography.	15

Text Books / Reference Book:

1) Text Book of Environmental Studies. Asthana, D. K. 2006. S. Chand Publishing.
2) Fundamentals of Environmental Studies, Basu, M., Xavier, S. 2016. Cambridge University Press, India.
3) Fundamentals of Environmental Science: G.S. Dhaliwal, G.S. Sangha and P.K. Raina, Kalyani Publication
4) Environmental Science (6TH ED) (1997): Jr. G.T. Miller, Wadsworth Pub. Co. Environmental Science (8th Edition) (2010): Daniel D. Chiras, Jones &Barlett Ltd.
5) Barry, G.R. and Chorley, J.R. 2003. Atmosphere, Weather and Climate. Routledge, London.
6) Critchfield, H.J. 1995. General Climatology. Printice Hall of India.
7) Daji, J.A. 1988. Textbook of Soil Science. Media Promoters and
8) Publishers. 6. Goldman, C.R. and Horne, A.J. 1983. Limnology. Mc Graw Hill.
9) Lutgens, F.K. and Tarbuck, E.J. 1982. Atmosphere Introduction to Meteorology. Prentice Hall Inc.
10) Menon, P.A. 1989. Our Weather. National Book Trust.
11) Miller, Jr. G.T. 1994. Living in the Environment: Principles, Connections and Solutions. Wadsworth Publishing Co.
12) Nair, B.N. and Thampy, D.M. 1980. Marine Ecology. Macmillan Co. of India

SEC -2 Skill Enhancement Course Practicals- II
Title of the Practical paper – ENVIRONMENT AND SOCIETY
Credits: 02 Total Marks: 50 Practical: 60Contact Hrs

About the Course:

A practical course or paper on "Environment and Society" typically explores the complex interactions between human societies and the natural environment. It examines how social structures, cultural practices, and economic systems impact the environment and, conversely, how environmental changes affect human societies. Overall, the course aims to provide a comprehensive understanding of how environmental and social systems are interconnected and to develop skills for addressing environmental challenges through both theoretical knowledge and practical experience.

Course Outcomes:

The outcomes of a practical course or paper on "Environment and Society" generally include:

1. Enhanced Understanding: Students gain a deeper comprehension of the interactions between environmental systems and human societies, including how environmental changes influence social structures and vice versa.

2. Analytical Skills: Development of skills to analyze and interpret data related to environmental issues and their societal impacts, using both qualitative and quantitative methods.
3. Practical Experience: Hands-on experience through fieldwork or case studies, allowing students to apply theoretical knowledge to real-world environmental problems and solutions.
4. Problem-Solving Abilities: Ability to propose and evaluate strategies for mitigating environmental issues and promoting sustainable practices within different societal contexts.
5. Critical Thinking: Improved capacity to critically assess environmental policies, practices, and social movements, understanding their effectiveness and implications. Enhanced ability to communicate complex environmental and social issues clearly and effectively, both in written and oral formats.
6. Policy Insight: Insight into how environmental policies are formulated and implemented, and how they affect both environmental and social outcomes. Increased awareness of environmental justice and ethical considerations related to environmental management and social equity.

Overall, the course aims to equip students with the knowledge and skills needed to address contemporary environmental challenges and contribute to sustainable development.

Sr.No.	**Practical titles / content**	**Contact Hours**
	1. Study of different components of environment 2. Prepare a chart of biodegradable and non-biodegradable pollutants generated in your locality. 3. Study of a representative type of ecosystem. 4. To prepare a checklist of invasive species. 5. Study of factors responsible for ecological degradation and air pollution 6. Study of different control measures for air pollution and noise pollution. 7. Filed visit to nearby meteorological station 8. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. 9. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. 10. Study of simple ecosystems-pond, river etc. and submit a report	04 / week

UA
Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology.
Nature of Question Paper for CBCS Pattern NEP-2020
B. Sc. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 30

Instructions
1) All Questions are compulsory
2) Figure to right indicate full marks.

Q.1 Choose correct alternative. (MCQ) **06 Marks**

1)
a) b) c) d)
2)
a) b) c) d)
3)
a) b) c) d)
4)
a) b) c) d)
5)
a) b) c) d)
6)
a) b) c) d)

Q.2. Answer the following. (Any three) **6 (2+2+2)**

A)
B)
C)
D)
E)

Q.3. Answer the following (Any two). **6 (3+3)**

A)
B)
C)

Q.4. Answer the following (Any two). **6 (3+3)**

A)
B)
C)

Q.5. Answer the following (Any one). **6 Marks**

A)
B)

IA/CA
Punyashlok Ahilyadevi Holkar Solapur University, Solapur
Faculty of Science & Technology
Nature of Question Paper for CBCS Pattern
B. Sc. / B.C.A. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 20

- **Internal Evaluation System for 20 Marks**
  - Choose any two of the following
  - Home Assignment / Unit Test / Tutorial /Seminar

- **Pattern of Examination:**
  - External Evaluation + Internal Evaluation
  - 30 Marks + 20 Marks = 50 Marks
- **Passing Criteria:**
  - University Written Exam (UA) – 12 out of 30
  - Internal/Continuous Assessment (IA/CA) – 08 out of 20
