

B.Sc. GEOGRAPHY

(HONOURS / HONOURS WITH RESEARCH)

CURRICULUM STRUCTURE

(w.e.f. Academic Year 2026-2027)



Department of Geography
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ABOUT THE DEPARTMENT OF GEOGRAPHY

The Department of Geography at CUTN was established in 2017 with a vision to develop it as a leading geography department in the country. The department has been recognized with a DST-FIST grant and received research grants from leading funding agencies in India.

Geography provides the spatial framework for analysing the Earth's physical and human systems, connecting environmental patterns with scientific inquiry. It integrates diverse scientific fields to understand relationships between people, places, and the environment and plays a crucial role in addressing global challenges such as sustainable development, health, and energy. Understanding the significance of Geography, the department currently offers a two-year postgraduate program and a PhD in Geography, focusing on areas such as physical, human, and environmental geography, as well as geospatial technologies. The department has well-equipped GIS, Image Processing, Survey, Cartography, Demography, Applied Geomorphology, Advanced Geospatial, and Urban Research labs. Comprehensive lectures in core Geography areas are paired with modern laboratory courses, ensuring students receive both theoretical knowledge and practical, hands-on training at every stage.

From the Academic Year 2026-27 onwards, the Department of Geography offers the Four-Year B.Sc. (Honours/Research) in Geography Programme designed in accordance with the National Education Policy (NEP) 2020. This comprehensive programme integrates fundamental and advanced Geography concepts with interdisciplinary learning, research exposure, and practical training.

VISION

To be the leading Geography Department in the country and attain excellence in Geography teaching and research.

MISSION

- M1 - Provide an enhanced educational atmosphere to the students through blending of teaching and research that fosters the geographic knowledge, skills, and experiences.
- M2 - Prepare students to solve societal problems and inspire them to become cognizant decision-makers and leaders.
- M3 - Engage local, regional, national, and global communities through demand-based collaborative research.
- M4 - Establish Centre for Advanced Geographical Research with innovative techniques, instrumentation, and infrastructure.



ABOUT THE PROGRAMME

The four-year B.Sc. Honours in Geography programme offered under Curriculum and Credit Framework for Undergraduate Programmes (CCFUGP) by the Department of Geography has eight semesters, with an overall credit of 173 (for both B.Sc. Honours and B.Sc. Honours with Research). An exit option can be availed at the end of the first, second, and third year, provided the student has satisfied the required credits to get a certificate, diploma, or B.Sc. degree, respectively.

The programme offers Geography as the major subject with choice-based minor streams: Economics, History, Statistics, Computer Science and Geology, along with open electives, language ability enhancement, skill enhancement, value-added, and MOOCs courses. In addition, internship, field work, and research project are included in the curriculum to provide professional skills.

ELIGIBILITY AND ADMISSION

A pass in the Plus Two examination or equivalent of any recognised board in India with 60% marks for General Category, 55% marks for OBC (NCL) / EWS, and 50% marks for SC / ST / PWD candidates. The admission into the programme is done through the Common University Entrance Test (CUET) conducted by NTA (Geography/Geology (or) General Aptitude Test from the CUET-UG domain subject list)

GRADUATE ATTRIBUTES

Through B.Sc. Honours/Research in Geography, the student will be able to acquire:

- Disciplinary knowledge
- Critical thinking and observation power
- Skills to handle geospatial tools and techniques
- ICT skills for professional development
- Ability to perform spatial analysis
- Communication and teamwork skills
- Attitude to conduct scientific research projects
- Societal and Environmental concern
- Values of environmental ethics and sustainability
- Paths for self-directed and life-long learning

**PROGRAMME OUTCOMES**

- PO1 - Prepare students to demonstrate proficiency in theoretical and applied realms of geography.
- PO2 - Make the students understand the contemporary environmental issues and underlying cause-effect relationships.
- PO3 - Provide the ability to evaluate as well as solve geographic problems effectively through geospatial technologies.
- PO4 - Enable students to work towards sustainable environment through both an independent and collaborative system.
- PO5 - Prepare the students to apply their geographical knowledge and skills in professional careers for their career advancement.

PROGRAMME SPECIFIC LEARNING OUTCOMES

After the successful completion of B.Sc., Honours in Geography, the student will be able to:

- PSO1 - Explain the planet's physical processes and human interactions at varying spatio-temporal scales.
- PSO2 - Demonstrate proficiency in handling geospatial tools and techniques for solving spatial problems and employment opportunities
- PSO3 - Appreciate the relevance of geographical aspects and provide geographic insights on important societal and environmental issues.
- PSO4 - Identify current research trends within the breadth and depth of geography and produce meaningful scholarly contributions.
- PSO5 - Create community awareness and demonstrate ethics in conducting geographical research and field-based activities.

PROGRAMME MAPPING**Programme Outcomes to Mission Statements**

	PO1	PO2	PO3	PO4	PO5
M1	x	x	x	x	x
M2		x	x	x	x
M3		x	x	x	x
M4	x	x	x	x	x

Programme Specific Learning Outcomes to Programme Outcomes

	PO1	PO2	PO3	PO4	PO5
PSO1	x	x	x	x	
PSO2	x		x		x
PSO3	x	x	x	x	x
PSO4	x	x	x	x	x
PSO5		x		x	x

**EVALUATION SCHEME**

The Curriculum and Credit Framework for Undergraduate Programmes (CCFUGP) is adopted for four year B.Sc. Honours/Research in Geography programme that offers flexibility to the students to choose the electives. Each course in the programme is assigned with a fixed number of credits based on the contents to be learned and it is evaluated by the course instructor(s). The evaluation of the internal component of the courses is continuous and the minimum passing mark for all the courses is 50%.

Evaluation of Theory Courses

All theory courses shall carry a Continuous Internal Assessment (CIA) component to the extent of 40 marks and End Semester Examination (ESE) for 60 marks.

Components		Weightage (%)
CIA	Test(s) / Quiz / Project / Case Study	20
	Assignment / Seminar / Interaction / Field Work	20
ESE	End Semester Exam	60

Evaluation of Laboratory Courses

The Laboratory Courses will be assessed based on Continuous Internal Assessment (CIA). No separate examination will be conducted.

Components	Weightage (%)
Lab Exercises	80
Assignment / Field Work / Case Study / Interaction	20

Evaluation of Research Project / Internship / Field Work

The thesis/report will be supervised and assessed by the internal/external members. Students must present their thesis/report in a viva-voce which will be conducted at the end of the semester.

Components	Weightage (%)
Internal Mark by the internal/external supervisor(s)	40
External Mark awarded by the examiner(s)	40
Viva-Voce	20

ATTENDANCE

A minimum of 75% attendance is mandatory for appearing in end semester exam and successful completion of practical / dissertation / internship / field work courses. The University's regulations will be governed for relaxations in minimum requirement of attendance.



END SEMESTER EXAMINATION – QUESTION PAPER PATTERN

Programme: B.Sc. Geography (Honours)

Duration: 3 Hours

Course Code: XXX

Maximum Marks: 60

Course Title: XXX

Date: XXX

Section-A [10 Marks]

The questions to be asked hereunder are objective-types or definition/short types to test the students' remembrance and understanding of domains. Equal weights will be given to all the units.

Section-B [20 Marks]

The questions to be asked hereunder are paragraph types with choices or either-or-types. At least one question will be asked from each unit. One or two question(s) will be asked each to test the students' ability to understand, apply, analyse, evaluate, and creative cognitive domains.

Section-C [30 Marks]

The questions to be asked hereunder are essay types with choices or either-or-types. One or two question(s) will be asked each to test the students' ability to analyse, evaluate, and creative cognitive domains.



AWARDING OF UG CERTIFICATE, UG DIPLOMAS, AND DEGREES

This programme is firmly aligned with the vision of NEP 2020, offering:

- Flexible and modular structure with multiple exit/entry points
- Emphasis on foundational, vocational, and research training
- Integration of ethics, environmental consciousness, and experiential learning
- Credit mobility and potential for multidisciplinary learning

The Department of Geography, CUTN is offering a flexible entry-exit option through this holistic undergraduate programme.

UG Certificate: Students who opt to exit after completion of the first year and have secured 42 credits will be awarded a UG certificate if, in addition, they complete one vocational course of 4 credits during the summer vacation of the first year.

UG Diploma: Students who opt to exit after completion of the second year and have secured 84 credits will be awarded the UG diploma if, in addition, they complete one vocational course of 4 credits during the summer vacation of the second year.

3-year UG Degree: Students who wish to undergo a 3-year UG programme will be awarded UG Degree in the Major discipline after successful completion of three years, securing 131 credits and satisfying the minimum credit requirement as mentioned in table below.

Students have the option to exit at the end of the first/second/third year to get a Certificate/Diploma/B.Sc. degree, respectively. The student must inform the department at the beginning of the respective even semester if he/she wishes to exit.

4-year UG Degree (Honours): A four-year UG Honours degree in the major discipline will be awarded to those who complete a four-year degree programme with a minimum of 173 credits and have satisfied the credit requirements as mentioned in table below.

4-year UG Degree (Honours with Research): Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research degree in the fourth year. They should do a research project/dissertation under the guidance of a faculty member of the department. The research project dissertation will be in the major discipline.

For the students opting for B.Sc. Honours with Research, the research guide shall be allotted to the students based on their research interest and academic ranking. They can also prefer to do research project/dissertation in any reputed academic institutes, research centres, industries and organizations. The project report shall be submitted in the form of a dissertation at the end of the 8th semester on or before the date notified by the Department. The student shall present the research project work and shall be evaluated by the Department.

The students, who secure a minimum of 173 credits, including 12 credits from a research project / dissertation, are awarded UG Degree (Honours with Research).



STRUCTURE OF THE UNDERGRADUATE PROGRAMME

Every Undergraduate Programme offered by the University shall confirm to the structure specified hereunder. A programme must mandate the students to complete 131 credits to complete a basic Bachelor's Degree within first 3 years. With an additional 42 credits of course work one can pursue 4th year for Honours or Honours with Research Degree. The UG Programme will consist of the following categories of courses and the minimum credit requirements for 3-year UG and 4-year UG (Honours) or UG (Honours with Research) programmes are given below.

Sl. No.	Category of Courses	Minimum Credit Requirement				
		1-year Certificate	2-year Diploma	3-year B.Sc. Degree	4-Year B.Sc. Honours Degree	4-Year B.Sc. Honours with Research Degree
1	Major Courses	14	36	71	95	95
2	Minor Courses	6	12	12	12	12
3	Discipline Specific Elective (DSE)	--	--	10	20	16
4	Open Elective Courses	6	9	9	9	9
5	Ability Enhancement Courses (AEC)	6	12	12	12	12
6	Skill Enhancement Courses (SEC)	4	6	6	6	6
7	Value Added Courses (VAC)	6	8	8	8	8
8	Research Project / Dissertation (PROJ)	--	--	--	8	12
9	Internship (WP)	--	--	2	2	2
10	Extension Activity	--	1	1	1	1
11	Total	42	84	131	173	173
12	Vocational Course (VOC) for early exit students	4	4	---	---	---



CURRICULUM STRUCTURE

FIRST YEAR

SEMESTER – I

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5011	Physical Geography	Major	3	3	40	60
2	GEO5012	Representation of Relief (P)	Major (P)	2	4	100	--
3	GEO5013	Representation of Climatic Data (P)	Major (P)	2	4		
4	**	Any One Stream from Table 1	Minor	3	4	40	60
5	**	Open Elective from Other Department	OE	3	3	40	60
6	**	Language - I *	AEC	3	3	40	60
7	DRRSEC	Disaster Risk Reduction	SEC	2	2	40	60
8	CONVAC	Constitutional Values	VAC	3	3	40	60
TOTAL				21	26		

SEMESTER – II

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5021	Human Geography	Major	3	3	40	60
2	GEO5022	Maps and Scales (P)	Major (P)	2	4	100	
3	GEO5023	Field Survey-I	Major (P)	2	4 [^]	100	
4	**	Any One Stream from Table 1	Minor	3	3	40	60
5	**	Open Elective from Other Department	OE	3	3	40	60
6	ENGAE1	English-I	AEC	3	3	40	60
7	CYBSEC	Cyber Security	SEC	2	2	40	60
8	ENSVAC	Environmental Science	VAC	3	3	40	60
TOTAL				21	25		
CUMULATIVE TOTAL				42			
For students exiting after one year (Certificate in Science)							
9	**	Vocational Course [#]	VOC	4	4	100	
TOTAL CREDITS FOR CERTIFICATE				46			

[#] Students who wish to exit at the end of the first year with a Certificate in Science need to undergo a vocational course offered by the University/MOOC.

[^] The students shall undertake minimum 80 hours of field work during the semester to earn 2 credits.



SECOND YEAR

SEMESTER – III

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5031	Climatology	Major	4	4	40	60
2	GEO5032	Principles of Cartography	Major	4	4	40	60
3	GEO5033	Map Projection and Survey (P)	Major (P)	2	4	100	
4	**	Any One Stream from Table-1	Minor	3	3	40	60
5	**	Open Elective from Other Department	OE	3	3	40	60
6	ENGAE2	English-II	AEC	3	3	40	60
7	GEOSE01	ICT for Geosciences	SEC	2	2	40	60
TOTAL				21	23		
CUMULATIVE TOTAL				63			

SEMESTER – IV

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5041	Geomorphology	Major	4	4	40	60
2	GEO5042	Terrain Analysis (P)	Major (P)	2	4	100	
3	GEO5043	Geography of Resources	Major	3	3	40	60
4	GEO5044	Population Geography	Major	3	3	40	60
5	**	Any One Stream from Table- 1	Minor	3	3	40	60
6	**	Language – II *	AEC	3	3	40	60
7	YOFVAC	Yoga and Fitness	VAC	2	2	40	60
8		Extension Activity	EXT	1°	--	--	--
TOTAL				21	22		
CUMULATIVE TOTAL				84			
For students exiting after two years (Diploma in Science)							
9	**	Vocational Course #*	VOC	4	4	100	
TOTAL CREDITS FOR DIPLOMA				88			

#* Students who wish to exit at the end of the second year with a Diploma in Science need to undergo a vocational course offered by the University/MOOC.

° The students shall enrol in any one of the extension activities such as NCC, NSS, RRC etc. and successfully complete the stipulated duration to earn the required 1 credit.

**THIRD YEAR****SEMESTER – V**

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5051	Hydrology	Major	4	4	40	60
2	GEO5052	Social and Cultural Geography	Major	4	4	40	60
3	GEO5053	Settlement Geography	Major	4	4	40	60
4	GEO5054	Remote Sensing	Major	4	4	40	60
5	GEO5055	Remote Sensing (P)	Major (P)	2	4	100	
6	**	Any One from Table-2 or MOOC ^{††}	DSE	3	3	40	60
7	GEOIN01	Internship ^{##}	Internship	2	2	100	
TOTAL				23	25		
CUMULATIVE TOTAL				107			

SEMESTER - VI

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5061	Oceanography	Major	4	4	40	60
2	GEO5062	Regional Planning and Development	Major	4	4	40	60
3	GEO5063	Geographic Information Science	Major	3	3	40	60
4	GEO5064	GIS (P)	Major (P)	2	4	100	
5	GEO5065	Map Interpretation (P)	Major (P)	2	4	100	
6	GEO5066	Field Survey-II †	Major (P)	2	†	100	
7	**	Any One from Table-2 or MOOC††	DSE	3	3	40	60
8	**	Any One from Table-3 or MOOC††	DSE	4	4	40	60
TOTAL				24	26		
CUMULATIVE TOTAL				131			

[†] Students shall complete the field survey with a minimum duration of five days before the end of sixth semester.

Note: Students have an option to exit at the end of the third year with B.Sc. Geography (with 131credits)



FOURTH YEAR

SEMESTER – VII

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5071	Biogeography	Major	4	4	40	60
2	GEO5072	Geography of India	Major	4	4	40	60
3	GEO5073	Geographical Thought	Major	4	4	40	60
4	GEO5074	Modern Surveying Techniques (P)	Major (P)	2	4	100	
5	GEO5075	Geospatial Analysis (P)	Major (P)	2	4	100	
6	**	Any One from Table 2 or MOOC ^{††}	DSE	3	3	40	60
7	**	Any One from Table 2 or MOOC ^{††}	DSE	3	3	40	60
TOTAL				22	26		
CUMULATIVE TOTAL				153			

SEMESTER – VIII

For B.Sc. Honours Degree

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5081	Research Methodology	Major	4	4	40	60
2	GEO5082	Research Ethics and Academic Writing	Major	4	4	40	60
3	GEO5083	Research Project	PROJ	8	16	40	60
4	**	Any One from Table-3 or MOOC ^{††}	DSE	4	4	40	60
TOTAL				20	28		
OVERALL TOTAL (B.Sc. Honours)				173			

For B.Sc. Honours with Research Degree

Sl. No.	Course Code	Course Title	Type	Credit	Hours/Week	Marks	
						Internal	External
1	GEO5081	Research Methodology	Major	4	4	40	60
2	GEO5082	Research Ethics and Academic Writing	Major	4	4	40	60
3	GEO5084	Research Project / Dissertation^^	PROJ	12	24	40	60
TOTAL				20	32		
OVERALL TOTAL (B.Sc. Honours with Research)				173			



Table-1: Minor Courses (3 Credits)

Stream	Stream-A (Economics)	Stream-B (History)	Stream-C (Statistics)	Stream-D (Geology)	Stream-E (Computer Science)
Semester-I	Economics-I	History-I	Statistics-I	Geology-I	Computer Science-I
Semester-II	Economics-II	History-II	Statistics-II	Geology-II	Computer Science-II
Semester-III	Economics-III	History-III	Statistics-III	Geology-III	Computer Science-III
Semester-IV	Economics-IV	History-IV	Statistics-IV	Geology-IV	Computer Science-IV

Note: Student can choose only one stream throughout the programme. The exact title of the course is decided by the offering Department. In case the concerned department is not offering minor course of the chosen stream, student can choose related MOOC to fulfil the minimum requirement.

Table-2: Discipline Specific Elective Courses (3 Credits)

Semester	Option-A	Option-B	Option-C	Option-D
Semester-V (Any One)	GEOEC01 - Political Geography	GEOEC02 - Agricultural Geography	GEOEC03 - Industrial Geography	GEOEC04 – Geography of Tourism
Semester-VI (Any One)	GEOEC05 - Geostatistics	GEOEC06 - Transport Geography	GEOEC07 – Spatial Decision Support System	GEOEC08 – Open Source GIS
Semester-VII (Any Two)	GEOEC09 - Economic Geography	GEOEC10 - Models in Geography	GEOEC11 – Geography of Health	GEOEC12 – Locational Analytics

Table-3: Discipline Specific Elective Courses (4 Credits)

Semester	Option-A
Semester-VI (Any One)	GEOEC13 Urban Planning and Sustainability GEOEC14 Applied Geomorphology GEOEC15 Environment and Sustainable Development GEOEC16 Geospatial Big Data Analytics
Semester-VIII (Any One)	GEOEC17 Urban GIS GEOEC18 Watershed Management GEOEC19 Climate Change and Social Wellbeing GEOEC20 Wetland Management GEOEC21 AR/VR and Spatial Intelligence GEOEC22 Geography of Gender



NOTES:

* Students who wish to undertake any of the language courses **other than** Tamil / Hindi / French shall take relevant language related MOOC courses at the appropriate level through UGC recognized online educational platforms. However, the choice of language should be the same in both first and fourth semesters.

** Course code will be allotted by the respective departments which offer the course.

Students shall complete an internship during winter/summer break for minimum of 10 days, before the end of the fifth semester in consultation with the respective mentor. The report and credits will be included in the fifth semester.

†† In the place of MOOC, the students shall undergo relevant MOOC courses at UG/PG level through a UGC recognized online platform during or before the completion of the semester with the required credits. The MOOC course shall be reviewed by the Department coordinator and approved by the internal members of the BoS. The students shall undertake UGC SWAYAM exam and transfer the credits or appear for the exam conducted by the CUTN, whichever is applicable.

^^ Students who secure 75% marks and above in the first six semesters and wish to undertake research at the undergraduate level can choose a research stream in the fourth year. They should do a research project or dissertation in the eighth semester for 12 credits under the guidance of a faculty member of the department to obtain Honours with Research degree. Students who do their eighth semester dissertation outside the campus should have an Internal Supervisor, a faculty member from the department. They shall attend the courses online. However, the end semester examination for these courses will be conducted at the department.



SYLLABUS

SEMESTER - I



SEMESTER - I					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5011	Physical Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the physical components and basic processes of the lithosphere, atmosphere, hydrosphere and biosphere.	Remember
CO 2	Understand the dynamics of earth systems and their interactions in shaping landforms, climate, oceans and ecosystems.	Understand
CO 3	Describe the atmospheric, geomorphic and oceanic processes, and analyze their influence on natural environments and human activities.	Apply / Analyze
CO 4	Acquire fundamental skills to connect and compare physical geographic processes with environmental issues, hazards and resource systems.	Skill

Syllabus:

Units	Contents	Hours
I	Earth System and Lithosphere: L1 – Nature, Scope and Significance of Physical Geography L2 – Origin and Interior Structure of the Earth L3 – Geological Time Scale and Rock Cycle L4 – Plate Tectonics and Earth Movements	9
II	Atmosphere and Climate System: L5 – Atmospheric Composition and Structure L6 – Insolation, Energy Balance and Air Temperature L7 – Global Pressure Belts, Winds and Circulation L8 – Air Masses, Fronts, Cyclones and Anticyclones	9
III	Geomorphic Processes and Landforms: L9 – Weathering, Mass-movement and Soils L10 – Denudation Processes L11 – Fluvial and Aeolian Landforms L12 – Glacial, Coastal and Karst Landforms	9
IV	Ocean Circulation: L13 – Configuration and Relief of the Ocean Floor L14 – Physical Properties of Ocean Water L15 – Circulation of Oceanic Waters L16 – Ocean Deposits and Resources	9



V	Biosphere and Sustainability: L17 – Biogeochemical Cycles L18 – Biomes and ecological regions of the world L19 – Human-Environment Relationships L20 – Physical geography in environmental sustainability	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Christopherson, R. W., & Birkeland, G. H. (2012). Geosystems: An Introduction to Physical Geography (8th ed.). Pearson Education, New Jersey. 2. Strahler, A. H., & Strahler, A. N. (2001). Modern Physical Geography (4th ed.). John Wiley & Sons, New York. 3. Waugh, D. (2005). Geography: An Integrated Approach. Nelson Thornes, Cheltenham. 4. Das Gupta, A., & Kapoor, A. N. (2001). Principles of Physical Geography. S. Chand & Company Ltd., New Delhi. 5. Khullar, D. R. (2012). Physical Geography. Kalyani Publishers, New Delhi.
Additional Books/ Reports	1. Barry, R. G., & Chorley, R. J. (1998). Atmosphere, Weather and Climate. Routledge, London. 2. Lal, D. S. (2005). Climatology. Sharda Pustak Bhawan, Allahabad. 3. Pinet, P. R. (2012). Invitation to Oceanography (6th ed.). Jones & Bartlett Learning. 4. Sharma, R. C., & Vatal, M. (1970). Oceanography for Geographers. Chaitanya Publishing House, Allahabad. 5. Thurman, H. V., & Trujillo, A. P. (2004). Introductory Oceanography. Pearson Prentice Hall.
Multi-media	1. http://www.physicalgeography.net/ 2. https://pubs.usgs.gov/gip/dynamic/understanding.html 3. https://www.noaa.gov/jetstream/ocean 4. https://wmo.int/topics/climate 5. https://www.physicalgeography.co.uk/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x			x
CO3	x	x	x		x
CO4	x	x	x	x	x



SEMESTER - I					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5012	Representation of Relief (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the principles and methods of representing relief through contours, spot heights, profiles and conventional terrain symbols.	Understand
CO 2	Construct contour maps, and relief profiles using given elevation and topographical data.	Apply
CO 3	Interpret landforms, and terrain characteristics from contour and relief information.	Analyze
CO 4	Prepare neat relief representation sheets and map portfolio using appropriate cartographic conventions and practical presentation skills.	Create

Syllabus:

Units	Contents	Hours
I	Relief Basics: Ex 1 – Conventional map sign and symbols Ex 2 – Relief Elements: Contours, Spot Heights and Benchmarks Ex 3 – Contour Interval and Index Contours	12
II	Contour Mapping: Ex 4 – Interpolation of Contours Ex 5 – Contours from Spot Heights Ex 6 – Construction of Simple Contour Map	12
III	Relief Profiles: Ex 7 – Representation of Slopes by Contours Ex 8 – Representation of Landforms by Contours Ex 9 – Landform Profiles for Terrain Comparison	12
IV	Relief Visualization: Ex 10 – Relief Representation using Hachures Ex 11 – Shaded Relief Sketch Ex 12 – Simple Block Diagram from Contours	12



V	Relief Mapping: Ex 13 – Ridge Lines and Watershed Boundaries Ex 14 – Small-Scale Relief Map Ex 15 - Large-Scale Relief Map	12
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Tasks for CIA
Exercises, Assignments and Interaction

References	
Text Books	1. Monkhouse, F. J. and Wilkinson, H. R. (1994) Maps and Diagrams, Methuen, London. 2. Singh, R. L. and Dutt, P. K. (1979) Elements of Practical Geography, Kalyani Publishers, New Delhi. 3. Sarkar, A. K. (2015) Practical Geography: A Systematic Approach (3 rd Edition), Orient Longman, Kolkata. 4. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Guptill, S. C. (1995) Elements of Cartography, John Wiley & Sons, New York. 5. Misra, R. P. and Ramesh, A. (1986) Fundamentals of Cartography, Concept Publishing Company, New Delhi.
Additional Books/ Reports	1. Raisz, E. (1962) Principles of Cartography, McGraw-Hill, New York. 2. Dent, B. D., Torguson, J. S. and Hodler, T. W. (2009) Cartography: Thematic Map Design, McGraw-Hill, New York. 3. Kraak, M. J. and Ormeling, F. (2010) Cartography: Visualization of Geospatial Data, Pearson Education, London. 4. Slocum, T. A., McMaster, R. B., Kessler, F. C. and Howard, H. H. (2022) Thematic Cartography and Geovisualization, CRC Press, Boca Raton. 5. Survey of India topographical map reading and conventional sign resources.
Multi-media	1. https://surveyofindia.gov.in/ 2. https://www.usgs.gov/programs/national-geospatial-program/topographic-maps 3. https://www.qgis.org/en/site/ 4. https://docs.qgis.org/ 5. https://opentopography.org/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2			x		x
CO3	x	x	x		x
CO4			x	x	x



SEMESTER - I					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5013	Representation of Climatic Data (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the sources, structure and basic characteristics of climatic data used in geographical analysis	Understand
CO 2	Prepare suitable graphs and diagrams to represent temperature, rainfall, humidity, pressure and other climatic data.	Apply
CO 3	Analyze climatic patterns and variations using temperature, rainfall and weather-related diagrams and maps.	Analyze
CO 4	Develop a climatic data practical record by selecting appropriate techniques for presentation and interpretation	Create

Syllabus:

Units	Contents	Hours
I	Climatic Data Basics: Ex 1 – Weather Symbols Ex 2 – Weather and Climate Data Sources Ex 3 – Automatic Weather Station Ex 4 – Preparation of Weather and Climate Dataset	12
II	Temperature Graphs: Ex 5 – Monthly Temperature Line Graph Ex 6 – Annual Temperature Trend Graph Ex 7 – Construction of Isotherms Ex 8 – Comparison of Temperature of Different Climatic Regimes	12
III	Rainfall Diagrams: Ex 9 – Monthly Rainfall Bar Graph Ex 10 – Representation of Rainfall Variability Ex 11 – Construction of Isohyets Ex 12 – Comparison of Precipitation of Different Climatic Regimes	12
IV	Representation of Weather Elements: Ex 13 – Representation of Humidity Ex 14 – Wind Rose Diagram Ex 15 – Construction of Isobars Ex 16 – Weather Station Model	12



V	Diagrams for Climatic Data: Ex 17 – Comparison of Temperature, Rainfall and Relative Humidity Ex 18 – Hythergraph Ex 19 – Ergograph Ex 20 - Climograph / Climatic Diagram	12
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Tasks for CIA
Exercise, Practical Demonstration and Interaction

References	
Text Books	1. Monkhouse, F. J. and Wilkinson, H. R. (1994) Maps and Diagrams, Methuen, London. 2. Singh, R. L. and Dutt, P. K. (1979) Elements of Practical Geography, Kalyani Publishers, New Delhi. 3. Sarkar, A. K. (1997) Practical Geography: A Systematic Approach, Oriental Longman, Kolkata. 4. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Guptill, S. C. (1995) Elements of Cartography, John Wiley & Sons, New York. 5. Strahler, A. H. and Strahler, A. N. (2001) Modern Physical Geography, John Wiley & Sons, New York.
Additional Books/ Reports	1. Barry, R. G. and Chorley, R. J. (2010) Atmosphere, Weather and Climate, Routledge, London. 2. Lal, D. S. (2005) Climatology, Sharda Pustak Bhawan, Allahabad. 3. Wilks, D. S. (2011) Statistical Methods in the Atmospheric Sciences, Academic Press, Amsterdam. 4. World Meteorological Organization (2018) Guide to Climatological Practices, WMO-No. 100, Geneva. 5. India Meteorological Department (latest available) Climatological Tables and Climate Data Products, Ministry of Earth Sciences, Government of India.
Multi-media	1. https://mausam.imd.gov.in/ 2. https://cdsp.imdpune.gov.in/ 3. https://power.larc.nasa.gov/ 4. https://climateknowledgeportal.worldbank.org/ 5. https://wmo.int/topics/climate

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2	x		x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - I					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
DRRSEC	Disaster Risk Reduction	2	-	-	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the basic concepts of disaster, hazard, vulnerability, risk, coping capacity and resilience.	Remember
CO 2	Understand the causes, types and impacts of natural and human-induced disasters in relation to social, economic and environmental vulnerability.	Understand
CO 3	Analyze the disaster management cycle, risk assessment, mitigation, preparedness, response, recovery and rehabilitation processes.	Analyze
CO 4	Acquire fundamental skills to apply community-based disaster risk reduction, institutional measures and geospatial approaches for disaster risk management.	Skill

Syllabus:

Units	Contents	Hours
I	Basic Concepts of Disaster Risk Reduction: L1 - Disaster, hazard, vulnerability, risk, coping capacity and resilience L2 - Types of disasters: natural, human-induced and complex emergencies L3 - Disaster trends, causes and impacts: physical, human, economic, social and psychological	6
II	Hazard, Vulnerability and Risk Assessment: L4 - Hazard identification and disaster vulnerability: physical, economic, social and environmental dimensions L5 - Risk assessment: exposure, susceptibility, capacity and resilience indicators L6 - Hazard and vulnerability profile of India with reference to flood, drought, cyclone, earthquake, landslide and tsunami	6
III	Disaster Risk Management: L7 - Disaster management cycle L8 - Preparedness, prediction, early warning systems and disaster communication L9 - Disaster response, relief, rescue, rehabilitation and reconstruction	6
IV	Disaster Risk Reduction: L10 - Mitigation and prevention: structural and non-structural measures L11 - Disaster education, trauma and stress management; first-aid and emergency procedures L12 - Community-based disaster risk management, safe community planning and public awareness	6



V	Institutional Framework and Geospatial Approaches: L13 - Disaster Management Act and institutional arrangements in India L14 - International strategies: Sendai Framework for Disaster Risk Reduction and Sustainable Development Goals L15 - Role of remote sensing, GIS and GPS in disaster risk reduction	6
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Presentation, Group Study and Interaction

References

Text Books	1. Gupta, A. K., Nair, S. S., Shiraz, A., & Dey, S. (2013). Flood Disaster Risk Management. CBS Publications, New Delhi. 2. Nidhi, G. D. (2014). Disaster Management Preparedness. CBS Publications Pvt. Ltd. 3. Singh, R. (2017). Disaster Management Guidelines for Earthquakes, Landslides, Avalanches and Tsunami. Horizon Press Publications. 4. Subramanian, R. (2023). <i>Disaster Management</i> (2nd ed.). Vikas Publishing. 5. Taïmpo. (2016). Disaster Management and Preparedness. CRC Press Publications.
Additional Books/ Reports	1. Coppola, D. P. (2015). Introduction to International Disaster Management. Butterworth-Heinemann, Oxford. 2. Government of India. (2005). Disaster Management Act, 2005. New Delhi. 3. Keller, E. A., & DeVecchio, D. E. (2012). Natural Hazards: Earth's Processes as Hazards, Disasters and Catastrophes. Pearson, New Jersey. 4. National Disaster Management Authority. National Disaster Management Guidelines. Government of India, New Delhi. 5. UNDRR. (2015). Sendai Framework for Disaster Risk Reduction 2015-2030. United Nations Office for Disaster Risk Reduction.
Multi-media	1. https://ndma.gov.in/ 2. https://nidm.gov.in/ 3. https://www.undrr.org/ 4. https://www.un-spider.org/ 5. https://bhuvan.nrsc.gov.in/ 6. https://www.imd.gov.in/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			x
CO2	x	x		x	x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SYLLABUS

SEMESTER - II



SEMESTER - II					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5021	Human Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts of human geography, man–environment relationships, spatial organization, and geopolitical systems.	Understand
CO 2	Analyze the interrelationships among race, ethnicity, religion, gender, and geopolitical processes in shaping human societies.	Analyze
CO 3	Apply geographical knowledge to interpret patterns of population distribution, migration, settlement growth, and urbanization,	Apply
CO 4	Develop critical perspectives on human geographical problems.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Human Geography: L1 - Nature, scope and branches of human geography L2 - Concepts of man-environment relationships- determinism, possibilism, and neo-determinism. L3 - Spatial analysis: location, distance, space, and spatial interaction.	9
II	Human Races, Society and Culture: L4 - Major races and its distribution: Caucasoid, Mongoloid and Negroid L5 - Habitats: Mode of life in different geographical regions L6 - Gender, Ethnicity, Culture and Identity; Globalization	9
III	Population, Settlement and Development: L7 - Population distribution, composition and growth L8 - Problems of over population and Migration; Human Development. L9 - Rural and Urban settlements: influencing factors, types, growth, morphology; Urbanization	9
IV	Religion, Languages and Communication: L10 - World's major religions: Hinduism, Buddhism, Christianity, Islam, and Judaism; Sacred spaces L11 - Major world languages; Linguistic relationships and dynamics L12 - Communication: Types and development.	9



V	Geopolitical Systems and Contemporary Issues: L13 - Geopolitics: boundaries and frontiers L14 - States, Nations and Citizenship L15 - Imperialism and colonialism; Human rights	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Chandna, R.C., (2016) Population Geography, Kalyani Publishers, New Delhi. 2. Dickinson, R.E., (2003) City and Region: A Geographical Interpretation, Routledge, London. 3. Husain, M., (2021) Human Geography (8th edition), Rawat Publications, Jaipur. 4. Rubenstein, J.M., (2019) An Introduction to Human Geography, Pearson Education, New Delhi. 5. Johnston, R.J., Gregory, D. and Smith, D.M., (2000) Economic and Social Geography Made Simple, Routledge, London.
Additional Books/ Reports	1. Jackson, P., & Smith, S. J. (2014). Exploring Social Geography (Routledge Revivals). London: Routledge. (Original work published 1984). 2. Johnston, R.J., (2000) Geography and Geographers, Arnold Publishers, London. 3. Stump, R.W., (2008) The Geography of Religion: Faith, Place and Space, Rowman & Littlefield, Maryland. 4. Taylor, P.J. and Flint, C., (2000) Political Geography: World Economy, Nation-State and Locality, Pearson Education, Harlow. 5. United Nations Development Programme, Human Development Report, New York.
Multi-media	1. https://censusindia.gov.in/census.website/ 2. https://hdr.undp.org/ 3. https://www.ohchr.org/en/ohchr_homepage 4. https://population.un.org/wup/ 5. https://openknowledge.worldbank.org/home

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x		x	
CO3	x	x	x	x	x
CO4	x	x	x	x	



SEMESTER - II					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5022	Maps and Scales (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the fundamentals of maps, map elements, directions, conventional signs and the role of scale in geographic representation.	Understand
CO 2	Apply different methods of scale conversion, construction and map measurement for distance, area and direction.	Apply
CO 3	Analyze topographical sheet information and map measurements for geographical interpretation and spatial representation.	Analyze
CO 4	Create neat practical map outputs and map records using appropriate scale, symbols, lettering and layout principles.	Create

Syllabus:

Units	Contents	Hours
I	Map Basics: Ex 1 – Types of Maps Ex 2 – Basic Map Elements Ex 3 – Reading of Map Atlas	12
II	Toposheet Basics: Ex 4 – Conventional Signs and Symbols in SOI Sheets Ex 5 – Marginal Information in SOI Topographical Sheets Ex 6 – Numbering Framework of SOI Sheets	12
III	Map Scale Construction and Conversion Ex 7 – Map Scale Representation: Statement, RF and Graphical Ex 8 – Plain Linear Scale Construction Ex 9 – Comparative and Diagonal Scale Construction	12
IV	Map Measurement and Direction: Ex 10 – Measuring Direction, Bearing and Azimuth Ex 11 – Map Area Measurement using Grid Method Ex 12 – Map Area Measurement using Graphical Method	12



V	Map Compilation and Layout: Ex 13 – Map Enlargement and Reduction Ex 14 – Base Map Compilation Ex 15 – Map Layouting	12
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Tasks for CIA

Exercise, Interpretation, Practical Demonstration and Interaction

References

Text Books	1. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Guptill, S. C. (1995) Elements of Cartography, John Wiley & Sons, New York. 2. Monkhouse, F. J. and Wilkinson, H. R. (1994) Maps and Diagrams, Methuen, London. 3. Misra, R. P. and Ramesh, A. (1986) Fundamentals of Cartography, Concept Publishing Company, New Delhi. 4. Singh, R. L. and Singh, P. B. (2024) Elements of Practical Geography, (revised reprint) Kalyani Publishers, New Delhi. 5. Sarkar, A. K. (2015) Practical Geography: A Systematic Approach, 3rd Edition, Orient Longman, Kolkata.
Additional Books/ Reports	1. Raisz, E. (1962) Principles of Cartography, McGraw-Hill, New York. 2. Steers, J. A. (1970) An Introduction to the Study of Map Projections, University of London Press, London. 3. Tyner, J. A. (2010) Principles of Map Design, Guilford Press, New York. 4. Kraak, M. J. and Ormeling, F. (2020) Cartography: Visualization of Geospatial Data, 4th Edition, CRC Press, Boca Raton. 5. Survey of India. Conventional Signs and Symbols and Topographical Map Reading Guidelines, Government of India.
Multi-media	1. https://surveyofindia.gov.in/ 2. https://bhuvan.nrsc.gov.in/ 3. https://www.ncert.nic.in/ 4. https://www.usgs.gov/ 5. https://qgis.org/en/site/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2			x		x
CO3	x	x	x		x
CO4	x		x	x	x



SEMESTER - II					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5023	Field Survey - I	-	-	-	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the fundamental concepts of field survey in geography.	Understand
CO 2	Analyze primary and secondary datasets to identify spatial patterns, field-based problems, and relationships between human and environmental variables.	Analyze
CO 3	Apply appropriate tools and techniques for systematic data collection in field studies.	Apply
CO 4	Develop a comprehensive field report including research-based conclusions and recommendations.	Create

Syllabus:

Units	Contents	Hours
I	Fundamentals of Field Survey Ex 1 – Basics of Geographic Enquiry Ex 2 - Problem Identification and Field Selection	12
II	Basic Tools of Field Investigation Ex 3 - Preparation of Questionnaire and Interview Schedule Ex 4 - Preparation of Schedule for Focus Group Discussion	12
III	Primary Data Collection Ex 5 - Field Observation Ex 6 - Socio-Economic Data Collection Ex 7 - Focus Group Discussion	12
IV	Secondary Data Collection and Analysis Ex 8 - Data Collection from Secondary Sources Ex 9 - Analysis of Demographic and Occupational data	12
V	Field Report Ex 10 – Data Compilation and Preparation of Field Report	12

**Tasks for CIA**

Field Report, Field Exercise, and Practical Demonstration

References

Text Books	1. Clifford, N. S. French and G. Valentine (2010). Key Methods in Geography, Sage, London. 2. Cloke, P., Cook, I., Crang, P. et al., (2004) Practising Human Geography, Sage Publications, London. 3. Flowerdew, R. and Martin, D., (2005) Methods in Human Geography: A Guide for Students Doing a Research Project (2nd edition), Pearson Education, Harlow. 4. Stoddart, R. (1982). Field Techniques and Research Methods in Geography, University of Nebraska, Lincoln. 5. Singh, R.L. and Singh, R.P.B., (2002) Elements of Practical Geography, Kalyani Publishers, New Delhi.
Additional Books/ Reports	1. Babbie, E., (2013) The Practice of Social Research, Cengage Learning, Boston. 2. Bryman, A., (2016) Social Research Methods (5th edition), Oxford University Press, Oxford. 3. Chambers, R., (1994) Participatory Rural Appraisal (PRA): Challenges, Potentials and Paradigm, World Bank Publications. 4. Creswell, J.W., (2014) Research Design: Qualitative, Quantitative and Mixed Methods Approaches, Sage Publications, USA. 5. Census of India, Primary Census Abstract, Office of the Registrar General, New Delhi.
Multi-media	1. https://censusindia.gov.in/census.website/ 2. https://www.mospi.gov.in/ 3. https://surveyofindia.gov.in/ 4. https://www.nfhsiips.in/nfhsuser/index.php 5. https://www.worldbank.org/ext/en/home

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x		x
CO4	x	x	x	x	x

Instructions:

The students shall undertake minimum 80 hours of field work during the semester to earn 2 credits.



SYLLABUS

SEMESTER - III



SEMESTER - III					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5031	Climatology	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the basic elements, structure and composition of the atmosphere and the fundamental concepts of weather and climate.	Remember
CO 2	Understand the processes controlling insolation, heat budget, temperature, pressure, winds, humidity and precipitation.	Understand
CO 3	Describe atmospheric circulation, air masses, fronts, cyclones, climatic classification and major meteorological hazards, and analyze their spatial patterns.	Apply / Analyze
CO 4	Acquire fundamental skills to interpret climatic data, weather systems, climate variability and climate change in relation to human and environmental systems.	Skill

Syllabus:

Units	Contents	Hours
I	Atmosphere and Energy System: L1 - Meaning, nature and scope of climatology L2 - Origin, composition and structure of the atmosphere L3 - Insolation: factors, distribution and significance L4 - Heat budget of the Earth and atmospheric energy balance	12
II	Atmospheric Motion: L5 - Temperature: controlling factors, vertical, horizontal and seasonal distribution L6 - Forces affecting winds; local winds L7 - Global pressure and wind belts L8 - General circulation of the atmosphere; Tri-cellular model L9 - Upper air circulation; Jet streams	12
III	Atmospheric Instability: L10 - Humidity, evaporation and condensation L11 - Atmospheric instability and lapse rate L12 - Clouds and Precipitation: types and global distribution L13 - Atmospheric disturbances: thunderstorms, tornadoes, hailstorms, and cloudbursts	12
IV	Atmospheric Systems: L14 - Air masses and Fronts: types, formation and associated weather conditions	12



	L15 - Tropical systems: Inter-tropical convergence and tropical depressions L16 - Indian monsoon: mechanism, seasonal rhythm and climatic controls	
V	Climate Classification and Variability: L17 - Koppen climatic classification L18 - Thornthwaite climatic classification L19 - Climate variability: ENSO, El Nino, La Nina and Southern Oscillation L20 - Climate change: evidences, causes and perspectives	12

Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	- Barry, R. G., & Chorley, R. J. (2010). Atmosphere, Weather and Climate (9th ed.). Routledge, London. - Lutgens, F. K., Tarbuck, E. J., & Tasa, D. G. (2016). The Atmosphere: An Introduction to Meteorology (13th ed.). Pearson, Boston. - Lal, D. S. (2005). Climatology. Sharda Pustak Bhawan, Allahabad - Singh, S. (2015). Climatology. Prayag Pustak Bhawan, Allahabad. - Trewartha, G. T., & Horn, L. H. (1980). An Introduction to Climate (5th ed.). McGraw-Hill, New York.
Additional Books/ Reports	- Ahrens, C. D. (2012). Essentials of Meteorology: An Invitation to the Atmosphere (6th ed.). Brooks/Cengage Learning, Belmont. - Oliver, J. E., & Hidore, J. J. (2002). Climatology: An Atmospheric Science (2nd ed.). Prentice Hall, New Jersey. - Critchfield, H. J. (1983). General Climatology. Prentice Hall of India, New Delhi. - IPCC. (2021). Climate Change 2021: The Physical Science Basis. Cambridge University Press, Cambridge. - India Meteorological Department. Climatological Tables, Weather Reports and Monsoon Reports, Government of India, New Delhi.
Multi-media	https://mausam.imd.gov.in/ https://wmo.int/ https://www.noaa.gov/jetstream https://climate.nasa.gov/ https://www.ipcc.ch/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x			x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - III					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5032	Principles of Cartography	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the nature, scope and basic concepts of cartography, maps, scale and cartographic communication.	Remember
CO 2	Understand geodesy, coordinate systems, map projections and principles of map compilation and generalization.	Understand
CO 3	Describe the principles of map design, symbolization, lettering, layout and representation of geographical data.	Apply / Analyze
CO 4	Acquire fundamental skills to interpret topographical sheets, atlases and thematic maps for geographical analysis.	Skill

Syllabus:

Units	Contents	Hours
I	Fundamentals of Cartography: L1 - Nature, and scope of cartography L2 – History of cartography; Recent developments L3 - Sources of cartographic data	12
II	Geodesy, Earth Reference System and Map Projections: L4 - Shape and size of the earth: spherical, ellipsoidal and geoidal concepts L5 - Datum, coordinate systems and grids L6 – Map Projections: principles, properties, types and distortions	12
III	Map Generalization and Symbolization: L7 - Map Compilation: Analog and Digital L8 - Generalization: selection, simplification, classification and exaggeration L9 - Symbolization: point, line and area symbols	12
IV	Map Design, Layout and Reproduction: L10 - Principles of map design and layout L11 - Lettering and typography: type, size, placement and positioning L12 - Map production and reproduction: traditional and modern techniques	12



V	Thematic Mapping: L13 - Representation of discrete geographical data L14 - Techniques of thematic mapping: choropleth, chorochromatic and flow maps L15 - Dynamic and interactive cartography	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Map Exercise, Interaction and Presentation

References

Text Books	1. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J., & Guptill, S. C. (1995). Elements of Cartography. John Wiley & Sons, New York. 2. Misra, R. P., & Ramesh, A. (1986). Fundamentals of Cartography. Concept Publishing Company, New Delhi. 3. Kraak, M. J., & Ormeling, F. (2010). Cartography: Visualization of Geospatial Data (3rd ed.). Pearson Education, London. 4. Monkhouse, F. J., & Wilkinson, H. R. (1994). Maps and Diagrams. Methuen, London. 5. Singh, R. L., & Singh, P. B. (2024). Elements of Practical Geography. (revised reprint) Kalyani Publishers, New Delhi.
Additional Books/ Reports	1. Sarkar, A. K. (2015). Practical Geography: A Systematic Approach. (3rd edition) Oriental Longman, Calcutta. 2. Steers, J. A. (1970). An Introduction to the Study of Map Projections. University of London Press, London. 3. Keates, J. S. (1996). Understanding Maps. Longman, London. 4. Tyner, J. A. (2010). Principles of Map Design. Guilford Press, New York. 5. Dent, B. D., Torguson, J. S., & Hodler, T. W. (2009). Cartography: Thematic Map Design. McGraw-Hill, New York.
Multi-media	1. https://www.nationalgeographic.org/encyclopedia/cartography/ 2. https://www.usgs.gov/programs/national-geospatial-program 3. https://surveyofindia.gov.in/ 4. https://bhuvan.nrsc.gov.in/ 5. https://www.icsm.gov.au/education/fundamentals-mapping

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x		x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - III					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5033	Map Projection and Survey (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the fundamental concepts, classification, properties and applications of map projections, and basic surveying techniques.	Understand
CO 2	Apply appropriate methods to construct selected map projections, and carry out basic field surveying using standard surveying instruments.	Apply
CO 3	Analyze projection distortion patterns, UTM grid system and survey observations for geographical mapping and measurement.	Analyze
CO 4	Prepare accurate map projections, survey plans and practical records using conventional methods and contemporary web-based cartographic tools with proper presentation.	Create

Syllabus:

Units	Contents	Hours
I	Projection Basics and Cylindrical Projections: Ex 1 – Projection Elements: Graticule, Parallels, and Meridians Ex 2 – Projection Classification by Surface, Aspect and Property Ex 3 – Simple Cylindrical Projection	12
II	Conical and Zenithal Projections: Ex 4 – Conical Projection with Standard Parallels Ex 5 – Polar Zenithal Equidistant Projection Ex 6 – Orthographic and Gnomonic Projection	14
III	Contemporary Tools and Applications: Ex 7 – UTM Grid Basics Ex 8 – Web Tools for Map Projections	10
IV	Basics of Surveying and Field Procedures: Ex 9 – Chain Surveying: Ranging, Chaining and Offset Measurement Ex 10 – Compass Surveying: Bearing and Traversing	12
V	Levelling and Plane Table Surveying: Ex 11 – Dumpy Level / Auto Level Setup and Staff Reading Ex 12 – Plane Table Surveying	12



Tasks for CIA
Exercise, Field Report, Practical Demonstration and Interaction

References	
Text Books	1. Monkhouse, F. J. and Wilkinson, H. R. (1994). Maps and Diagrams. Methuen, London. 2. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Guptill, S. C. (1995). Elements of Cartography. John Wiley & Sons, New York. 3. Raisz, E. (1962). Principles of Cartography. McGraw-Hill, New York. 4. Misra, R. P. and Ramesh, A. (1986). Fundamentals of Cartography. Concept Publishing Company, New Delhi. 5. Steers, J. A. (1970). An Introduction to the Study of Map Projections. University of London Press, London.
Additional Books/ Reports	1. Snyder, J. P. (1987). Map Projections: A Working Manual. U.S. Geological Survey Professional Paper 1395. 2. Snyder, J. P. and Voxland, P. M. (1989). An Album of Map Projections. U.S. Geological Survey Professional Paper 1453. 3. Bugayevskiy, L. M. and Snyder, J. P. (1995). Map Projections: A Reference Manual. Taylor & Francis, London. 4. Iliffe, J. and Lott, R. (2008). Datums and Map Projections for Remote Sensing, GIS and Surveying. Whittles Publishing. 5. Kraak, M. J. and Ormeling, F. (2020). Cartography: Visualization of Geospatial Data. CRC Press.
Multi-media	1. https://kartoweb.itc.nl/geometrics/index.html 2. https://pubs.usgs.gov/pp/1395/report.pdf 3. https://www.map-projections.net/ 4. https://epsg.io/ 5. https://qgis.org/en/docs/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2			x		x
CO3	x	x	x		x
CO4			x	x	x



SEMESTER - III					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOSE01	ICT for Geosciences	2	-	-	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the fundamentals of Information and Communication Technology and its relevance in geosciences.	Understand
CO 2	Apply digital tools, online platforms and communication technologies for geoscientific data handling and presentation.	Apply
CO 3	Analyze geoscientific information using ICT-based applications and collaborative digital environments.	Analyze
CO 4	Develop digital communication outputs and ICT-enabled solutions for geoscience education, research and outreach.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to ICT in Geosciences: L1 – Components of ICT L2 – Role of ICT in Earth Sciences L3 – ICT Ethics, Cyber Security and Data Privacy	6
II	Digital Data Management and Information Sources: L4 – Digital Data Formats and Cloud Storage L5 – Spreadsheet Applications for Geoscientific Data L6 – Online Data Repositories and Open Access Resources	6
III	ICT Tools for Geoscience Education: L7 – Digital Mapping and Visualization Tools L8 – Mobile Applications for Geosciences L9 – Multimedia Applications in Geoscience Education L10 – Virtual Learning and E-content Development	6
IV	Geoscience Research and Communication: L11 – Scientific Writing and Story Map L12 – Online Survey Tools for Geographic Data Collection L13 – Infographic Design Tools for Presentation	6



V	Emerging ICT Trends in Geosciences: L14 – Notebooks for Geoscience Research L15 – Internet of Things (IoT) and Sensor-based Monitoring L16 – Geoscience Case Studies	6
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Tasks for CIA

Internal Tests, Seminar, Assignment, Presentation, ICT-based Activity, Case Study and Interaction

References

Text Books	1. Shelly, G.B. and Vermaat, M.E. (2011) Discovering Computers and Information Technology, Cengage Learning. 2. Turban, E., Volonino, L. and Wood, G. (2015) Information Technology for Management, Wiley. 3. Campbell, J.B. and Wynne, R.H. (2011) Introduction to Remote Sensing, Guilford Press. 4. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2015) Geographic Information Systems and Science, Wiley. 5. Kumar, A. and Sinha, R. (2018) ICT in Education and Geosciences, Academic Press.
Additional Books/ Reports	1. UNESCO (2021) ICT Competency Framework for Teachers. 2. Open Educational Resources (OER) for Geosciences – UNESCO Reports. 3. National Digital Library of India (NDLI) Resources. 4. World Meteorological Organization (WMO) ICT and Climate Information Reports. 5. ISRO Outreach and E-learning Resources.
Multi-media	1. https://www.wmo.int/ 2. https://ndl.iitkgp.ac.in/ 3. https://www.isro.gov.in/ 4. https://earthdata.nasa.gov/ 5. https://www.unesco.org/en/digital-education

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				
CO2	x		x	x	x
CO3	x	x	x	x	
CO4	x	x	x	x	x



SYLLABUS

SEMESTER - IV



SEMESTER - IV					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5041	Geomorphology	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the fundamental concepts, scope and significance of geomorphology in understanding earth surface processes and landforms.	Remember
CO 2	Understand the role of endogenetic and exogenetic processes in shaping the earth surface through time.	Understand
CO 3	Describe and analyze major geomorphic processes and landforms associated with fluvial, arid, glacial, coastal, and karst environments.	Apply / Analyze
CO 4	Acquire fundamental skills to interpret land forming factors and landforms	Skill

Syllabus:

Units	Contents	Hours
I	Fundamentals of Geomorphology: L1 – Nature and evolution of geomorphic ideas L2 – Fundamentals concepts in geomorphology L3 – Internal structure and isostasy L4 – Continental drift theory and plate tectonics L5 – Crustal formation and deformation	12
II	Geomorphic Processes: L6 – Endogenetic processes: folding, faulting, seismicity and vulcanicity L7 – Exogenic processes and denudation agents L8 – Types and factors of weathering: physical, chemical and biological L9 – Mass movement: processes, types and controlling factors	12
III	Fluvial Processes and Geomorphic Cycles: L10 – Drainage basins, drainage patterns and stream ordering L11 – Fluvial erosion, transportation and deposition L12 – Fluvial landforms and geomorphic cycle	12
IV	Geomorphic Environments: L13 – Arid processes and aeolian landforms L14 – Glacial processes and landforms L15 – Coastal processes and landforms L16 – Underground water and karst topography	12



V	Process Geomorphology: L17 – Morphogenetic regions L18 – Processes of slope development L19 – Dynamic equilibrium in geomorphology L20 – Tectonics, climate and landform development	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Quiz,
Field Observation Report and Interaction

References

Text Books	1. Huggett, R. J. (2017). Fundamentals of Geomorphology. Routledge, London. 2. Kale, V. S., & Gupta, A. (2018). Introduction to Geomorphology. Orient Black Swan, Hyderabad. 3. Strahler, A. H., & Strahler, A. N. (2001). Modern Physical Geography. John Wiley and Sons, New York. 4. Summerfield, M. A. (1991). Global Geomorphology. Longman, London. 5. Thornbury, W. D. (1969). Principles of Geomorphology. Wiley Eastern, New Delhi.
Additional Books/ Reports	1. Bloom, A. L. (2004). Geomorphology: A Systematic Analysis of Late Cenozoic Landforms. Waveland Press, Illinois. 2. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). Geomorphology. Methuen, London. 3. Goudie, A. S. (2010). Geomorphological Techniques. Routledge, London. 4. Ritter, D.F., Kochel, R.C. and Miller, J.R., (2002): Process Geomorphology, Waveland Press. 5. Selby, M. J. (1985). Earth's Changing Surface. Clarendon Press, Oxford. 6. Singh, S. (2018). Geomorphology. Prayag Pustak Bhawan, Allahabad.
Multi-media	1. https://www.usgs.gov/programs/landslide-hazards 2. https://www.usgs.gov/programs/earthquake-hazards 3. https://www.bgs.ac.uk/discovering-geology/earth-hazards/ 4. https://www.nasa.gov/earth/ 5. https://www.physicalgeography.net/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x			x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - IV					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5042	Terrain Analysis (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts and significance of terrain analysis and topographic interpretation.	Understand
CO 2	Apply terrain analysis techniques using topographic sheets.	Apply
CO 3	Analyze landform characteristics and drainage morphometry using contour and drainage network.	Analyze
CO 4	Develop thematic terrain maps and interpret geomorphological processes for practical applications.	Create

Syllabus:

Units	Contents	Hours
I	Slope Analysis: Ex 1 – Identification of Slope Categories Ex 2 – Gradient Analysis	12
II	Drainage Dataset Creation: Ex 3 – Creation of Stream Datasets from Toposheets Ex 4 – Delineation of Watersheds from Toposheets	12
III	Morphometric Analysis: Ex 5 – Stream Ordering using Strahler's Method Ex 6 – Calculation of Drainage Density and Bifurcation Ratio	12
IV	Basin Analysis: Ex 7 – Longitudinal and Hypsometric Curve Analysis Ex 8 – Landform Classification using Basin Parameters	12
V	Geomorphological Mapping: Ex 9 – Mapping of Fluvial Landforms Ex 10 – Mapping of Coastal Features	12



Tasks for CIA

Practical Record, Field Exercise, Case Study and Practical Demonstration

References

Text Books	1. Clarke, J.I. (1996) Morphometry from Maps, Elsevier. 2. Evans, I.S. (2012) Geomorphometry and Landform Mapping, Elsevier. 3. Huggett, R.J. (2017) Fundamentals of Geomorphology, Routledge. 4. Smith, M.J., Paron, P. and Griffiths, J.S. (2011) Geomorphological Mapping: Methods and Applications, Elsevier. 5. Strahler, A.H. and Strahler, A.N. (2001) Modern Physical Geography, Wiley.
Additional Books/ Reports	1. Schumm, S.A. (2005) River Variability and Complexity, Cambridge University Press. 2. Verstappen, H.T. (2011) Applied Geomorphology, Elsevier.
Multi-media	1. https://www.usgs.gov/ 2. https://bhuvan.nrsc.gov.in/ 3. https://earthdata.nasa.gov/ 4. https://qgis.org/en/site/ 5. https://geomorphometry.github.io/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	X	X			
CO2	X		X	X	
CO3	X	X	X	X	
CO4	X	X	X	X	X



SEMESTER - IV					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5043	Geography of Resources	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, classification and spatial distribution of resources across the world	Remember
CO 2	Understand the utilization, conservation and management of natural and human resources	Understand
CO 3	Analyze resource scarcity, resource conflicts and sustainable resource development strategies	Apply / Analyze
CO 4	Acquire practical skills to evaluate resource planning, governance and sustainability policies	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Resource Geography: L1 – Nature, Scope and Significance of Resource Geography L2 – Classification of Resources L3 – Distribution and Utilization of Resources	6
II	Natural Resources: L4 – Land Resources and Soils L5 – Water Resources: Surface and Underground L6 – Forest and Natural Vegetation L8 – Mineral Resources L9 – Marine Resources	12
III	Energy Resources: L9 – Conventional Energy Resources L10 – Non-Conventional Energy Resources L11 – Energy Crisis, Resource Scarcity and Sustainable Energy Development	9
IV	Resource Management: L12 - Human Resources and Technology L13 – Resource Conservation and Management L14 – Geospatial Technologies in Sustainable Resource Development	9



V	Resource Planning and Issues: L15 – Resource Regions of the World L16 – Resource Planning in India L17 – Resource Conflicts and Environmental Issues	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Gautam, A. (2022): <i>Geography of Resources: Exploitation, Conservation and Managements</i> , Sharda Pustak Bhawan. 2. Husain, M., (2003). <i>Resource Geography</i> . Anmol Publications Pvt Ltd., New Delhi. 3. Mitchell, B. (2002): <i>Resource and Environmental Management</i> , Pearson Education. 4. Owen, S. & Owens, P. (1991): <i>Environment, Resources and Conservation</i> , Cambridge University Press. 5. Singh, J. & Dhillon, S.S. (2006): <i>Agricultural Geography</i> , Tata McGraw Hill.
Additional Books/ Reports	1. Jha, C.S. et al. (2022): <i>Geospatial Technologies for Resources Planning and Management</i> , Springer. 2. Nunan, F. (2026): <i>Sustainable Natural Resource Management: A Multidisciplinary Approach</i> , Edward Elgar Publishing. 3. Rai, P.K. et al. (2024): <i>Natural Resources Management and Sustainable Livelihoods in the Mountainous Region</i> , Springer. 4. Shit, P.K. et al. (2024): <i>Geospatial Practices in Natural Resources Management</i> , Springer. 5. Thakur, B. et al. (2021): <i>Resource Management, Sustainable Development and Governance</i> , Springer.
Multi-media	1. https://www.unep.org/ 2. https://www.wri.org/ 3. https://www.fao.org/natural-resources-management/en/ 4. https://www.ipcc.ch/reports/ 5. https://moef.gov.in/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X	X			X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - IV					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5044	Population Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, sources and spatial distribution of population across the world	Remember
CO 2	Understand demographic processes such as fertility, mortality and migration	Understand
CO 3	Analyze population growth, composition, policies and population-resource relationships	Apply / Analyze
CO 4	Acquire practical skills to interpret demographic data and population issues using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Population Geography: L1 – Nature, Scope and Significance of Population Geography L2 – Sources of Population Data L3 – Population Theories	9
II	Population Distribution and Growth: L4 – Population Distribution and Density L5 – Determinants of Population Distribution L6 – Population Growth and Trends	9
III	Population Dynamics: L7 – Fertility and Mortality L8 – Migration: Types, Causes and Consequences L9 – Population Composition: Age, Sex and Occupation	9
IV	Population and Development: L10 – Population Policies and Family Welfare Programmes L11 – Population and Resources L12 – Urbanization and Population Change L13 – Human Development and Quality of Life	9



V	Population Issues: L14 – Population Problems in Developing Countries L15 – Population Growth and Distribution in India L16 – Population Challenges: Ageing, Youth and Gender Issues L17 – Population Planning and Sustainable Development	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Chandna, R.C. (2010): <i>Population Geography</i> , Kalyani Publishers. 2. Weeks, J.R. (2012): <i>Population: An Introduction to Concepts and Issues</i> , Cengage Learning. 3. Bhende, A.A. & Kanitkar, T. (2011): <i>Principles of Population Studies</i> , Himalaya Publishing House. 4. Clarke, J.I. (1972): <i>Population Geography</i> , Pergamon Press. 5. Trewartha, G.T. (1969): <i>A Geography of Population</i> , McGraw Hill.
Additional Books/ Reports	1. United Nations (2024): <i>World Population Prospects Report</i> . 2. Census of India (Latest Edition): <i>Population Census Reports</i> . 3. UNDP (2023): <i>Human Development Report</i> . 4. National Family Health Survey (NFHS-5) Reports, Government of India. 5. Population Reference Bureau (2023): <i>World Population Data Sheet</i> .
Multi-media	1. https://population.un.org/wpp/ 2. https://censusindia.gov.in/ 3. https://hdr.undp.org/ 4. https://www.nfhsindia.org/ 5. https://www.prb.org/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x				
CO2	x	x		x	x
CO3	x	x	x		x
CO4	x	x	x	x	x



SYLLABUS

SEMESTER - V



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5051	Hydrology	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the components and processes of the hydrological cycle and water resource systems.	Understand
CO 2	Apply hydrological techniques for watershed analysis, runoff estimation and groundwater assessment.	Apply
CO 3	Analyze hydrological processes, water quality issues and human impacts on hydrological systems.	Analyze
CO 4	Develop sustainable approaches for watershed management and water resource planning.	Create

Syllabus:

Units	Contents	Hours
I	Fundamentals of Hydrology: L1 – Scope, Concepts and Systems Approach in Hydrology L2 – Hydrological Cycle: Components and Processes L3 – Precipitation, Evaporation and Infiltration L4 – Anthropogenic Interventions in the Hydrological Cycle	12
II	Surface Water Hydrology: L5 – Surface Runoff and Stream Flow L6 – Hydrograph Analysis and Flow Measurement L7 – Floods, Droughts and Hydrological Extremes L8 – River Basin and Watershed Concepts	12
III	Groundwater Hydrology: L9 – Groundwater Occurrence and Movement L10 – Aquifers and Groundwater Recharge L11 – Groundwater Quality and Contamination L12 – Groundwater Assessment and Management	12
IV	Watershed Management and Water Quality: L13 – Watershed Modelling; Soil Erosion and Sediment Yield L14 – Water Quality Parameters and Pollution L15 – Integrated Watershed Management L16 – Sustainable Water Resource Management	12



V	Applied Hydrology: L17 – Hydrological Data Collection and Analysis L18 – Remote Sensing and GIS Applications in Hydrology L19 – Climate Change and Hydrological Responses L20 – Case Studies in River Basin and Watershed Management	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Field Observation, Project Work and Interaction

References

Text Books	1. Christopherson, R. W., and Birkeland, G. H. (2012): Geosystems: An Introduction to Physical Geography (8th Edition), Pearson Education. 2. Karanth, K. R. (2017): Ground Water Assessment, Development, and Management, Tata- McGraw Hill. 3. Lawrence, S. D. (2008): Physical Hydrology, Waveland Press. 4. Tideman, E. M. (1999): Watershed management – Guidelines for Indian Conditions, Omega Scientific Publishers. 5. Todd, D. K. and Mays L. W. (2021): Groundwater Hydrology, (3ed.) McGraw Hill Book Company. 6. Ward, and Trimble (2004): Environmental Hydrology, Lewis Publishers, CRC Press.
Additional Books/ Reports	1. Central Water Commission (India) Hydrological Reports. 2. Mitchell, C.W. (1991): Land Evaluation, John Wiley & Sons Inc. 3. Rajora, R. (2002): Integrated Watershed Management, Rawat Publications. 4. UNESCO World Water Development Reports. 5. Waugh, D. (2005): Geography: An Integrated Approach, Nelson Thornes.
Multi-media	1. https://www.usgs.gov/special-topics/water-science-school 2. https://www.unesco.org/en/water-security 3. https://cwc.gov.in/ 4. https://earthdata.nasa.gov/ 5. https://www.wmo.int/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	X	X			
CO2	X	X	X	X	
CO3	X	X	X		X
CO4	X	X	X	X	X



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5052	Social and Cultural Geography	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand human values, social ethics, welfare, wellbeing, inclusion, and exclusion, and other important cultural geographical concepts.	Understand
CO 2	Analyze and correlate different theories with contemporary social and cultural issues.	Analyze
CO 3	Apply models, and geographical approaches to examine social and cultural issues.	Apply
CO 4	Develop critical perspectives for interpreting contemporary social and cultural geographical issues.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Social Geography L1 – Nature and Scope of Social Geography L2 – Concept of Social Wellbeing and Quality of Life; Social Geography of Health and Healthcare Systems L3 – Social Networks and Community Dynamics L4 – Urban and Rural Social Landscapes	12
II	Social Issues: L5 – Social Stratification and Segregation - Class, Caste, and Ethnic Segregation L6 – Issues of Social Justice and Equity - Access to Resources and Opportunities, Gender and Social Inequality L7 – Social Geographies of Inclusion and Exclusion – Slums, Gated Communities L8 – Social Mobility and Change	12
III	Introduction to Cultural Geography: L9 – Nature and Scope of Cultural Geography L10 – Concept of Culture, Cultural Landscape, Cultural Identity and Representation; Spatial Dimensions of Cultural Practices L11 – Cultural Regions of India - Caste, Class, Religion, Gender, Language and Their Spatial Underpinnings L12 – Cultural diffusion: Types of cultural diffusion, innovation diffusion	12



IV	Culture and Globalization: L13 – Cultural Interaction and Exchange L14 – Cultural Integration and Cultural Hybridization L15 – Impact of Globalization on Local Cultures L16 – Cultural Policy and Management - Strategies and Challenges	12
V	Recent Trends in Social and Cultural Geography: L17 – Concept of Space in Social and Cultural Contexts - Place Making, First, Second, and Third Space L18 – Digital and Virtual Cultures L19 – Urbanization and Cultural Transformation L20 – Social Movements and Cultural Change	12

Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	1. Atkinson, D., Jackson, P., Sibley, D., & Washbourne, N. (Eds.). (2005): Cultural geography: A critical dictionary of key concepts. I.B. Tauris. 2. Fouberg, E.H., Murphy, A.B., de Blij H.J. (2015): Human Geography: People, Place, and Culture, 11th ed, Wiley 3. Mitchell, D. (2000): Cultural Geography: A Critical Introduction, Blackwell. 4. Lefebvre, H. (1991): The production of space. Blackwell. 5. Valentine, G. (2001): Social geographies: Space and society. Prentice Hall.
Additional Books/ Reports	1. Anderson, K., Domosh, M., Pile, S., & Thrift, N. (Eds.) (2003): Handbook of cultural geography. SAGE Publications. 2. Appadurai, A. (1996): Modernity at large: Cultural dimensions of globalization. University of Minnesota Press. 3. Cook, I., Crouch, D., Naylor, S., & Ryan, J. R. (Eds.). (2000): Cultural turns/geographical turns: Perspectives on cultural geography. Prentice Hall. 4. Harvey, D. (1990): The condition of postmodernity: An enquiry into the origins of cultural change. Wiley-Blackwell. 5. Soja, E. W. (1996): Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places. Wiley-Blackwell.
Multi-media	1. https://wid.world/ 2. https://hdr.undp.org/ 3. https://nhm.gov.in/ 4. https://censusindia.gov.in/census.website/ 5. https://whc.unesco.org/en/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x			x
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5053	Settlement Geography	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, types and patterns of rural and urban settlements	Remember
CO 2	Understand settlement morphology, hierarchy and spatial organization	Understand
CO 3	Analyze urbanization, settlement planning and contemporary settlement issues	Apply / Analyze
CO 4	Acquire practical skills to interpret settlement patterns and planning strategies using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Settlement Geography: L1 – Nature, Scope and Significance of Settlement Geography L2 – Rural vs Urban Settlements L3 – Approaches and Methods in Settlement Studies	12
II	Rural Settlements: L4 – Types and Patterns of Rural Settlements L5 – Morphology of Rural Settlements L6 – House Types and Functions; Rural Service Centers	12
III	Urban Settlements: L7 – Origin and Growth of Towns L8 – Urban Morphology and Land Use Models L9 – Urban Hierarchy and Central Place Theory L10 – Urbanization and Smart Cities	12
IV	Settlement Planning: L11 – Rural Settlement Issues and Planning L12 – Rural-Urban Fringe L13 – Urban Problems and Sustainable Urban Development	12



V	Contemporary Settlement Issues: L14 – Migration and Settlement Change L15 – Slums, Housing and Infrastructure Problems L16 – Geospatial Technologies in Settlement Analysis	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Field Observation, Project Work and Interaction

References

Text Books	1. Ramachandran, R. (2011): <i>Urbanization and Urban Systems in India</i> , Oxford University Press. 2. Singh, R.Y. (2007): <i>Geography of Settlements</i> , Rawat Publications. 3. Carter, H. (1995): <i>The Study of Urban Geography</i> , Arnold Publishers. 4. Pacione, M. (2009): <i>Urban Geography: A Global Perspective</i> , Routledge. 5. Johnson, J.H. (1972): <i>Urban Geography: An Introductory Analysis</i> , Pergamon Press.
Additional Books/ Reports	1. UN-Habitat (2022): <i>World Cities Report</i> . 2. Government of India (Latest Edition): <i>Smart Cities Mission Reports</i> . 3. Census of India: <i>Town Directory and Urban Agglomeration Reports</i> . 4. United Nations (2023): <i>World Urbanization Prospects</i> . 5. Ministry of Housing and Urban Affairs (MoHUA), Government of India Reports.
Multi-media	1. https://unhabitat.org/ 2. https://smartcities.gov.in/ 3. https://censusindia.gov.in/ 4. https://population.un.org/wup/ 5. https://mohua.gov.in/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X	X			X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5054	Remote Sensing	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the basic concepts of electromagnetic radiation, its interaction with the earth's surface and atmosphere	Understand
CO 2	Describe the resolution properties to interpret, process, and evaluate remotely sensed images	Analyze
CO 3	Apply knowledge of image processing principles strategically to new problems.	Apply
CO 4	Evaluate the applicability of remote sensing technologies as a monitoring tool for studying certain landscape phenomenon and spatial problems.	Evaluate

Syllabus:

Units	Contents	Hours
I	Introduction to Remote Sensing L1 – Concepts, Scope and Components of Remote Sensing L2 – Electro-Magnetic Radiation (EMR) and Electro-Magnetic Spectrum L3 – Theories and Properties of Electro-Magnetic Radiation L4 – Types of Remote Sensing	12
II	Energy Interaction with Atmosphere & Earth Surface L5 – Energy Interaction: Reflection, Absorption and Transmission L6 – Atmospheric Scattering: Rayleigh, Mie and Non-selective Scattering L7 – Refraction, Atmospheric Windows and Atmospheric Effects L8 – Spectral Signature: Interaction with Soil, Water, Vegetation and Other Features	12
III	Platforms, Sensors and Orbits L9 – Types of Remote Sensing Platforms L10 – Types of Sensors: FOV, IFOV, Active and Passive Sensors L11 – Satellite Orbits and Sensor Characteristics L12 – Resolution: Spatial, Spectral, Radiometric and Temporal	12
IV	Unit – IV: Image Interpretation and Data Products L13 – Image Colour Composites: Natural Colour Composite and FCC L14 – Image Indices L15 – Elements and Techniques of Image Interpretation L16 – Remote Sensing Data Products: Legacy Systems and Recent Developments	12



V	Unit – V: Advanced Sensing Techniques L17 – Principles and Applications of Hyperspectral Remote Sensing L18 – Field Spectrometry and Imaging Spectrometry L19 – UAV (Drone-based) Remote Sensing: Concepts and Applications L20 – Emerging Trends and Future Prospects	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Image Interpretation Exercise, Case Study, Project Work and Interaction

References	
Text Books	1. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2015) Remote Sensing and Image Interpretation, Wiley. 2. Jensen, J.R. (2016) Introductory Digital Image Processing, Pearson. 3. Campbell, J.B. and Wynne, R.H. (2011) Introduction to Remote Sensing, Guilford Press. 4. Sabins, F.F. (2007) Remote Sensing: Principles and Interpretation, Waveland Press. 5. Joseph, G. and Jagannathan, C. (2018) Fundamentals of Remote Sensing, Universities Press.
Additional Books/ Reports	1. Curran, P.J. (1985) Principles of Remote Sensing, Longman. 2. Richards, J.A. (2013) Remote Sensing Digital Image Analysis, Springer. 3. NRSC/ISRO Remote Sensing Applications Reports. 4. NASA Earth Observation and Remote Sensing Resources. 5. USGS Remote Sensing and Earth Explorer Documentation.
Multi-media	1. https://earthdata.nasa.gov/ 2. https://earthexplorer.usgs.gov/ 3. https://www.isro.gov.in/ 4. https://www.nrsc.gov.in/ 5. https://www.esa.int/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x		x	x	
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5055	Remote Sensing (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Augment knowledge and skills of image interpretation and mapping, and have experience with image processing software	Understand
CO 2	Cognize analytical workflows to derive products and extract information from remote sensing images for a broad range of applications.	Analyze
CO 3	Apply image processing and interpretation skills independently to a real-world situation.	Apply
CO 4	Develop satellite data processing and analysis skills which are helpful for the employability of the students.	Create

Syllabus:

Units	Contents	Hours
I	Visual Image Interpretation Ex 1 – Visual interpretation keys Ex 2 – Visual interpretation of satellite images Ex 3 – Introduction to stereo images and interpretation using mirror stereoscope	12
II	Digital Image Visualization: Ex 4 – Introduction to ENVI software Ex 5 – Satellite Data Visualization and Ex 6 – Exploring Metadata	12
III	Image Pre-processing: Ex 7 – Radiometric Correction Ex 8 – Atmospheric Correction Ex 9 – Geometric Correction	12
IV	Image Enhancement: Ex 10 – Contrast Enhancement Ex 11 – Image Sharpening Ex 12 – Density Slicing Ex 13 – Low Pass and High Pass Filtering	12



V	Image Classification: Ex 14 – Unsupervised Classification Ex 15 – Supervised Classification Ex 16 – Accuracy Assessment	12
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Tasks for CIA

Practical Record, Lab Exercise, Project Work, Case Study and Practical Demonstration

References

Text Books	1. Campbell, J. B., and Wynne, R. H. (2011): Introduction to Remote Sensing, 5th Edition, The Guilford Press. 2. Gibson, P., and Power, C. H. (2000): Introductory Remote Sensing: Digital Image Processing and Applications, Routledge Publisher. 3. Gonzalez, R. C., and Woods, R. E., (2007): Digital Image Processing, 3rd Edition, Prentice-Hall Inc. 4. Jensen, J. R., (2006): Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc. 5. Lillesand, T. M., and Kiefer, P. W. (2007): Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons.
Additional Books/ Reports	1. Curran, P.J. (1985) Principles of Remote Sensing, Longman. 2. Imagine (2009): Tour Guide Imagine, Leica Geosystem GIS & Mapping, Atlanta. 3. Richards, J. A., and Jia, X. (2005): Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag. 4. NRSC/ISRO Remote Sensing Applications Reports. 5. USGS Remote Sensing and Earth Explorer Documentation.
Multi-media	1. https://www.usgs.gov/ 2. https://bhuvan.nrsc.gov.in/ 3. https://earthdata.nasa.gov/ 4. https://www.esa.int/ 5. https://www.nv5geospatialsoftware.com/Support/Self-Help-Tools/Tutorials

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x		x	x	
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC01	Political Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Define the basic concepts, nature, scope and evolution of Political Geography as a sub-discipline of Geography.	Remember
CO 2	Explain the spatial dimensions of state, nation, territory, boundaries, frontiers, and geopolitical theories.	Understand
CO 3	Analyze the role of political processes, federalism, electoral behaviour, and regionalism in shaping geographic space.	Apply/Analyze
CO 4	Evaluate contemporary geopolitical issues related to resources, climate change, oceans, borders and regional cooperation with special reference to India.	Evaluate

Syllabus:

Units	Contents	Hours
I	Nature and Scope of Political Geography: L1 - Meaning, nature and scope of Political Geography L2 - Development of Political Geography: Classical to contemporary L3 - State, nation, nation-state and territoriality; Concept of sovereignty, power and space L4 - Political geography and geopolitics: similarities and differences	9
II	State, Boundaries and Frontiers: L5 - Elements of state: territory, population, government and sovereignty L6 - Concept and classification of boundaries; Frontiers and borderlands L7 - Core areas, capitals and administrative divisions L8 - Buffer states, enclaves, exclaves and geopolitical significance	9
III	Classical and Contemporary Geopolitical Theories: L9 - Friedrich Ratzel and organic theory of state L10 - Mackinder's Heartland Theory and Spykman's Rimland Theory L11 - Sea power, air power and changing geopolitical strategies L12 - Critical geopolitics and contemporary world order	9
IV	Political Processes and Electoral Geography: L13 - Geography of federalism and decentralization L14 - Political regions, regionalism and nationalism L15 - Electoral geography: Determinants of electoral behaviour: caste, religion, language, region and development L16 - Electoral reforms and delimitation in India	9



V	Contemporary Geopolitical Issues and India: L17 - Geopolitics of world resources, climate change and environmental security L18 - Geopolitics of the Indian Ocean L19 - Regional organizations: SAARC, ASEAN, OPEC and EU L20 - India's geopolitical concerns: borders, neighborhood and strategic location	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Presentation and Interaction

References

Text Books	1. Agnew, J. (2003). Geopolitics: Re-visioning World Politics. Routledge, London. 2. Glassner, M. I. and Fahrer, C. (2004). Political Geography. John Wiley & Sons, New York. 3. Jones, M., Jones, R. and Woods, M. (2015). An Introduction to Political Geography: Space, Place and Politics. Routledge, London. 4. Taylor, P. J. and Flint, C. (2011). Political Geography: World-Economy, Nation-State and Locality. Pearson Education, London. 5. Dikshit, R. D. (1999). Political Geography: A Contemporary Perspective. Tata McGraw Hill, New Delhi.
Additional Books/ Reports	1. Adhikari, S. (2004). Political Geography. Rawat Publications, Jaipur. 2. Cohen, S. B. (2015). Geopolitics: The Geography of International Relations. Rowman & Littlefield, Lanham. 3. Pounds, N. J. G. (1972). Political Geography. McGraw Hill, New York. 4. Prescott, J. R. V. (1987). Political Frontiers and Boundaries. Allen & Unwin, London. 5. Ministry of External Affairs, Government of India. Annual Reports, New Delhi. 6. Election Commission of India. Reports and statistical data on Indian elections.
Multi-media	1. https://eci.gov.in/ 2. https://www.mea.gov.in/ 3. https://www.un.org/ 4. https://www.saarc-sec.org/ 5. https://asean.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x			x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC02	Agricultural Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, nature and determinants of agricultural activities across the world	Remember
CO 2	Understand agricultural systems, land use patterns and agricultural regionalization	Understand
CO 3	Analyze agricultural productivity, food security and contemporary agricultural issues	Apply / Analyze
CO 4	Acquire practical skills to evaluate agricultural development and sustainable farming practices using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Agricultural Geography: L1 - Nature, Scope and Significance of Agricultural Geography L2 – Determinants of Agriculture: Physical, Economic and Technological Factors L3 - Types of Agricultural Systems	9
II	Agricultural Land Use and Patterns: L4 - Irrigation and Agricultural Inputs L5 - Cropping Patterns and Cropping Intensity L6 - Von Thünen's Agricultural Land Use Model L7 – Agricultural Regionalization	9
III	Agricultural Productivity and Development: L8 - Agricultural Productivity and Efficiency L9 - Green Revolution and Agricultural Transformation L10 – Issues of Commercial and Subsistence Agriculture L11 - Organic Farming and Sustainable Agricultural Practices	9
IV	Agriculture and Environment: L12 - Agriculture and Climate Change L13 – Land Degradation and Soil Conservation L14 - Food Security and Sustainable Agriculture	9



V	Agricultural Geography of India: L15 – Major Agricultural Regions of India L16 – Agricultural Policies and Rural Development in India L17 – Contemporary Issues in Indian Agriculture	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	1. Singh, J. & Dhillon, S.S. (2006): <i>Agricultural Geography</i>, Tata McGraw Hill. 2. Grigg, D.B. (1995): <i>An Introduction to Agricultural Geography</i>, Routledge. 3. Hussain, M. (2007): <i>Agricultural Geography</i>, Rawat Publications. 4. Morgan, W.B. & Munton, R.J.C. (1971): <i>Agricultural Geography</i>, Methuen. 5. Tarrant, J.R. (1974): <i>Agricultural Geography</i>, David & Charles Publishers.
Additional Books/ Reports	1. FAO (2023): <i>State of Food and Agriculture Report</i>. 2. Government of India: <i>Agricultural Statistics at a Glance</i>. 3. ICAR Reports on Sustainable Agriculture. 4. IPCC (2022): <i>Climate Change and Land Report</i>. 5. NABARD Annual Reports on Rural Development and Agriculture.
Multi-media	1. https://www.fao.org/ 2. https://agricoop.gov.in/ 3. https://icar.org.in/ 4. https://www.ipcc.ch/ 5. https://www.nabard.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X	X			X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC03	Industrial Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the factors, theories and models explaining the location, distribution and spatial organization of industries.	Understand
CO 2	Analyze the patterns of industrial regions, industrialization, globalization and regional disparities at global and Indian scales.	Analyze
CO 3	Apply theories, classification frameworks, and regional characteristics to interpret the distribution, growth, and function of industries	Apply
CO 4	Develop fundamental skills to evaluate industrial development, environmental impacts, industrial policy and contemporary industrial planning issues.	Create

Syllabus:

Units	Contents	Hours
I	Foundations of Industrial Geography: L1 - Nature and scope of Industrial Geography L2 - Classification of industries: primary, secondary, tertiary and quaternary linkages L3 - Evolution of industrial systems: cottage, small-scale, large-scale and modern industries	9
II	Industry Location and Theories: L4 - Factors of industrial location L5 - Alfred Weber's theory of industrial location L6 - Losch, Hoover and Pred's approaches to industrial location	9
III	Industrial Regions: L7 - Major industrial regions of the world L8 - Industrial agglomeration, localization, economies of scale and industrial complexes L9 - Globalization, liberalization and changing manufacturing systems	9
IV	Industrial Geography of India: L10 - Major industrial regions of India and their characteristics L11 - Iron and steel, cotton textile, petrochemical, automobile and IT industries in India L12 - Industrial policies, industrial corridors, SEZs and Make in India initiatives	9



V	Contemporary Industrial Issues and Planning: L13 - Industrial hazards, occupational risks and disaster management in industrial areas L14 - Industrial pollution, environmental degradation and sustainable industrial development L15 - Contemporary trends: automation, global value chains, circular economy and green industries	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	- Alexander, J. W. (1963). Economic Geography. Prentice-Hall, New Jersey. - Hoover, E. M. (1948). The Location of Economic Activity. McGraw-Hill, New York. - Weber, A. (1929). Theory of the Location of Industries. University of Chicago Press, Chicago. - Lloyd, P. E., & Dicken, P. (1977). Location in Space: A Theoretical Approach to Economic Geography. Harper & Row, London. - Chapman, K., & Walker, D. (1991). Industrial Location: Principles and Policies. Basil Blackwell, Oxford.
Additional Books/ Reports	- Bale, J. (1981). The Location of Manufacturing Industry. Oliver & Boyd, Edinburgh. - Hayter, R. (1997). The Dynamics of Industrial Location: The Factory, the Firm and the Production System. John Wiley & Sons, Chichester. - Yusuf, S. & Nabeshima, K. (2010). Changing the Industrial Geography in Asia: The Impact of China and India. The World Bank, Washington D C. - Siddhartha, K., & Mukherjee, S. (2016). Economic Geography: Theories, Processes and Patterns. Kishalaya Publications, New Delhi. - Government of India. Economic Survey, Annual Reports of Ministry of Commerce and Industry, and Industrial Policy documents.
Multi-media	https://dpiit.gov.in/ https://www.commerce.gov.in/ https://www.investindia.gov.in/ https://www.makeinindia.com/ https://www.worldbank.org/en/topic/competitiveness

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		x
CO3	x	x	x		x
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOE04	Geography of Tourism	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the spatial patterns of tourism resources, destinations, tourist flows and tourism regions at global, national and local scales.	Understand
CO 2	Analyze the role of physical, cultural, economic and infrastructural factors in the development of tourism destinations.	Analyze
CO 3	Apply knowledge of tourism factors, infrastructure, accessibility, and connectivity to interpret tourism development patterns and regional tourism circuits.	Apply
CO 4	Develop fundamental skills to assess tourism impacts, plan sustainable tourism development and interpret tourism resources using maps and geospatial tools.	Create

Syllabus:

Units	Contents	Hours
I	Foundations of Tourism Geography: L1 - Nature, scope and significance of Tourism Geography L2 - Factors affecting growth and nature of tourism L3 – Types and forms of tourism	9
II	Tourism Resources, Infrastructure and Regional Patterns: L4 - Tourism resources: natural, cultural, historical and recreational resources; Geographical Parameters of Tourism by Robinson L5 - World tourism regions and major international tourism flows L6 – Tourism infrastructure: transport, accommodation, amenities and support services	9
III	Tourism Development, Impact and Planning: L7 - Accessibility, connectivity and location factors in tourism development L8 - Economic, socio-cultural and environmental impacts of tourism; impact of globalization on tourism L9 – Sustainable tourism, Responsible and community-based tourism	9
IV	Tourism in India: L10 - Major tourism circuits, regions and emerging destinations L11 - National Tourism Policy; Incredible India Tourism L12 - Case Studies of Himalaya, Desert, Coast and islands	9



V	Contemporary Issues and Recent Trends L13 – Over tourism, seasonality, disaster and tourism resilience L14 –Heritage conservation, environmental ethics and sustainable development goals in tourism L15 – Application of remote sensing and GIS in tourism	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	1. Bhatia, A. K. (2012). Tourism Development: Principles and Practices. Sterling Publishers, New Delhi. 2. Boniface, B., Cooper, C. & Cooper, R. (2016). Worldwide Destinations: The Geography of Travel and Tourism. Routledge, London. 3. Hall, C. M. & Page, S. J. (2014). The Geography of Tourism and Recreation: Environment, Place and Space. Routledge, London. 4. Pearce, D. G. (1987). Tourism Today: A Geographical Analysis. Longman, Harlow. 5. Williams, S. (2009). Tourism Geography: A New Synthesis. Routledge, London.
Additional Books/ Reports	1. Kamra, K. K. & Chand, M. (2006). Basics of Tourism: Theory, Operation and Practice. Kanishka Publishers, New Delhi. 2. Seth, P. N. (1999). Successful Tourism Management. Sterling Publishers, New Delhi. 3. Raj, R. & Morpeth, N. D. (2007). Religious Tourism and Pilgrimage Management. CABI, Wallingford. 4. Ministry of Tourism, Government of India. Annual Reports and Tourism Statistics, New Delhi. 5. UNWTO. Tourism Highlights and related reports, Madrid.
Multi-media	1. https://tourism.gov.in/ 2. https://www.unwto.org/ 3. https://www.incredibleindia.gov.in/ 4. https://whc.unesco.org/ 5. https://www.undp.org/publications/tourism-and-sustainable-development-goals-journey-2030

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - V					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOIN01	Internship	-	-	-	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the organizational structure, professional practices and work environment related to Geography and Geospatial Sciences	Understand
CO 2	Apply theoretical knowledge, technical skills and geospatial tools to perform assigned tasks and solve real-world problems	Apply
CO 3	Analyze workplace experiences, field observations and project outputs to evaluate professional practices and challenges	Analyze
CO 4	Develop professional competencies, communication skills and project reports through experiential learning and reflective practice	Create

Instructions:

1. After completing the first two semesters, students may undergo an internship in outside institution/industry/NGO with a mandate to work as a member of a research group in a project in close association with the external expert.
2. The students shall apply for the internship in consultation with their mentors during the winter/summer break. The minimum period of internship shall be ten days.
3. Getting Attendance/Internship completion Certificate from the host institution is mandatory.
4. The students need to submit a report (maximum of 10 pages) covering the aspects of a) industry/organization background, customs and practices b) intern duties and individual responsibility c) professional skills gathered and d) usefulness and career networking. The report shall be graded following the rubrics given.



Rubrics for Evaluation

Component	Criteria	Weight
Institution	Reputation/relevance of the institution	20
Report	Professional skills gathered	40
	Neatness and structure of the report	30
	Plagiarism	10
Total		100

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x	x	x
CO2	x		x	x	x
CO3	x	x		x	x
CO4				x	x



SYLLABUS

SEMESTER - VI



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5061	Oceanography	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the fundamental concepts, processes and components of oceanography and marine environments.	Understand
CO 2	Apply oceanographic techniques and knowledge to interpret marine processes, ocean circulation and coastal systems.	Apply
CO 3	Analyze ocean resources, marine ecosystems and environmental issues associated with oceans and coasts.	Analyze
CO 4	Develop sustainable perspectives for marine resource management and coastal environmental conservation.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Oceanography: L1 – Nature, Scope and Branches of Oceanography L2 – Origin and Evolution of Oceans L3 – Distribution of Oceans and Seas L4 – Configuration and Relief of the Ocean Floor; Major Ocean Reliefs	12
II	Physical Properties and Marine Resources: L5 – Temperature of Ocean Water and Heat Budget L6 – Salinity and Density of Ocean Water L7 – Marine Resources: Biotic and Abiotic L8 – Conservation and Sustainable Utilization of Marine Resources	12
III	Ocean Circulation: L9 – Ocean Water Movements: Waves and Tides L10 – Ocean Currents: Causes and Characteristics L11 – Currents of the Atlantic, Pacific and Indian Oceans L12 – Surface and Deep Ocean Circulation	12
IV	Coastal and Marine Ecosystems: L13 – Coastal Ecosystems and Ocean Habitats L14 – Mangroves, Coral Reefs and Estuarine Systems L15 – Marine Pollution and Environmental Degradation L16 – Natural and Anthropogenic Impacts on Marine Ecosystems	12



V	Applied Oceanography and Emerging Trends: L17 – Ocean-Atmosphere Interaction and Climate Change L18 – Fisheries, Coastal Zone Management and Blue Economy L19 – Remote Sensing and GIS Applications in Oceanography L20 – Deep Sea Exploration and Contemporary Oceanographic Research	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Project Work, Field Observation and Interaction

References

Text Books	1. Pinet, P.R. (2012) Invitation to Oceanography, Jones & Bartlett Learning. 2. Sharma, R.C. and Vatal, M. (1970) Oceanography for Geographers, Chaitanya Publishing House. 3. Stewart, R. (2009) Introduction to Physical Oceanography, Orange Grove Books. 4. Thurman, H.V. and Trujillo, A.P. (2013) Introductory Oceanography, Pearson. 5. Strahler, A.H. and Strahler, A.N. (2001) Modern Physical Geography, Wiley.
Additional Books/ Reports	1. Waugh, D. (2005) Geography: An Integrated Approach, Nelson Thornes. 2. NOAA Ocean and Coastal Resources Reports. 3. UNESCO Intergovernmental Oceanographic Commission Reports. 4. National Institute of Oceanography (India) Publications. 5. IPCC Special Reports on Oceans and Cryosphere.
Multi-media	1. https://oceanservice.noaa.gov/ 2. https://www.noaa.gov/ 3. https://ioc.unesco.org/ 4. https://www.nio.res.in/ 5. https://earthdata.nasa.gov/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x		x	
CO3	x	x	x		x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5062	Regional Planning and Development	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, principles and approaches of regional planning and development	Remember
CO 2	Understand regional disparities, planning strategies and development theories	Understand
CO 3	Analyze regional planning models, policies and sustainable development issues	Apply / Analyze
CO 4	Acquire practical skills to evaluate regional planning programmes and development strategies using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Regional Planning: L1 - Nature, Scope and Significance of Regional Planning L2 - Concept of Region and Regionalization L3 - Types of Planning Regions	12
II	Regional Development Theories: L4 - Growth Pole Theory L5 - Core-Periphery Theory L6 - Cumulative Causation Theory L7 - Balanced and Unbalanced Regional Development	12
III	Regional Disparities and Planning: L8 - Regional Imbalances in India L9 - Rural and Urban Regional Development L10 - Backward Region Development Programmes L11 - Decentralized and Participatory Planning	12
IV	Regional Planning Approaches: L12 - Sustainable Regional Development L13 - Metropolitan and Rural Planning L14 - Role of GIS and Remote Sensing in Regional Planning L15 - Regional Planning Agencies in India	12



V	Contemporary Issues in Regional Development: L16 - Regionalization and Globalization L17 - Environmental and Social Issues in Regional Planning L18 - Smart Regions and Future Planning Perspectives	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Misra, R.P. & Sundaram, K.V. (2000): <i>Regional Planning: Concepts, Techniques, Policies and Case Studies</i> , Concept Publishing Company. 2. Chand, M. & Puri, V.K. (2010): <i>Regional Planning in India</i> , Allied Publishers. 3. Friedman, J. & Alonso, W. (1964): <i>Regional Development and Planning</i> , MIT Press. 4. Glasson, J. (1992): <i>An Introduction to Regional Planning</i> , Routledge. 5. Gore, C. (1984): <i>Regions in Question: Space, Development Theory and Regional Policy</i> , Methuen.
Additional Books/ Reports	1. NITI Aayog (Latest Edition): <i>India Development Reports</i> . 2. Government of India: <i>Five Year Plan and Regional Development Reports</i> . 3. UNDP (2023): <i>Human Development Report</i> . 4. World Bank (2022): <i>World Development Report</i> . 5. Ministry of Rural Development, Government of India Reports.
Multi-media	1. https://www.niti.gov.in/ 2. https://rural.nic.in/ 3. https://hdr.undp.org/ 4. https://www.worldbank.org/ 5. https://www.moef.gov.in/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x				
CO2	x	x		x	x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5063	Geographic Information Science	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the theoretical foundations, components and frameworks of Geographic Information Science.	Understand
CO 2	Apply geospatial data models, coordinate systems and database concepts for spatial problem solving.	Apply
CO 3	Analyze spatial datasets using GIS analytical techniques and geospatial models.	Analyze
CO 4	Develop geospatial outputs and project-based solutions using GIS tools and spatial analysis methods.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Geographic Information Science: L1 – Concepts, Elements and Evolution of GIS L2 – Theoretical Models and Representation of Geographic Data L3 – Spatial Data and Spatial Data Infrastructure	9
II	Spatial Reference Systems and Data Management: L4 – Spatial Referencing: Coordinate Systems, Datum and Map Projections L5 – Spatial and Attribute Data; Input and Digitization L6 – GIS Databases: Data Quality, Accuracy and Precision	9
III	Spatial Data Models and Geodatabases: L7 – Vector and Raster Data Models L8 – Tessellations and Topology Concepts L9 – Geodatabase Components and Types	9
IV	Spatial Analysis Techniques: L10 – Spatial Queries and Map Algebra L11 – Neighborhood, Proximity and Overlay Analysis: Raster and Vector Approaches L12 – Interpolation and Network Analysis	9



V	Web GIS and Emerging Applications: L13 – Web GIS: Concepts and Applications L14 – Geovisualization and GIS Output Presentation L15 – Open-source GIS Platforms and Spatial Decision Support	9
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Tasks for CIA

Internal Tests, Assignment, Seminar, Spatial Analysis Exercise, Practical Demonstration and Interaction

References

Text Books	1. Burrough, P.A. and McDonnell, R.A. (1998) Principles of Geographic Information Systems, Oxford University Press. 2. Chang, K.T. (2006) Introduction to Geographic Information Systems, Tata McGraw-Hill. 3. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005) Geographic Information Systems and Science, Wiley. 4. Heywood, I., Cornelius, S. and Carver, S. (2004) An Introduction to Geographical Information Systems, Pearson Education. 5. DeMers, M.N. (1999) Fundamentals of Geographic Information Systems, John Wiley & Sons.
Additional Books/ Reports	1. Huisman, O. and de By, R.A. (2009) Principles of Geographic Information Systems, ITC. 2. Konecny, G. (2014) Geoinformation: Remote Sensing, Photogrammetry and GIS, CRC Press. 3. Maguire, D.J., Goodchild, M.F. and Rhind, D.W. (1991) Geographic Information Systems, Longman. 4. QGIS Documentation and User Guides. 5. ESRI GIS Learning Resources and Spatial Analysis Tutorials.
Multi-media	1. https://qgis.org/en/site/ 2. https://www.esri.com/training/ 3. https://www.gislounge.com/ 4. https://earthdata.nasa.gov/ 5. https://www.usgs.gov/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1			X		X
CO2		X	X		X
CO3			X	X	X
CO4	X		X		X



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5064	GIS (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts of geodatabases, spatial data structures, coordinate systems and spatial referencing in GIS.	Understand
CO 2	Use GIS software to do georeferencing, digitization, symbolization, layout of map and spatial analysis	Apply
CO 3	Analyze spatial and attribute data using GIS techniques, including data integration, coordinate transformation and spatial aggregation.	Analyze
CO 4	Develop GIS based analytical workflow for the spatial analysis to solve environmental and societal problems	Create

Syllabus:

Units	Contents	Hours
I	Structuring Geographic Data: Ex 1 – Building Geodatabase Ex 2 – Create Feature Class, Fields and Domains	12
II	Explore spatial and attribute data: Ex 3 – Joining and Relating the Attributes Ex 4 – Field Calculator, Feature Geometry Tools and Spatial Data Aggregation	12
III	Spatial referencing: Ex 5 – Custom Coordinate System and Coordinate Transformations Ex 6 – Georeference a Raster Image	12
IV	Digitizing and Editing Geographic Data: Ex 7 – Digitize point, line and polygon Features Ex 8 – Exploring Advanced Editing Tools	12
V	Map Symbolization and Layouting : Ex 9 – Symbolizing Geographic Data Ex 10 – Creating Map Layouts	12



Tasks for CIA
Exercise, GIS Project Work, Practical Demonstration and Interaction

References	
Text Books	1. Burrough, P.A. and McDonnell, R.A. (1998) Principles of Geographic Information Systems, Oxford University Press. 2. Chang, K.T. (2006) Introduction to Geographic Information Systems, Tata McGraw-Hill. 3. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005) Geographic Information Systems and Science, Wiley. 4. Heywood, I., Cornelius, S. and Carver, S. (2004) An Introduction to Geographical Information Systems, Pearson Education. 5. DeMers, M.N. (1999) Fundamentals of Geographic Information Systems, John Wiley & Sons.
Additional Books/ Reports	1. Allen, D. W. (2011): GIS Tutorial 2: Spatial Analysis Workbook for ArcGIS10, ESRI Press. 2. Allen D. W. and Coffey, J. M. (2011): GIS Tutorial 3: Advanced Workbook for ArcGIS10, ESRI Press. 3. Willpen L. G., and Kurland, K. S. (2011): GIS Tutorial 1: Basic Workbook for ArcGIS10, ESRI Press. 4. QGIS Documentation and User Guides. 5. ESRI GIS Learning Resources and Spatial Analysis Tutorials.
Multi-media	1. https://qgis.org/en/site/ 2. https://www.esri.com/training/ 3. https://www.gislounge.com/ 4. https://earthdata.nasa.gov/ 5. https://www.usgs.gov/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2			x	x	x
CO3	x	x	x		x
CO4			x		x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5065	Map Interpretation (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the basic principles of topographical map interpretation, and the spatial characteristics of physical and cultural features.	Understand
CO 2	Interpret drainage, settlement, transport, agricultural, forest and land use features from Survey of India topographical sheets	Apply
CO 3	Analyze spatial relationships among physical and cultural features through map-based observation and inference	Analyze
CO 4	Prepare integrated topographical interpretation reports with suitable sketches, notes and practical record presentation	Create

Syllabus:

Units	Contents	Hours
I	Physical Features Ex 1 – Identification of Drainage Patterns Ex 2 – Interpretation of Landforms	12
II	Settlement and Transport Ex 3 – Identification of Rural Settlement Patterns and Urban Morphology Ex 4 – Transport Connectivity and Accessibility Analysis	12
III	Irrigation and Agriculture Resources Ex 5 – Identification of Irrigation and Water Resource Features Ex 6 – Interpretation of Agriculture Crops and Land Use	12
IV	Land Use and Forest Resources Ex 7 – Interpretation of Forest Resources Ex 8 – Land Use/Land Cover Mapping	12
V	Integrated Interpretation Ex 9 – Interpretation of Toposheet with the Satellite Image Ex 10 – Interpretation of Toposheet with the Online Data	12



Tasks for CIA
Interpretation Exercise, Practical Demonstration and Interaction

References	
Text Books	1. Monkhouse, F. J. and Wilkinson, H. R. (1994) Maps and Diagrams, Methuen, London. 2. Singh, R. L. and Dutt, P. K. (1979) Elements of Practical Geography, Kalyani Publishers, New Delhi. 3. Sarkar, A. K. (1997) Practical Geography: A Systematic Approach, Oriental Longman, Kolkata. 4. Mishra, R. P. and Ramesh, A. (1986) Fundamentals of Cartography, Concept Publishing Company, New Delhi. 5. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Guptill, S. C. (1995) Elements of Cartography, John Wiley & Sons, New York.
Additional Books/ Reports	1. Raisz, E. (1962) Principles of Cartography, McGraw-Hill, New York. 2. Kraak, M. J. and Ormeling, F. (2020) Cartography: Visualization of Geospatial Data, CRC Press, Boca Raton. 3. Survey of India (latest available) Conventional Signs and Symbols and Topographical Sheet Guidelines, Government of India. 4. National Atlas and Thematic Mapping Organisation (NATMO) (latest available) Atlas and Thematic Mapping Resources, Government of India. 5. Tyner, J. A. (2015) The World of Maps: Map Reading and Interpretation for the 21st Century, Guilford Press, New York.
Multi-media	1. https://surveyofindia.gov.in/ 2. https://onlinemaps.surveyofindia.gov.in/ 3. https://bhuvan.nrsc.gov.in/ 4. https://www.usgs.gov/programs/national-geospatial-program/topographic-maps 5. https://qgis.org/en/site/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2	x		x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5066	Field Survey - II	-	-	-	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the methods and significance of geography field survey.	Understand
CO 2	Analyze physical, environmental and socio-cultural features through field observations.	Analyze
CO 3	Apply field survey techniques to observe and identify landforms, natural resources, ecosystems, pollution sources and cultural features.	Apply
CO 4	Develop scientific field reports with interpretation of physical landforms, environmental issues and cultural features.	Create

Syllabus:

Units	Contents
I	Fundamentals of Field Survey: Ex-1 Methods of Field Survey Ex-2 Pre-field Planning
II	Geomorphological Observation: Ex-3 Identification of Landforms and Environmental Features Ex-4 Observation of Water and Soil Resources
III	Climate and Environmental Observation: Ex-5 Understand of Climate and its Influence on Man and Environment Ex-6 Vegetation Survey and Ecosystem Observation
IV	Social and Cultural Observation: Ex-7 Observation of Settlement and Land Use Patterns Ex-8 Identification of Unique Socio-Cultural Aspects
V	Field Report: Ex-9 Preparation of Field Note/Diary Ex-10 Preparation of Field Report

Note: Students shall complete the field survey-II with a minimum duration of five days and submit the report, before the end of sixth semester.



Rubrics for Evaluation:

Component	Criteria	Weight
Field (40%)	Involvement in pre-field work planning	10
	Active participation in the field work	20
	Field diary, observation and data collection	10
Report (40%)	Observations - Physical aspects	10
	Observations - Human and socio-economic aspects	10
	Field photographs / sketches / maps	10
	Neatness and structure of the report	10
Presentation (20%)	Documentation and Presentation skills	10
	Plagiarism	5
	Q&A	5
Total		100

References	
Text Books	1. Clifford, N. S. French and G. Valentine (2010). Key Methods in Geography, Sage, London. 2. Flowerdew, R. and Martin, D., (2005) Methods in Human Geography: A Guide for Students Doing a Research Project (2nd edition), Pearson Education, Harlow. 3. Stoddart, R. (1982). Field Techniques and Research Methods in Geography, University of Nebraska, Lincoln.
Additional Books/ Reports	1. Bryman, A., (2016) Social Research Methods (5th edition), Oxford University Press, Oxford. 2. Chambers, R., (1994) Participatory Rural Appraisal (PRA): Challenges, Potentials and Paradigm, World Bank Publications. 3. Creswell, J.W., (2014) Research Design: Qualitative, Quantitative and Mixed Methods Approaches, Sage Publications, USA.

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOE05	Geostatistics	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, methods and importance of statistical techniques in geographical studies	Understand
CO 2	Apply statistical and geostatistical techniques to analyze geographical, spatial and temporal data.	Apply
CO 3	Analyze geographical data using statistical techniques and geospatial tools	Analyze
CO 4	Acquire practical skills to interpret, represent and evaluate spatial data for geographical research	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Statistics: L1 - Nature, Scope and Significance of Geostatistics L2 – Types and Sources of Geographical Data L3 - Measures of Central Tendency and Dispersion	9
II	Inferential Statistics: L4 - Probability Concepts and Distributions L5 - Univariate Analysis L6 - Bivariate Analysis L7 - Multivariate Analysis	9
III	Spatial Statistics: L8 - Spatial Continuity Analysis L9 – Random variables and stochastic processes L10 – Variograms and covariance functions L11 – Geostatistical (Probabilistic) Estimation; Cross-validation and error analysis	9
IV	Time Series Analysis: L12 - Components of time series analysis: trend, cycle, seasonal, irregular L13 - Spatio-temporal Geostatistics L14 - Spatial Autocorrelation	9



V	Applications of Geostatistics: L15 – Geostatistics in Environmental Studies L16 – Spatial Techniques in Population and Health Studies L17 – Contemporary Trends in Geostatistics	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Gregory, S. (2010): <i>Statistical Methods and the Geographer</i> , Sage Publications. 2. Rogerson, P.A. (2019): <i>Statistical Methods for Geography</i> , Sage Publications. 3. Ebdon, D. (1985): <i>Statistics in Geography</i> , Blackwell. 4. Hammond, R. & McCullagh, P.S. (1978): <i>Quantitative Techniques in Geography: An Introduction</i> , Oxford University Press. 5. Fotheringham, A.S., Brunson, C. & Charlton, M. (2000): <i>Quantitative Geography</i> , Sage Publications.
Additional Books/ Reports	1. ESRI (2023): <i>GIS and Spatial Analysis Reports</i> . 2. Government of India: <i>National Spatial Data Infrastructure Reports</i> . 3. ISRO-Bhuvan Geospatial Data Reports. 4. United Nations Geospatial Information Reports. 5. Census of India Data and Statistical Handbooks.
Multi-media	1. https://www.esri.com/ 2. https://bhuvan.nrsc.gov.in/ 3. https://www.un.org/geospatial/ 4. https://censusindia.gov.in/ 5. https://www.qgis.org/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC06	Transport Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand transport networks, modes, flows, accessibility, connectivity and their relationship with economic and social processes.	Understand
CO 2	Analyze transport theories, spatial interaction models, network measures and transport patterns at global and Indian scales.	Analyze
CO 3	Apply theories, models, and measurement techniques to interpret transport systems and spatial linkages.	Apply
CO 4	Develop fundamental skills to evaluate contemporary transport issues, planning strategies, environmental concerns and sustainable mobility systems.	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Transport Geography: L1 - Nature, scope and development of Transport Geography L2 - Concepts of accessibility, mobility, and connectivity L3 – Transportation and spatial structure: linkages, nodes and hinterlands	6
II	Transport Modes: L4 - Land transport: roads, railways and pipelines L5 - Water transport: inland waterways, sea routes and ports L6 – Air transport: airports, air routes and global connectivity	6
III	Transport Networks and Spatial Interaction: L7 - Network structure and hierarchies L8 - Measurement of connectivity; Graph theoretic measures: gamma and alpha index L9 - Measurement of accessibility; accessibility and shortest-path matrix L10 – Allocation and Gravity models; Ullman's triad	12
IV	Transportation and Regional Development: L11 - Role of transport in regional development and spatial integration L12 - Urban transport systems and challenges in India L13 - Transport corridors, logistics parks and national infrastructure initiatives L14 - Transport and environmental impacts (emissions, noise, land use)	12



V	Transport Planning and Recent Trends: L15 – Transport cost, distance decay and least-cost route concepts L16 - Public transport planning and policy L17 – Application of GIS and GNSS in transport planning	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Hoyle, B. S., & Knowles, R. D. (1998). Modern Transport Geography. John Wiley & Sons, Chichester. 2. Hurst, M. E. E. (1974). Transportation Geography: Comments and Readings. McGraw-Hill, New York. 3. Rodrigue, J. P., Comtois, C., & Slack, B. (2017). The Geography of Transport Systems. Routledge, New York. 4. Taaffe, E. J., Gauthier, H. L., & O'Kelly, M. E. (1996). Geography of Transportation. Prentice Hall, New Jersey. 5. White, H. P., & Senior, M. L. (1983). Transport Geography. Longman, London.
Additional Books/ Reports	1. Black, W. R. (2003). Transportation: A Geographical Analysis. Guilford Press, New York. 2. Button, K. J. (2010). Transport Economics. Edward Elgar, Cheltenham. 3. Knowles, R., Shaw, J., & Docherty, I. (2008). Transport Geographies: Mobilities, Flows and Spaces. Blackwell, Oxford. 4. Raza, M., & Aggarwal, Y. P. (1986). Transport Geography of India. Concept Publishing Company, New Delhi. 5. Government of India. Annual Reports of Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Ports, Shipping and Waterways, and Ministry of Civil Aviation.
Multi-media	1. https://morth.nic.in/ 2. https://indianrailways.gov.in/ 3. https://shipmin.gov.in/ 4. https://www.civilaviation.gov.in/ 5. https://www.nhai.gov.in/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		x
CO3	x	x	x		x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC07	Spatial Decision Support System	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, components and applications of Spatial Decision Support Systems in geographical problem solving	Understand
CO 2	Apply spatial database and geospatial techniques for spatial analysis and decision-making.	Apply
CO 3	Analyze spatial models and evaluate decision alternatives for environmental and regional planning.	Analyze / Evaluate
CO 4	Design simple SDSS-based solutions for resource management and sustainable development.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Spatial Decision Support Systems (SDSS): L1 - Concepts, Evolution and Components of SDSS L2 - Spatial Data Models and Spatial Databases L3 - Decision-Making Process and Decision Support Frameworks	9
II	GIS and Spatial Analysis for Decision Support: L4 - Spatial Data Query and Management L5 - Multi-Criteria Decision Analysis (MCDA) in GIS L6 – Location-based Allocation Modelling	9
III	Suitability Analysis: L7 - GPS, DEM and Web-based Geospatial Data L8 - Spatial Modelling and Suitability Analysis L9 - Big Data and Cloud-based Geospatial Platforms	9
IV	Applications of SDSS: L10 - Urban and Regional Planning L11 - Disaster Risk Reduction and Environmental Management L12 - Agricultural and Water Resource Management	9



V	Contemporary Trends and Case Studies: L13 - Smart Cities and Geospatial Decision Systems L14 - Participatory GIS and Collaborative Decision-Making L15 - Case Studies on Sustainable Development and Spatial Planning	9
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction, Project Presentation

References	
Text Books	1. Burrough, P.A. and McDonnell, R.A. (2015) Principles of Geographical Information Systems, Oxford University Press. 2. Malczewski, J. (1999) GIS and Multicriteria Decision Analysis, John Wiley & Sons. 3. Aronoff, S. (2005) Geographic Information Systems: A Management Perspective, WDL Publications. 4. Chang, K.T. (2018) Introduction to Geographic Information Systems, McGraw Hill. 5. Longley, P., Goodchild, M., Maguire, D. and Rhind, D. (2015) Geographic Information Science and Systems, Wiley.
Additional Books/ Reports	1. Eastman, J.R. (2016) IDRISI and GIS Applications, Clark Labs. 2. Heywood, I., Cornelius, S. and Carver, S. (2011) An Introduction to Geographical Information Systems, Pearson. 3. Tomlinson, R. (2013) Thinking About GIS: Geographic Information System Planning for Managers, ESRI Press. 4. Goodchild, M.F. and Janelle, D.G. (2004) Spatially Integrated Social Science, Oxford University Press. 5. United Nations (2023) Geospatial Information for Sustainable Development Goals Report.
Multi-media	1. https://www.esri.com/en-us/what-is-gis/overview 2. https://www.qgis.org/en/site/ 3. https://www.usgs.gov/centers/wetland-and-aquatic-research-center/science/usgs-geographic-information-systems-gis 4. https://www.un-spider.org/ 5. https://www.sdsconsortium.org/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x		x		
CO2	x	x	x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC08	Open Source GIS	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the architecture, components and ecosystem of Open Source GIS platforms and geospatial databases.	Understand
CO 2	Apply open-source geospatial tools for spatial data processing, analysis and cartographic visualization.	Apply
CO 3	Analyze spatial patterns and geographic problems using advanced Open Source GIS techniques and spatial models.	Analyze
CO 4	Develop geospatial solutions and thematic outputs for environmental and socio-economic applications using Open Source GIS.	Create

Syllabus:

Units	Contents	Hours
I	Open Source GIS Environment: L1 – Evolution and Philosophy of Open Source GIS L2 – Open Geospatial Consortium (OGC) Standards L3 – Open Source GIS Platforms: QGIS, GRASS GIS and SAGA GIS L4 – Installation, Plugins and Customization in QGIS	9
II	Geospatial Data Management: L5 – Spatial Data Formats and Metadata Standards L6 – Spatial Databases: PostgreSQL and PostGIS L7 – Georeferencing and Coordinate Transformation L8 – Open Street Map and Crowd sourced Geographic Data	9
III	Spatial Analysis using Open Source GIS: L9 – Raster and Vector Data Processing L10 – Terrain Analysis and Digital Elevation Models L11 – Overlay, Buffer and Network Analysis L12 – Spatial Statistics and Geoprocessing Models	9
IV	Web GIS and Geospatial Applications: L13 – Introduction to Web GIS and GeoServer L14 – Web Mapping using Leaflet and OpenLayers L15 – Open Source GIS for Environmental and Disaster Management L16 – Mobile GIS and Field Data Collection Applications	9



V	Open Source GIS Project Applications: L17 – Land Use / Land Cover Mapping L18 – Spatial Decision Support System L19 – Open Source GIS for Urban and Rural Planning L20 – Case Studies using Open Source GIS	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Practical Exercise, GIS Lab Work, Project, Case Study, Interaction

References

Text Books	1. Neteler, M. and Mitasova, H. (2008) Open Source GIS: A GRASS GIS Approach, Springer. 2. Sherman, G. (2008) Desktop GIS: Mapping the Planet with Open Source Tools, Pragmatic Bookshelf. 3. Steiniger, S. and Hunter, A.J.S. (2013) The 2012 Free and Open Source GIS Software Map – A Guide to Facilitate Research, Development and Adoption. 4. Chang, K.T. (2018) Introduction to Geographic Information Systems, McGraw Hill Education. 5. Bolstad, P. (2019) GIS Fundamentals: A First Text on Geographic Information Systems, XanEdu Publishing.
Additional Books/ Reports	1. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2015) Geographic Information Systems and Science, Wiley. 2. Burrough, P.A. and McDonnell, R.A. (1998) Principles of Geographical Information Systems, Oxford University Press. 3. QGIS Documentation Project (Latest Edition), Official QGIS Training Manual. 4. Open Source Geospatial Foundation (OSGeo) Documentation and Resources. 5. United Nations Geospatial Information Section Reports on Open Geospatial Technologies.
Multi-media	1. https://qgis.org/en/site/ 2. https://grass.osgeo.org/ 3. https://saga-gis.sourceforge.io/en/index.html 4. https://postgis.net/ 5. https://www.osgeo.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x		x		
CO2	x		x	x	x
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC13	Urban Planning and Sustainability	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, principles and approaches of urban planning and sustainability	Understand
CO 2	Examine urbanization processes, urban land use and environmental challenges in growing cities	Analyze
CO 3	Apply geospatial and planning tools for sustainable urban development and management	Apply
CO 4	Develop planning perspectives for inclusive, resilient and sustainable urban systems	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Urban Planning and Sustainability: L1 - Concepts and Evolution of Urban Planning L2 - Urbanization Trends, Patterns and Processes L3 - Urban Governance and Planning Institutions L4 - Sustainable Development and Sustainable Cities	12
II	Urban Structure and Land Use Planning: L5 - Urban Land Use Models and Internal Structure of Cities L6 - Master Plans, Zoning and Urban Land Management L7 - Housing, Slums and Informal Settlements L8 - Transportation and Urban Infrastructure	12
III	Urban Environment and Sustainability: L9 - Urban Population Growth and Environmental Problems L10 - Waste Management and Urban Resource Efficiency L11 - Urban Green Spaces and Ecosystem Services L12 - Disaster Risk Reduction and Urban Resilience	12
IV	Geospatial Technologies in Urban Planning: L13 - GIS and Remote Sensing Applications in Urban Planning L14 - Smart Cities and Digital Urban Governance L15 - Spatial Decision Support Systems for Urban Management	12



V	Contemporary Issues and Case Studies: L16 - Sustainable Urban Mobility and Inclusive Planning L17 - Urban Policies and Sustainable Development Goals (SDGs) L18 - Case Studies of Sustainable Urban Planning in India and Abroad	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Project Report, Urban Planning Case Study

References	
Text Books	1. Hall, P. (2014) Cities of Tomorrow: An Intellectual History of Urban Planning and Design, Wiley Blackwell. 2. Pacione, M. (2009) Urban Geography: A Global Perspective, Routledge. 3. Carter, H. (2016) The Study of Urban Geography, Arnold Publishers. 4. Levy, J.M. (2016) Contemporary Urban Planning, Routledge. 5. Singh, R.B. (Ed.) (2015) Urban Development Challenges, Risks and Resilience in Asian Mega Cities, Springer.
Additional Books/ Reports	1. UN-Habitat (2022) World Cities Report. 2. Moughtin, C. (2003) Urban Design: Green Dimensions, Routledge. 3. Banerjee-Guha, S. (2010) Accumulation by Dispossession: Transformative Cities in the New Global Order, Sage. 4. OECD (2020) Cities in the World: A New Perspective on Urbanisation. 5. Government of India (2015) Smart Cities Mission Guidelines.
Multi-media	1. https://unhabitat.org/ 2. https://niua.in/project-details/Smartnet 3. https://sdgs.un.org/goals 4. https://www.esri.com/en-us/arcgis/products/arcgis-urban/overview 5. https://worldbank.org/en/topic/urbandevelopment

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x		x	
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC14	Applied Geomorphology	3	1	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the significance of applied geomorphology in landform analysis and environmental problem solving.	Remember
CO 2	Understand the application of geomorphic processes and terrain characteristics in resource and hazard assessment.	Understand
CO 3	Analyze fluvial and coastal geomorphic processes for environmental management, land use planning and infrastructure development.	Apply / Analyze
CO 4	Evaluate landform dynamics using field information, maps, remote sensing, GIS and DEM-based techniques.	Evaluate

Syllabus:

Units	Contents	Hours
I	Introduction to Applied Geomorphology: L1 - Geomorphic systems approach: Process-form relationship L2 - Geomorphic mapping: concepts, scales, symbols and interpretation L3 - Terrain evaluation: relief, slope, aspect, lithology, structure and drainage T1 - Field, laboratory and geospatial data sources in applied geomorphology	12
II	Fluvial Geomorphology: L4 - River processes: erosion, transportation, deposition L5 - Modifications in river flow and channel adjustment L6 - Dynamics of river terraces and floodplains T2 - Sampling river bed sediments	12
III	Delta Systems: L7 - Types, morphology and dynamics of river delta L8 - Estuaries: formation and types L9 - Estuarine circulation and mixing T3 - Granulometric analysis	12
IV	Coastal Processes: L10 - Destructional and constructional landforms in coastal regions L11 - Coastal sediment analysis: textural parameters, magnetic susceptibility and geochemistry L12 - Sea level changes and coastal subsidence T4 - Subsurface sediment sampling and textural analysis	12



V	Geospatial Techniques and Contemporary Applications: L13 – Geospatial tools in geomorphic mapping and terrain analysis L14 - DEM derivatives: slope, aspect, hill shade, curvature, profiles and terrain indices L15 - Indian case studies in applied geomorphology: river basins and coastal regions T5 - Extraction of delta features from DEM	12
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Tasks for CIA

Internal Tests, Seminar, Tutorials, Case Study, Field Observation Report and Interaction

References

Text Books	1. Cooke, R. U., & Doornkamp, J. C. (1990). Geomorphology in Environmental Management. Clarendon Press, Oxford. 2. Goudie, A. S. (2010). Geomorphological Techniques. Routledge, London. 3. Gupta, Avijith. (2011). Tropical Geomorphology. Cambridge University Press. 4. Rhoads, L. Bruce. (2020). River Dynamics-Geomorphology to Support Management. Cambridge University Press. 5. Michael A. Summerfield. (1991). Global Geomorphology – An introduction to study of landforms. Pearson Education Limited.
Additional Books/ Reports	1. Huggett, R. J. (2017). Fundamentals of Geomorphology. Routledge, London. 2. Kale, V. S., & Gupta, A. (2001). Introduction to Geomorphology. Orient Longman, Hyderabad. 3. Thornbury, W. D. (1969). Principles of Geomorphology. Wiley Eastern, New Delhi. 4. Bloom, A. L. (2004). Geomorphology: A Systematic Analysis of Late Cenozoic Landforms. Waveland Press, Illinois. 5. Schumm, S. A. (2005). River Variability and Complexity. Cambridge University Press, Cambridge.
Multi-media	1. https://www.tulane.edu/~sanelson/eens1110/streams.htm 2. https://www.sciencedirect.com/science/article/abs/pii/S0070457107100054

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x			x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC15	Environment and Sustainable Development	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, components and importance of environment and sustainable development	Remember
CO 2	Understand environmental issues, ecological processes and sustainability principles	Understand
CO 3	Analyze environmental degradation, resource management and sustainable development strategies	Apply / Analyze
CO 4	Acquire practical skills to evaluate environmental policies and sustainable practices using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Environment and Sustainable Development: L1 - Nature, Scope and Components of Environment L2 – Concept and Principles of Sustainable Development L3 - Human-Environment Relationship	12
II	Environmental Systems and Resources: L4 - Ecosystems: Structure and Functions L5 - Natural Resources and Resource Conservation L6 - Biodiversity and Environmental Management L7 – Environmental Pollution: Types and Sources	12
III	Environmental Issues and Challenges: L8 - Climate Change and Global Warming L9 - Deforestation, Desertification and Land Degradation L10 - Disaster Management and Environmental Hazards L11 - Population, Urbanization and Environmental Stress	12
IV	Sustainable Development Approaches: L12 - Sustainable Agriculture and Rural Development L13 – Sustainable Urban Development L14 - Environmental Impact Assessment (EIA) L15 - Role of GIS and Remote Sensing in Environmental Management	12



V	Environmental Policies and Global Initiatives: L16 – Environmental Laws and Policies in India L17 – Sustainable Development Goals (SDGs) L18 – International Environmental Conventions and Agreements	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Adams, W.M. (2009): <i>Green Development: Environment and Sustainability in a Developing World</i> , Routledge. 2. Singh, S. (2017): <i>Environmental Geography</i> , Prayag Pustak Bhawan. 3. Miller, G.T. & Spoolman, S. (2016): <i>Environmental Science</i> , Cengage Learning. 4. Redclift, M. (1987): <i>Sustainable Development: Exploring the Contradictions</i> , Routledge. 5. Saxena, H.M. (2013): <i>Environmental Geography</i> , Rawat Publications.
Additional Books/ Reports	1. UNEP (2023): <i>Global Environment Outlook Report</i> . 2. IPCC (2023): <i>Climate Change Assessment Report</i> . 3. United Nations (2023): <i>Sustainable Development Goals Report</i> . 4. Government of India: <i>State of Environment Report</i> . 5. World Bank (2023): <i>World Development Report on Environment and Sustainability</i> .
Multi-media	1. https://www.unep.org/ 2. https://www.ipcc.ch/ 3. https://sdgs.un.org/goals 4. https://moef.gov.in/ 5. https://www.worldbank.org/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	X	X			
CO2	X	X		X	
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - VI					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC16	Geospatial Big Data Analytics	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, sources and characteristics of geospatial big data and spatial databases.	Understand
CO 2	Apply geospatial analytical techniques and cloud-based tools for processing spatial big data.	Apply
CO 3	Analyze spatial patterns, trends and relationships using geospatial big data analytics and visualization methods.	Analyze
CO 4	Evaluate and design geospatial solutions for environmental, urban and regional planning applications using big data frameworks.	Evaluate / Create

Syllabus:

Units	Contents	Hours
I	Introduction to Geospatial Big Data: L1 – Concepts and Characteristics of Big Data in Geography L2 – Sources of Geospatial Big Data: Sensors, Social Media and IoT L3 – Spatial Data Infrastructure and Cloud Geospatial Platforms L4 – Ethical Issues and Data Governance in Big Data Analytics	12
II	Big Data Storage and Processing: L5 – Distributed Computing and Hadoop Ecosystem L6 – Spatial Databases and NoSQL Geodatabases L7 – Data Cleaning, Integration and Geospatial ETL (Extract-Transform-Load) Processes L8 – Cloud-based Geospatial Data Management	12
III	Geospatial Analytics and Modelling: L9 – Spatial Data Mining and Pattern Detection L10 – Spatio-temporal Analysis and Visualization L11 – Machine Learning Approaches in Geospatial Analytics L12 – Geospatial Predictive Modelling and Simulation	12
IV	Applications of Geospatial Big Data: L13 – Urban Analytics and Smart Cities L14 – Environmental Monitoring and Climate Analytics L15 – Disaster Risk Assessment using Big Geospatial Data L16 – Mobility Analytics and Location-based Services	12



V	Emerging Trends and Project Applications: L17 – Artificial Intelligence and Deep Learning in Geospatial Analytics L18 – Real-time Spatial Analytics and GeoAI L19 – Geospatial Dashboards and Decision Support Systems L20 – Case Studies and Project Work in Geospatial Big Data Analytics	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Practical Exercise, Data Analytics Project, Case Study, Interaction

References

Text Books	1. Miller, H.J. and Goodchild, M.F. (2015) Data-Driven Geography, GeoJournal. 2. Li, S., Dragicevic, S. and Veenendaal, B. (2011) Advances in Web-based GIS, Mapping Services and Applications, CRC Press. 3. Marr, B. (2015) Big Data: Using SMART Big Data, Analytics and Metrics to Make Better Decisions, Wiley. 4. Anselin, L. (2020) Spatial Econometrics and Big Spatial Data Analytics, Springer. 5. Kitchin, R. (2014) The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences, Sage.
Additional Books/ Reports	1. Batty, M. (2013) The New Science of Cities, MIT Press. 2. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2015) Geographic Information Systems and Science, Wiley. 3. Open Geospatial Consortium (OGC) Technical Standards and Reports. 4. United Nations Global Geospatial Information Management (UN-GGIM) Reports. 5. ESRI and NASA White Papers on Geospatial Big Data and GeoAI.
Multi-media	1. https://www.ogc.org/ 2. https://earthdata.nasa.gov/ 3. https://www.un-ggim.org/ 4. https://developers.google.com/earth-engine 5. https://www.kdnuggets.com/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x		x		
CO2	x		x	x	x
CO3	x	x	x	x	
CO4	x	x	x	x	x



SYLLABUS

SEMESTER - VII



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5071	Biogeography	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, principles and scope of biogeography and biodiversity patterns.	Understand
CO 2	Apply ecological and biogeographical concepts to interpret the distribution of flora and fauna.	Apply
CO 3	Analyze ecosystem processes, biodiversity conservation issues and human-environment interactions.	Analyze
CO 4	Develop sustainable approaches for ecosystem management and biodiversity conservation.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Biogeography: L1 – Nature, Scope and Development of Biogeography L2 – Basic Concepts: Biosphere, Ecosystem and Biomes L3 – Factors Affecting Distribution of Plants and Animals L4 – Ecological Principles and Environmental Relationships	12
II	Plant and Animal Geography: L5 – Phytogeography and Zoogeography L6 – World Distribution of Major Biomes L7 – Floristic and Faunal Regions of the World L8 – Endemism, Speciation and Migration	12
III	Ecosystem Processes and Biodiversity: L9 – Structure and Functioning of Ecosystems L10 – Food Chains, Food Webs and Energy Flow L11 – Biodiversity: Concepts, Levels and Patterns L12 – Biodiversity Hotspots and Conservation Strategies	12
IV	Human Impact and Environmental Change: L13 – Human Impact on Ecosystems and Species Distribution L14 – Deforestation, Habitat Fragmentation and Land Degradation L15 – Climate Change and Biogeographical Responses L16 – Invasive Species and Environmental Stress	12



V	Applied Biogeography and Conservation: L17 – Conservation Biogeography and Protected Areas L18 – Sustainable Ecosystem Management L19 – Geospatial Techniques in Biodiversity Assessment L20 – Case Studies in Biogeography and Conservation Planning	12
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Project Work, Field Observation and Interaction

References

Text Books	1. Lomolino, M.V., Riddle, B.R. and Whittaker, R.J. (2017) Biogeography, Sinauer Associates. 2. Cox, C.B. and Moore, P.D. (2010) Biogeography: An Ecological and Evolutionary Approach, Wiley. 3. Huggett, R.J. (2004) Fundamentals of Biogeography, Routledge. 4. Odum, E.P. and Barrett, G.W. (2005) Fundamentals of Ecology, Brooks/Cole. 5. Singh, S. (2017) Biogeography: A Geographical Perspective, Prayag Pustak Bhawan.
Additional Books/ Reports	1. MacArthur, R.H. and Wilson, E.O. (1967) The Theory of Island Biogeography, Princeton University Press. 2. UNEP Global Biodiversity Outlook Reports. 3. IUCN Red List and Conservation Reports. 4. IPBES Biodiversity and Ecosystem Services Reports. 5. Convention on Biological Diversity (CBD) Publications.
Multi-media	1. https://www.iucn.org/ 2. https://www.cbd.int/ 3. https://ipbes.net/ 4. https://earthdata.nasa.gov/ 5. https://www.unep.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x		x	x	
CO3	x	x	x		x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5072	Geography of India	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the physical and environmental setting of India, including physiographic divisions, monsoons, and natural resources.	Understand
CO 2	Analyze the development patterns in agriculture, industry, and trade and the regional disparities therein.	Analyze
CO 3	Apply concepts of geopolitical and economic strategies in understanding India's internal and external challenges	Apply
CO 4	Develop research-based interpretations, and policy-oriented solutions to resource conservation, and socio-economic challenges.	Create

Syllabus:

Units	Contents	Hours
I	Physical Environment: L1 - Major physiographic regions and their characteristics L2 - Drainage systems: Himalayan and Peninsular L3 - Indian climate: Seasonal characteristics, Monsoon, Jet Stream, climatic divisions L4 - Himalayan Cryosphere: Glaciers and permafrost zones	12
II	Natural Resources: L5 - Soil types and distribution L6 - Natural vegetation regions L7 - Mineral and Energy resources L8 - Environmental degradation- deforestation, desertification, and pollution; Resource conservation strategies and policies	12
III	Agriculture, and Industry: L9 - Cropping patterns and major food crops; Green revolution (Phases I and II) and its impact, Agro-climatic zones L10 - Livestock, poultry, fisheries, aquaculture and dry farming L11 - Industrial development: Automobile and information technology sectors; Industrial Policies, SEZs, Industrial Regions	12
IV	Population, Settlements and Cultural Aspects: L12 - Growth and distribution of population; Migration trends L13 - Population policies, problems and health indicators L14 - Rural and urban settlement types and morphology; Urbanisation: smart cities, slums and challenges L15 - Cultural diversity: religion, language, ethnicity, tribal regions	12



V	Transport, Trade, Development, and Geopolitics: L16 – Transport networks: railways, roadways, airways, waterways, pipelines L17 – Internal and external trade: composition, direction, balance of trade L18 – Regional planning and development: backward regions, Five-Year Plans, Watershed management L19 – Interstate disputes, reorganization, boundary issues; Geopolitics of South Asia and Indian Ocean realm.	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Khullar, D. R. (2018): India A Comprehensive Geography, Kalyani Publications. 2. Sharma, T.C., (2013): Economic Geography of India. Rawat Publication. 3. Singh, A., Kaushiva, P., (2014): Geopolitics of the Indo-Pacific, KW Publishers. 4. Singh, R. L., (1971): India: A Regional Geography, National Geographical Society of India. 5. Tirtha, R., (2002): Geography of India, Rawat Publications.
Additional Books/ Reports	1. Deshpande, C. D., (1992): India: A Regional Interpretation, ICSSR. 2. Menon, S., (2018): Inside the Making of India's Foreign Policy, Penguin Random House India Private Limited. 3. Singh, R. B., (2014): Urban Development Challenges, Risk & Resilience in Asian Mega Cities, Springer. 4. Singh, R. B., Schickhoff, U., and Suraj M., (Eds.) (2016): Climate Change, Glacier Response, and Vegetation Dynamics in the Himalaya, Springer. 5. Spate, O. H. K., and Learmonth A. T. A., (1967): India and Pakistan: A General and Regional Geography, Methuen.
Multi-media	1. https://www.usgs.gov/ 2. https://www.fao.org/home/en/ 3. https://moef.gov.in/ 4. https://indiawris.gov.in/wris/#/ 5. https://censusindia.gov.in/census.website/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x

SEMESTER - VII			
Course Code	Course Name	Hours / Week	Credits



		L	T	P	
GEO5073	Geographical Thought	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understanding contemporary modern views will inculcate critical thinking.	Understand
CO 2	Analyze the nature of geography as spatial science with changing space and time.	Analyze
CO 3	Apply philosophical approaches and geographical perspectives to interpret spatial phenomena, regional patterns, and contemporary issues in geography.	Apply
CO 4	Develop both inductive and deductive reasoning to attain holistic thinking about geographic systems.	Create

Syllabus:

Units	Contents	Hours
I	Evolution of Geographic Thought: L1 - Early Origins of Geographical Thinking: Greek and Roman Geographers L2 – Development of Medieval Geography: Arab geographers L3 - Development of geographical thought during Dark Age	12
II	Development of Modern Geographical Thought: L4 - Disciplinary Trends in Germany, France, Britain, United States of America. L5 - Evolution of Geography in India: Progress, Contributions of Indian Geographers, Geographical Societies L6 - Areal differentiation and spatial organization	12
III	Philosophical Debates in Contemporary Geography L7 - Changing Paradigms in Geography L8 – Dualism and Dichotomy: Environmental Determinism and Possibilism; Systematic and Regional; Ideographic and Nomothetic L9 - Hartshorne-Schaefer debate	12
IV	Contemporary Approaches in Geography: L10 - Quantitative Revolution and its impact L11 – Behavioural, Humanistic and Systems Approaches L12 - Positivism, Radicalism and Marxism	12



V	Recent Trends: L13 - Welfare Geography, Feminism and Postmodernism L14 – Changing Concept of Space in Geography L15 – Future Directions in Geographical Research	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Adhikari, S. (2015): Fundamentals of Geographical Thought, Orient Blackswan. 2. Dikshit, R.D. (2004): Geographical Thought: A Contextual History of Ideas, Prentice Hall India. 3. Hartshorne R., (1959): Perspectives of Nature of Geography, Rand Mac Nally and Co. 4. Husain, M. (2015): Evolution of Geographical Thought, 6th ed, Rawat Publications. 5. Peet, P. (1998): Modern Geographical Thought, Wiley-Blackwell.
Additional Books/ Reports	1. Arentsen M., Stam R. and Thuijjs R. (2000): Post-modern Approaches to Space, ebook 2. Cresswell, T. (2013). Geographic Thought: A Critical Introduction, Wiley-Blackwell. 3. Harvey, D. (1969): Explanation in Geography. Edward Arnold Publishers Ltd. 4. Singh, R. B. (2016): Progress in Indian Geography, Indian National Science Academy. 5. Soja, Edward (1989): Post-modern Geographies, Verso, London. Reprinted 1997: Rawat Publications.
Multi-media	1. https://www.loc.gov/item/lcwaN0018836/ 2. https://www.davidrumsey.com/ 3. https://portal.natmo.gov.in/en/home.html

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5074	Modern Surveying Techniques (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the principles, components and applications of GNSS and Total Station surveying, including instrument handling and survey errors.	Understand
CO 2	Apply GNSS and Total Station for field data collection, coordinate measurement and surveying.	Apply
CO 3	Analyze differential GNSS and Total Station survey data for spatial accuracy, coordinate referencing and mapping.	Analyze
CO 4	Prepare survey outputs, field maps and GIS-ready datasets from instrument-based observations.	Create

Syllabus:

Units	Contents	Hours
I	Handheld GNSS Surveying: Ex 1 – Handheld GNSS Setup Ex 2 – Coordinate Recording; Waypoint Collection and Route Tracking	12
II	Data Transfer and Mapping: Ex 3 – GNSS Data Transfer and Attribute Organization Ex 4 – GNSS-based Field Mapping	12
III	Total Station Surveying: Ex 5 – Total Station Setup: Centering, Levelling, Station Orientation, Backsight and Foresight Measurement Ex 6 – Point Data Collection using Total Station	12
IV	Differential GNSS Surveying: Ex 7 – GNSS Base and Rover Setup using Trimble R12 Ex 8 – RTK Surveying	12



V	Data Integration and Mapping Ex 9 – Total Station Data Processing and Base Map Preparation Ex 10 – GNSS Data Export for GIS Integration	12
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Tasks for CIA

Instrument Handling, Field Survey, Data Processing, Practical Demonstration and Interaction

References

Text Books	1. Kanetkar, T. P. and Kulkarni, S. V. (2015) Surveying and Levelling, Vol. I and II, Pune Vidyarthi Griha Prakashan. 2. Punmia, B. C., Jain, A. K. and Jain, A. K. (2016) Surveying, Vol. I and II, Laxmi Publications, New Delhi. 3. Duggal, S. K. (2013) Surveying, Vol. I and II, McGraw Hill Education, New Delhi. 4. Schofield, W. and Breach, M. (2007) Engineering Surveying, Butterworth-Heinemann, Oxford. 5. Ghilani, C. D. and Wolf, P. R. (2012) Elementary Surveying: An Introduction to Geomatics, Pearson, Boston.
Additional Books/ Reports	1. Kavanagh, B. F. (2010) Surveying: Principles and Applications, Pearson, Boston. 2. Uren, J. and Price, W. F. (2010) Surveying for Engineers, Palgrave Macmillan, London. 3. Trimble Inc. User Guides for Trimble R12 GNSS Receiver and Trimble Total Station. 4. Survey of India manuals and field mapping guidelines. 5. National Remote Sensing Centre and Survey of India geospatial data guidelines and resources.
Multi-media	1. https://geospatial.trimble.com/ 2. https://www.trimble.com/en/resources/support 3. https://www.surveyofindia.gov.in/ 4. https://qgis.org/en/site/ 5. https://www.esri.com/training/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x		x		x
CO2	x		x		x
CO3		x	x	x	x
CO4		x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5075	Geospatial Analysis (P)	-	-	4	2

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the theoretical foundations and contemporary techniques involved in remote sensing data processing and geospatial analysis	Understand
CO 2	Apply remote sensing and GIS techniques to interpret and analyze high-resolution multi-source geospatial data using open-source, cloud-based and commercial software	Apply
CO 3	Analyze and evaluate spatial research problems and environmental issues through critical interpretation of geospatial data and practical methodologies	Analyze
CO 4	Develop research-oriented geospatial solutions and professional competencies for environmental studies and employment opportunities in the geospatial sector	Create

Syllabus:

Units	Contents	Hours
I	Image Processing and Manipulation Ex 1 – Multispectral Image Analysis, Image Indices and Band Math Operations Ex 2 – Change Detection using Multi-temporal Data Ex 3 – Texture Analysis and Extraction of Textural Parameters	12
II	Image Classification and Hyperspectral Analysis: Ex 4 – Classification using Machine Learning Algorithms: Random Forest and Support Vector Machine Ex 5 – Hyperspectral Data Pre-processing and Feature Reduction Ex 6 – Field Spectroradiometer Data Processing and Hyperspectral Indices	12
III	Spatial Analysis Techniques: Ex 7 – Spatial Interpolation: Thiessen Polygons, IDW and Kriging Methods Ex 8 – Vector-based Spatial Operations (Extract, Overlay, Proximity) Ex 9 – Raster-based Spatial Analysis (Local, Focal and Raster Calculator)	12
IV	Open-source and Cloud based Analysis: Ex 10 – Exploration of Image Processing Tools in SAGA Ex 11 – Exploration of Spatial Analysis Tools in QGIS Ex 12 – Cloud-based Geospatial Analysis using Google Earth Engine	12



V	Web GIS and Spatial Data Publishing: Ex 13 – Web GIS Services and Applications Ex 14 – Exploration of Online Geospatial Platforms: Bhuvan and ArcGIS Ex 15 – Spatial Data Publishing using ArcGIS Server	12
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Tasks for CIA
Lab Exercises, Assignments, Case Study, Project Work and Interaction

References	
Text Books	1. Borengasser, M., and Hungate, W. S., and Watkins, R. (2008): Hyperspectral remote sensing: principles and applications, 1st Edition, CRC Press, Boca Raton, FL. 2. Eismann, Michael T. (2012): Hyperspectral Remote Sensing, SPIE Press Monograph Vol. PM210. ISBN: 9780819487872. 3. Hanssen, R. F. (2001): Radar Interferometry: Data Interpretation and Error Analysis, 1st Edition, Springer Netherlands. 4. Jensen, J. R. (2006): Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc., New Jersey. 5. Richards, J. A., and Xiuping, J. (2005): Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag, Berlin.
Additional Books/ Reports	1. Tso, B., and Mather, P. M. (2012): Classification Methods for Remotely Sensed Data, 2nd Edition, CRC Press, Boca Raton, FL. 2. Thenkabail, P. S., Lyon, J. G., and Huete, A. (2011): Hyperspectral Remote Sensing of Vegetation. CRC Press, Boca Raton, FL. 3. Van Der Meer, F. D., and De Jong, S. M. (2002): Imaging Spectrometry: Basic Principles and Prospective Applications, Kluwer Academic Publishers, New York. 4. Varshney, P. K., and Arora, M. K. (2004): Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data, 1st Edition, Springer-Verlag Berlin Heidelberg.
Multi-media	1. https://qgis.org/en/docs/index.html 2. https://developers.google.com/earth-engine 3. https://bhuvan.nrsc.gov.in/ 4. https://earthdata.nasa.gov/ 5. https://saga-gis.sourceforge.io/en/index.html

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x		x	x	x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC09	Economic Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, nature and scope of economic geography and economic activities	Remember
CO 2	Understand the spatial organization of economic activities and theories of economic location	Understand
CO 3	Analyze patterns of production, trade, industrialization and globalization in different regions	Apply / Analyze
CO 4	Acquire practical skills to interpret economic data and evaluate regional economic development using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Economic Geography: L1 - Nature, Scope and Significance of Economic Geography L2 – Classification of Economic Activities L3 - Factors Influencing Economic Activities	9
II	Theories and Patterns of Economic Activities: L4 - Agricultural and Industrial Location Theories: Weber's Theory of Industrial Location L5 - Economic Regions and Regional Specialization L6 – Transportation and Trade Networks	9
III	Primary and Secondary Economic Activities: L7 - Agriculture, Forestry and Fishing L8 - Mining and Energy Resources L9 - Manufacturing Industries, Industrial Regions and Industrialization	9
IV	Tertiary and Quaternary Activities: L10 – Trade, Commerce, Tourism and Service Industries L11 – Transport and Communication Systems L12 - Globalization and Information Economy	9



V	Contemporary Economic Issues: L13– Agriculture and rural economies L14 – Environmental impacts of economic activity L15 – Sustainable development and green economies	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	1. Alexander, J.W. (1988): <i>Economic Geography</i> , Prentice Hall. 2. Coe, N.M., Kelly, P.F. & Yeung, H.W.C. (2020): <i>Economic Geography: A Contemporary Introduction</i> , Wiley-Blackwell. 3. Hartshorne, T.A. & Alexander, J.W. (2017): <i>Economic Geography</i> , Pearson Education. 4. Wheeler, J.O., Muller, P.O. & Thrall, G.I. (1998): <i>Economic Geography</i> , Wiley. 5. Singh, J. & Dhillon, S.S. (2004): <i>Agricultural Geography</i> , Tata McGraw Hill.
Additional Books/ Reports	1. World Bank (2023): <i>World Development Report</i> . 2. United Nations (2023): <i>World Economic Situation and Prospects</i> . 3. Government of India: <i>Economic Survey of India</i> . 4. WTO (2023): <i>World Trade Statistical Review</i> . 5. UNDP (2023): <i>Human Development Report</i> .
Multi-media	1. https://www.worldbank.org/ 2. https://www.un.org/development/desa/dpad/ 3. https://www.indiabudget.gov.in/economicsurvey/ 4. https://www.wto.org/ 5. https://hdr.undp.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				
CO2	x	x			x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC10	Models in Geography	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, functions and classification of models in Geography.	Understand
CO 2	Examine major geographical traditions and quantitative approaches in spatial analysis.	Analyze
CO 3	Apply spatial interaction and diffusion models to geographical problems and regional analysis.	Apply
CO 4	Evaluate the relevance of geographical models in contemporary spatial planning and decision-making.	Evaluate

Syllabus:

Units	Contents	Hours
I	Introduction to Models in Geography: L1 - Meaning, Nature and Functions of Models L2 - Types and Classification of Models in Geography L3 - Procedural Problems in Model Building and Validation L4 - Models, Paradigms and Quantitative Revolution in Geography	9
II	Geographical Traditions and Measurement Models: L5 - Four Traditions in Geography: Spatial, Area Studies, Man-Land and Earth Science L6 - Measurement Models: Nominal, Ordinal and Interval Scales L7 - Multidimensional Measurement and Validation L8 - Quantitative Techniques in Geographical Analysis	9
III	Classification and Spatial Interaction Models: L9 - Logic, Purpose and Procedures of Classification L10 - Complementarity, Transferability and Intervening Opportunity L11 - Gravity Models and Potential Models L12 - Network and Flow Models	9
IV	Spatial Diffusion and Location Models: L13 - Spatial Diffusion: Concepts and Processes L14 - Dynamics of Spatial Patterns and Scales L15 - Location Allocation Problems and Regional Organization	9



V	Contemporary Applications of Geographical Models: L16 - Models in Urban and Regional Planning L17 - GIS and Spatial Decision Support Systems L18 - Recent Trends in Spatial Modelling and Geographical Research	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Model Interpretation Exercise, Case Study

References

Text Books	1. Husain, M. (2016) Models in Geography, Rawat Publications. 2. Harvey, D. (1969) Explanation in Geography, Edward Arnold Publishers Ltd. 3. Chorley, R.J. and Haggett, P. (2013) Socio-Economic Models in Geography, Routledge. 4. Chorley, R.J. and Haggett, P. (2013) Integrated Models in Geography, Routledge. 5. Abler, R., Adams, J.S. and Gould, P. (1971) Spatial Organization: The Geographer's View of the World, Prentice Hall.
Additional Books/ Reports	1. Peet, R. (1998) Modern Geographical Thought, Blackwell Publishers. 2. Johnston, R.J. (2000) Geography and Geographers, Arnold Publishers. 3. Haggett, P. (2001) Geography: A Global Synthesis, Pearson Education. 4. Robinson, J.L. (1976) A New Look at the Four Traditions of Geography, Journal of Geography. 5. Pattison, W.D. (1964) The Four Traditions of Geography, Journal of Geography.
Multi-media	1. https://www.rgs.org/ 2. https://www.aag.org/ 3. https://www.esri.com/en-us/what-is-gis/overview 4. https://www.geographyrealm.com/ 5. https://opengeospatial.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x			x	
CO2	x	x		x	
CO3	x		x	x	x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC11	Geography of Health	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, scope and approaches in the Geography of Health.	Understand
CO 2	Analyze the spatial distribution and determinants of diseases and health inequalities.	Analyze
CO 3	Apply geospatial and epidemiological methods in health mapping and healthcare planning.	Apply
CO 4	Develop critical perspectives on public health policies, healthcare accessibility and sustainable health systems.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Geography of Health: L1 - Nature, Scope and Development of Health Geography L2 - Concepts of Health, Disease and Well-being L3 - Approaches in Health Geography: Ecological and Spatial Perspectives L4 - Determinants of Health: Physical, Social and Economic Factors	9
II	Disease Ecology and Epidemiology: L5 - Disease Ecology and Epidemiological Transition L6 - Communicable and Non-Communicable Diseases L7 - Nutrition, Lifestyle and Public Health L8 - Spatial Patterns of Diseases in India and the World	9
III	Healthcare Systems and Accessibility: L9 - Healthcare Systems and Infrastructure L10 - Accessibility and Availability of Health Services L11 - Health Indicators and Quality of Life L12 - Health Policies and Programmes in India	9
IV	Geospatial Technologies in Health Geography: L13 - GIS and Remote Sensing Applications in Health Studies L14 - Disease Mapping and Spatial Analysis L15 - Spatial Decision Support Systems in Healthcare Planning	9



V	Contemporary Issues in Health Geography: L16 - Urban Health, Environmental Pollution and Climate Change L17 - Pandemics, Disaster Management and Public Health L18 - Sustainable Development Goals (SDGs) and Global Health	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Health Mapping Exercise

References

Text Books	1. Meade, M.S. and Earickson, R.J. (2005) Medical Geography, Guilford Press. 2. Gatrell, A.C. and Elliott, S.J. (2015) Geographies of Health: An Introduction, Wiley Blackwell. 3. Gesler, W.M. (1991) The Cultural Geography of Health Care, University of Pittsburgh Press. 4. May, J.M. (2010) The Ecology of Human Disease, MD Publications. 5. Curtis, S. (2010) Space, Place and Mental Health, Ashgate.
Additional Books/ Reports	1. World Health Organization (2023) World Health Statistics Report. 2. Phillips, D.R. (1993) Health and Health Care in the Third World, Longman. 3. Hunter, J.M. (1974) The Geography of Health and Disease, Social Science & Medicine. 4. Government of India (2022) National Health Policy and Health Statistics Report. 5. UNDP (2023) Human Development Report.
Multi-media	1. https://www.who.int/ 2. https://www.cdc.gov/ 3. https://www.unicef.org/health 4. https://www.nhm.gov.in/ 5. https://www.healthdata.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x		x	
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC12	Locational Analytics	3	-	-	3

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the basic concepts, scope and significance of locational analytics in geographical decision-making and spatial planning.	Remember
CO 2	Understand spatial data, location intelligence, geocoding, proximity, accessibility and market-area concepts used in locational analysis.	Understand
CO 3	Analyze site selection, allocation, spatial interaction, network-based accessibility and service-area problems using geographic principles.	Apply / Analyze
CO 4	Acquire fundamental skills to interpret locational patterns and support decisions related to retail, public services, transport, health and disaster management.	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Locational Analytics: L1 - Meaning, nature and location concepts: place, space, distance and interaction L2 - Location intelligence in planning and decision-making; Applications in transport, health, governance, disaster management and urban planning L3 - Spatial decision problems: site selection, service delivery, allocation	9
II	Spatial Data and Analytical Foundations: L4 - Spatial and non-spatial data in locational analytics; Geocoding, address matching, coordinates and data quality L5 - Proximity analysis: distance, direction, buffers, and catchments L6 - Spatial distribution, clustering, density and hotspots	9
III	Location Models and Market Area Analysis: L7 - Central place theory and service hierarchy; Weberian principles and cost-based location decisions L8 - Spatial interaction and gravity model applications L9 - Suitability analysis and multi-criteria location decisions	9
IV	Network, Accessibility and Allocation Analysis: L10 - Network accessibility and connectivity measures L11 - Service area and nearest facility analysis L12 - Location-allocation models for public and commercial services L13 - Route optimization and least-cost movement	9



V	Contemporary Applications and Decision Support: L14 - Retail and business site selection; Locational analytics for health, education and emergency services L15 - Urban facility planning, smart cities and infrastructure decisions L16 - Ethics, privacy, uncertainty and bias in location data	9
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Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Exercise and Interaction

References

Text Books	1. Church, R. L., & Murray, A. T. (2009). Business Site Selection, Location Analysis and GIS. John Wiley & Sons, Hoboken. 2. Daskin, M. S. (2013). Network and Discrete Location: Models, Algorithms, and Applications. John Wiley & Sons, New York. 3. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic Information Science and Systems. John Wiley & Sons, Hoboken. 4. Malczewski, J. (1999). GIS and Multicriteria Decision Analysis. John Wiley & Sons, New York. 5. Rodrigue, J. P., Comtois, C., & Slack, B. (2017). The Geography of Transport Systems. Routledge, New York
Additional Books/ Reports	1. Birkin, M., Clarke, G., & Clarke, M. (2017). Retail Location Planning in an Era of Multi-Channel Growth. Routledge, London. 2. Fotheringham, A. S., Brunson, C., & Charlton, M. (2000). Quantitative Geography: Perspectives on Spatial Data Analysis. Sage Publications, London. 3. Goodchild, M. F., & Janelle, D. G. (Eds.). (2004). Spatially Integrated Social Science. Oxford University Press, Oxford. 4. Miller, H. J., & Shaw, S. L. (2001). Geographic Information Systems for Transportation: Principles and Applications. Oxford University Press, Oxford. 5. O'Sullivan, D., & Unwin, D. J. (2010). Geographic Information Analysis. John Wiley & Sons, Hoboken.
Multi-media	1. https://www.esri.com/en-us/location-intelligence/overview 2. https://qgis.org/ 3. https://www.openstreetmap.org/ 4. https://www.openrouteservice.org/ 5. https://geodacenter.github.io/ 6. https://transportgeography.org/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	X		X		X
CO2	X	X	X		X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SYLLABUS

SEMESTER - VIII



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5081	Research Methodology	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the basic knowledge about research in terms of research design, data collection, analysis, and report writing.	Understand
CO 2	Analyze collected research data using statistical and visualization tools such as tables, graphs, maps, and GIS/GNSS-based outputs.	Analyze
CO 3	Apply appropriate research designs, sampling methods, measurement scales, and data collection techniques.	Apply
CO 4	Develop a keen interest in research and use the knowledge for future research.	Create

Syllabus:

Units	Contents	Hours
I	Research Methodology Overview: L1 - Classification of Research; Procedure of Scientific research L2 - Review of Literature L3 - Logical Reasoning and Defining Research Gap and Problem	12
II	Research Design and Sampling: L4 - Research Design and Formulating Hypothesis L5 – Measurement of Scales L6 – Sampling: Methods of sampling and Size of Sampling	12
III	Data Collection and Visualization: L7 - Methods of Primary and Secondary Data collection L8 - Questionnaire surveys, Pilot Study and Mobile based surveys L9 – Processing of Data, Jurimetrics, Data Display: tables, graphs, maps, visualizations; Reliability and validity of data	12
IV	Report Writing and Citation: L10 - Layout, Structure and Language of Research Reports L11 - Writing of abstract and Story maps L12 - Citation methods: Foot note, Text note, End note; Citation rules: Blue book, OSCOLA, MLA, APA and Chicago	12



V	Indexing and Reference Management: L13 – Indexing and Citation databases; Journal impact factor L14 – Scientometrics L15 - Reference Management Software	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Gomez, B. and Jones, J. P. (2010): Research Methods in Geography: A Critical Introduction, John Wiley and Sons, Sussex. 2. Goode, W and P.K, Hatt (1981): Methods in Social Research, Mc Graw Hill, Tokyo 3. Har Prasad (1992): Research Methods and Techniques in Geography, Rawat Publications, New Delhi. 4. Kothari, C. R. (1994): Research Methodology: Methods and Techniques, New Age International (P) Ltd. 5. Misra H.N. and V.P. Singh (1998): Research Methodology in Geography: Social, Spatial and Policy Dimensions, Rawat Publications New Delhi.
Additional Books/ Reports	1. Clifford, N., Cope, M., Gillespie, T.W., French, S. (Eds) 2016. Key Methods in Geography, 3rd ed, Sage 2. Goyal, R. (2010). Research Methodology for Health Profession. India: Jaypee Brothers Medical Publishers Pvt. Limited. 3. Montello, D., and Sutton, P. (2013): An Introduction to Scientific Research Methods in Geography and Environmental Studies, SAGE Publications, California. 4. Murthy, K.L.N. (2004): Research Methodology in Geography: A Text Book, Concept Publishing Co. 5. Sheskin, I.M. (1987): Survey Research for Geographers Scientific Publisher, Jodhpur.
Multi-media	1. https://methods.sagepub.com/# 2. https://apastyle.apa.org/ 3. https://www.chicagomanualofstyle.org/home.html 4. https://www.law.ox.ac.uk/oscola 5. https://www.legalbluebook.com/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	X				X
CO2	X		X		X
CO3	X		X		X
CO4	X	X	X	X	X



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5082	Research Ethics and Academic Writing	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the basics of philosophy of science and ethics, research integrity, publication ethics, academic culture and communication.	Understand
CO 2	Apply integrity in data collection, publication, collaboration, and academic writing.	Apply
CO 3	Analyze cases of scientific and publication misconduct, issues related to plagiarism, predatory publishing and data misrepresentation	Analyze
CO 4	Develop productive and effective research and academic writing with ethical and positive approaches.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Research Ethics: L1 - Moral philosophy, nature of moral judgments and reactions; Intellectual honesty and research integrity L2 – Scientific misconduct: fabrication, falsification, plagiarism L3 - Ethical review for human and animal studies; Informed consent for data collection; Privacy and confidentiality of data	12
II	Publication Ethics: L4 - Publication misconduct; Selective reporting and misrepresentation of data; Best practices/standards setting initiatives and guidelines L5 - Conflicts of Interest; Collaborative research, Authorship; Peer review L6 – Open access publications and initiatives; Article Processing Charges (APC); Predatory publications in open access L7 - Redundant publications, Citation manipulation, Research retraction and ethical implications	12
III	Writing an Academic Essay: L8 - Analyse the Prompt, Gathering the Information, Organizing the Materials, Essay Drafting; Construction of Thesis Statement L9 – Organising the Paragraphs and Making the Writing Coherent L10 – Usage of appropriate words and avoiding redundancy	12
IV	Reporting Research Findings and Preparation of Presentation: L11 - Result interpretation L12 - Proofreading an essay or report: Typographical Errors, Grammatical Errors; Academic Integrity L13 – Oral and poster presentations; Preparing the visual aids, use of Common Language; Rehearsing and Confident Delivery of presentations	12



V	Emerging technologies, ethical challenges and Practicing Academic Writings: L14 - Ethics of using AI in Research, Detection of AI-generated content and ethical disclosure L15 – Communicating through Email and Scientific CV Writing L16 - Preparation of Project Proposals and Research Statements	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. Alexander Bird (2006). Philosophy of Science. Routledge 2. Becker, H. S. (1986): Writing for Social Scientists: How to Start and Finish Your Thesis, Book or Article, University of Chicago Press. 3. Wesiman, H. (1996): Basic technical reporting, Prentice Hall Publications. 4. Oshima, A., and Hogue, A. (2006): Writing academic English, Pearson Publications. 5. Murray, R. and Moore, S. (2006): The Handbook of Academic Writing: A Fresh Approach, McGraw-Hill Publications.
Additional Books/ Reports	1. Resnik DB (2005). The Ethics of Science–An Introduction. Taylor & Francis-e-library 2. Chaddah, P. (2019). Ethics in Competitive Research: Do not get scooped, do not get plagiarized. 3. Zemach, D. E. and Rumisek, L. A. (2005): Academic Writing: from Paragraph to Essay, Macmillan Publications. 4. Bailey, S. (2015): Academic Writing for International Students of Business (Second Edition), Routledge Publications. 5. Tupas, T. R. F., Cook, C., and Ismail, N. B. T. (2009): Communicating in the University Culture, Centre for English Language Communication, National University of Singapore.
Multi-media	1. https://publicationethics.org/ 2. https://ori.hhs.gov/ 3. https://researcheracademy.elsevier.com/ 4. https://www.unesco.org/en/articles/recommendation-ethics-artificial-intelligence 5. https://owl.purdue.edu/owl/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x		x		x
CO3	x		x		x
CO4	x	x	x	x	x



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEO5083 / GEO5084	Research Project / Dissertation	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the basics of philosophy of science and ethics, research integrity, publication ethics, academic culture and communication.	Understand
CO 2	Apply integrity in data collection, publication, collaboration, and academic writing.	Apply
CO 3	Analyze cases of scientific and publication misconduct, issues related to plagiarism, predatory publishing and data misrepresentation	Analyze
CO 4	Develop productive and effective research and academic writing with ethical and positive approaches.	Create

Instructions:

Students need to carry out dissertation work in the Department or in an academic/scientific institution or industry, write a thesis, and defend it at the end. The thesis will be supervised and assessed by internal/external members. The students should select a specific topic from the following broad areas for conducting the research work.

- | | |
|--------------------------------------|--------------------------------------|
| a. Applied Geomorphology | k. Sustainable Tourism |
| b. Applied Climatology | l. Urban resilience |
| c. Integrated Watershed Management | m. Urban Planning and Sustainability |
| d. Coastal Zone Management | n. Rural and Regional Development |
| e. Biodiversity and Conservation | o. Remote Sensing |
| f. Environmental Impact Assessment | p. GIS and Location Analytics |
| g. Agriculture and Land Use Planning | q. Spatial Decision Support System |
| h. Human Health and Wellbeing | r. Climate Change |
| i. Demography and Social Wellbeing | s. Disaster Risk Reduction |
| j. Energy Resources | t. Sustainable Development Goals |

The thesis should be between 60 and 100 pages including maps, tables, diagrams, and graphs. The ideal structure of thesis is a) Introduction, b) Study Area, c) Materials and Methods, d) Results and Discussion, e) Summary and Conclusion, f) References, and g) Supplementary Materials. The thesis will be evaluated by internal/external members following the rubrics.

**Rubrics for Evaluation:**

Assessment	Criteria		Marks
Internal Marks (Awarded by the internal and/or external supervisor)	Attendance (Regularity)		10
	Independence (Self-motivation)		10
	Skills and Knowledge (On the topic)		10
	Interaction (Promptness)		10
External Marks Awarded by the examiners (average of examiners)	Mid-term Presentation		10
	Report	Presentation of Chapters	10
		Research Findings	10
		Relevance of Maps / Figures / Tables	5
		Citation & References	5
	Viva Voce	Presentation Skills	10
		Q & A	10
Total Marks			100

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1			x	x	x
CO2			x	x	x
CO3	x	x	x	x	x
CO4	x		x	x	x

NOTE:

- Students who wish to receive the B.Sc. Honours Degree in Geography shall take Research Project Course of 8 credits (GEO5083) and any one of the DSE course from Table 3 or a MOOC course for at least 4 credits.
- Students who secure 75% marks and above in the first six semesters and wish to receive B.Sc. Honours with Research Degree in Geography can choose a research stream in the fourth year. They should do a Research Project / Dissertation (GEO5084) in the eighth semester for 12 credits under the guidance of a faculty member of the department. Students who do their fourth semester dissertation outside the campus should have an Internal Supervisor, a faculty member from the department. They shall attend the courses online. However, the end semester examination for these courses will be conducted at the department.



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC17	Urban GIS	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, components and applications of Urban GIS in urban studies and planning.	Understand
CO 2	Apply GIS techniques for mapping, analysis and management of urban spatial data.	Apply
CO 3	Analyze urban problems using geospatial technologies and spatial analytical methods.	Analyze
CO 4	Develop geospatial solutions for sustainable urban planning and smart city management.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Urban GIS: L1 - Concepts and Evolution of Urban GIS L2 - Urban Spatial Data: Sources, Types and Quality L3 – Urban Baseline Spatial Data Development	12
II	Urban Spatial Database and Mapping: L4 - Urban GIS Database Management L5 – Use of field collected GPS and Mobile GIS Applications L6 - Web GIS and Open source GIS platforms in Urban Applications	12
III	Spatial Analysis in Urban Studies: L7 - Urban Land Use and Land Cover Analysis L8 - Spatial Statistics and Urban Pattern Analysis L9 - Multi-Criteria Decision Analysis in Urban Planning	12
IV	Remote Sensing and Smart City Applications:: L10 - Remote Sensing for Urban Monitoring L11 - Urban Growth Modelling and Change Detection L12 - GIS Applications in Smart Cities and Urban Governance	12
V	Urban GIS Applications and Case Studies: L13 - GIS in Transportation and Infrastructure Planning L14 - Disaster Management and Urban Resilience L15 - Case Studies of Urban GIS Applications in India and Abroad	12



Tasks for CIA
Internal Tests, Seminar, Assignment, Practical Demonstration, Project Report

References	
Text Books	1. Chang, K.T. (2018) Introduction to Geographic Information Systems, McGraw Hill. 2. Longley, P., Goodchild, M., Maguire, D. and Rhind, D. (2015) Geographic Information Science and Systems, Wiley. 3. Burrough, P.A. and McDonnell, R.A. (2015) Principles of Geographical Information Systems, Oxford University Press. 4. Heywood, I., Cornelius, S. and Carver, S. (2011) An Introduction to Geographical Information Systems, Pearson. 5. Lo, C.P. and Yeung, A.K.W. (2007) Concepts and Techniques of Geographic Information Systems, Pearson.
Additional Books/ Reports	1. Maguire, D.J., Batty, M. and Goodchild, M.F. (2005) GIS, Spatial Analysis and Modeling, ESRI Press. 2. Tomlinson, R. (2013) Thinking About GIS: Geographic Information System Planning for Managers, ESRI Press. 3. Batty, M. (2013) The New Science of Cities, MIT Press. 4. NIUA (2021) Urban and Regional Information Systems in India Report. 5. Government of India (2015) Smart Cities Mission Guidelines
Multi-media	1. https://www.esri.com/en-us/what-is-gis/overview 2. https://qgis.org/en/site/ 3. https://niua.in/project-details/Smartnet 4. https://sdgs.un.org/goals 5. https://www.esri.com/en-us/arcgis/products/arcgis-urban/overview

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	X		X		
CO2	X	X	X		X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC18	Watershed Management	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the basic concepts, principles, scope and significance of watershed management in geography and environmental planning.	Remember
CO 2	Understand watershed characteristics, hydrological processes, drainage basin parameters and their role in land and water resource management.	Understand
CO 3	Analyze soil erosion, runoff, land degradation and watershed problems using geomorphic, hydrological and socio-economic perspectives.	Apply / Analyze
CO 4	Evaluate watershed conservation measures, planning approaches, institutional mechanisms and community participation for sustainable development.	Evaluate

Syllabus:

Units	Contents	Hours
I	Introduction to Watershed Management: L1 - Meaning, concept, scope and objectives of watershed management L2 - Watershed as a planning unit: basin, catchment, sub-watershed and micro-watershed L3 - Watershed problems: soil erosion, runoff, drought, flood, land degradation and water scarcity	12
II	Watershed Characteristics and Management Approaches: L4 - Watershed characteristics and functions L5 - Principles of integrated watershed management L6 - Participatory watershed management L7 - Monitoring and evaluation of watershed projects: indicators, impact assessment and sustainability	12
III	Soil and Land Conservation: L8 - Soil erosion and conservation measures L9 - Land capability and land suitability assessment L10 - Land evaluation and land use planning	12
IV	Hydrological Processes and Management: L11 - Surface water and groundwater relationship in watershed systems; Water conservation and harvesting L12 - Groundwater suitability analysis L13 - Watershed prioritization based on physical, hydrological and	12



	morphometric parameters	
V	Geospatial Techniques and Contemporary Applications: L14 - Remote sensing and GIS applications in watershed management L15 - Watershed approaches for climate change, disaster risk reduction and ecosystem related problems L16 - Case studies of watershed management: semi-arid regions, hill watersheds, flood-prone basins and Indian examples	12

Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Report and Interaction

References

Text Books	1. Tideman, E. M. (1996). Watershed Management: Guidelines for Indian Conditions. Omega Scientific Publishers, New Delhi. 2. Murthy, J. V. S. (1998). Watershed Management. New Age International Publishers, New Delhi. 3. Singh, V. P. (1992). Elementary Hydrology. Prentice Hall, New Jersey. 4. Suresh, R. (2012). Soil and Water Conservation Engineering. Standard Publishers Distributors, New Delhi. 5. Brooks, K. N., Ffolliott, P. F., Magner, J. A., & Gregersen, H. M. (2013). Hydrology and the Management of Watersheds. Wiley-Blackwell, Hoboken.
Additional Books/ Reports	1. Government of India. (2008). Common Guidelines for Watershed Development Projects. Department of Land Resources, New Delhi. 2. Government of India. (2011). Integrated Watershed Management Programme: Guidelines. Department of Land Resources, New Delhi. 3. FAO. (2006). The New Generation of Watershed Management Programmes and Projects. FAO Forestry Paper 150, Rome. 4. Goudie, A. S. (2010). Geomorphological Techniques. Routledge, London.
Multi-media	1. https://dolr.gov.in/ 2. https://pmksy.gov.in/ 3. https://bhuvan.nrsc.gov.in/ 4. https://indiawris.gov.in/ 5. https://earthexplorer.usgs.gov/

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2	x	x	x		x
CO3	x	x	x	x	x
CO4	x	x	x	x	x



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC19	Climate Change and Social Wellbeing	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the concepts, causes and impacts of climate change on society and environment	Remember
CO 2	Understand climate systems, vulnerability and adaptation strategies related to social wellbeing	Understand
CO 3	Analyze climate change impacts on health, livelihood, migration and sustainable development	Apply / Analyze
CO 4	Acquire practical skills to evaluate climate policies, mitigation measures and resilience strategies using geographical approaches	Skill

Syllabus:

Units	Contents	Hours
I	Introduction to Climate Change: L1 - Nature, Scope and Significance of Climate Change Studies L2 – Climate System and Greenhouse Effect L3 - Causes and Evidence of Climate Change	12
II	Climate Change and Environment: L4 - Global Warming and Extreme Weather Events L5 - Climate Change, Biodiversity Loss and Natural Resources L6 – Climate Change, Disaster Risks and Community Resilience	12
III	Climate Change and Social Wellbeing: L7 - Climate Change and Human Health L8 - Food Security, Water Security and Livelihoods L9 - Climate-Induced Migration and Social Vulnerability L10 - Urbanization, Poverty and Climate Justice	12
IV	Adaptation and Mitigation Strategies: L11 - Climate Change Adaptation Measures L12 – Mitigation Strategies and Carbon Management L13 - Role of GIS and Remote Sensing in Climate Adaptation Studies	12
V	Climate Policies and Sustainable Development: L14 – International Climate Agreements and COP Summits L15 – Climate Policies and Programmes in India L16 – Sustainable Development and Climate Resilience	12



Tasks for CIA
Internal Tests, Seminar, Assignment, Case Study, Interaction

References	
Text Books	1. IPCC (2023): <i>Climate Change Assessment Reports</i>. 2. Barry, R.G. & Chorley, R.J. (2009): <i>Atmosphere, Weather and Climate</i>, Routledge. 3. Singh, S. (2019): <i>Climatology</i>, Prayag Pustak Bhawan. 4. Hulme, M. (2009): <i>Why We Disagree About Climate Change</i>, Cambridge University Press. 5. Adger, W.N., Lorenzoni, I. & O'Brien, K.L. (2009): <i>Adapting to Climate Change: Thresholds, Values, Governance</i>, Cambridge University Press.
Additional Books/ Reports	1. United Nations (2023): <i>Sustainable Development Goals Report</i>. 2. WHO (2023): <i>Climate Change and Health Reports</i>. 3. UNEP (2023): <i>Emissions Gap Report</i>. 4. Government of India: <i>National Action Plan on Climate Change (NAPCC)</i>. 5. World Bank (2023): <i>Climate and Development Report</i>.
Multi-media	1. https://www.ipcc.ch/ 2. https://unfccc.int/ 3. https://www.who.int/health-topics/climate-change 4. https://www.unep.org/ 5. https://moef.gov.in/

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	X				
CO2	X	X			X
CO3	X	X	X	X	X
CO4	X	X	X	X	X



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC20	Wetland Management	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the concepts, classification, ecological significance and distribution of wetlands in global and regional contexts.	Understand
CO 2	Apply field-based and geospatial techniques for wetland mapping, monitoring and assessment.	Apply
CO 3	Analyze wetland ecosystem dynamics, environmental threats and climate change impacts using spatial and temporal data.	Analyze
CO 4	Evaluate wetland conservation, restoration and management strategies through policy and case study approaches.	Evaluate

Syllabus:

Units	Contents	Hours
I	Wetlands: Concepts and Functions: L1 – Definition, Classification and Distribution of Wetlands L2 – Wetland Ecology and Biogeochemical Cycles L3 – Ecological Functions and Ecosystem Services L4 – Wetlands and Climate Change	12
II	Wetland Ecosystems and Conservation: L5 – Wetland Biodiversity and Vegetation L6 – Natural and Anthropogenic Threats to Wetlands L7 – Wetland Restoration and Conservation Approaches; Ramsar Convention and Wetland Policies	12
III	Wetland Assessment and Field Techniques: L8 – Wetland Identification and Delineation L9 – Field Survey Methods and Sampling Techniques; Regional and Local Wetland Assessment Methods L10 – Water Quality Assessment and Hydrological Characteristics	12
IV	Geospatial Applications in Wetland Management: L11 – Remote Sensing and GIS-based Wetland Mapping and Wetland Monitoring L12 – Time Series Analysis and Vegetation Phenology L13 – Surface Hydraulics and Biophysical Variable Estimation	12



V	Emerging Techniques and Case Studies: L14 – Open Source Tools, Google Earth Engine and Cloud-based Geospatial Analytics for Wetland Monitoring L15 – Blue Carbon Initiative and Sustainable Wetland Management L16 – Indian and Global Wetland Case Studies	12
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Tasks for CIA
Internal Tests, Seminar, Assignment, Field Survey Report, Practical Demonstration, Case Study and Project Presentation

References	
Text Books	1. Keddy, P. A. (2010): Wetland Ecology: Principles and Conservation, Cambridge University Press. 2. Mitsch, W. J. and Gosselink, J. G. (2015): Wetlands (5th Edition), Wiley Publications. 3. LePage, B. A. (2011): Wetlands: Integrating Multidisciplinary Concepts, Springer. 4. Lyon, J. G. (2005): Wetland Landscape Characterization, Ann Arbor Press. 5. Weng, Q. (2011): Advances in Environmental Remote Sensing: Sensors, Algorithms and Applications, CRC Press.
Additional Books/ Reports	1. Awange, J.L. and Kiema, J.B.K. (2013): Environmental Geoinformatics: Monitoring and Management, Springer. 2. Purkis, S. and Klemas, V. (2011): Remote Sensing and Global Environmental Change, Wiley. 3. Ban, Y. (2016): Multitemporal Remote Sensing: Methods and Applications, Springer. 4. Kuenzer, C., Dech, S. and Wagner, W. (2015): Remote Sensing Time Series: Revealing Land Surface Dynamics, Springer. 5. Ramsar Convention Secretariat Reports on Wetland Conservation and Management.
Multi-media	1. https://www.ramsar.org/ 2. https://earthengine.google.com/ 3. https://data.jrc.ec.europa.eu/dataset/jrc-gswe-global-surface-water-explorer-v1 4. https://web.nateko.lu.se/timesat/timesat.asp 5. https://www.unep.org/explore-topics/wetlands

Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2			x	x	
CO3	x	x	x	x	
CO4	x	x	x	x	x



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC21	AR/VR and Spatial Intelligence	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Recognize the basic concepts, evolution and significance of augmented reality, virtual reality, mixed reality and spatial intelligence in geography.	Remember
CO 2	Understand spatial computing, 3D geographic data, immersive visualization, geospatial technologies and human-environment interaction in extended reality environments.	Understand
CO 3	Analyze the role of AR/VR applications in spatial learning, terrain visualization, urban planning, disaster management, tourism, heritage and environmental studies.	Apply / Analyze
CO 4	Evaluate ethical, technical and social issues related to immersive geospatial technologies and acquire fundamental skills for decision support.	Evaluate

Syllabus:

Units	Contents	Hours
I	Fundamentals of AR/VR and Spatial Intelligence L1 – Meaning, evolution and scope of AR, VR, MR and XR L2 – Spatial intelligence: perception, cognition, orientation, navigation and decision-making L3 – Links between geography, geospatial technology and immersive environments; AR/VR in spatial visualization and field learning L4 – AR/VR system components: displays, sensors, controllers, tracking and interaction devices	12
II	Spatial Data, 3D Geography and Immersive Visualization L5 – Spatial data for immersive environments: raster, vector, terrain, point cloud, 3D models and real-time data L6 – DEMs, 3D terrain, landscape representation and virtual field environments: 360° images, panoramas, LiDAR and drone-based 3D visualization L7 – Georeferencing, coordinate systems, scale, accuracy and data integration for AR/VR L8 – Cartographic design in immersive spaces: symbols, hierarchy, interface and spatial storytelling	12
III	Spatial Computing Technologies and Platforms L9 – Spatial computing architecture and AR/VR development platforms L10 – GIS-AR/VR integration: QGIS, ArcGIS, Cesium, Google Earth, web maps and open geospatial services L11 – Interaction methods: gaze, gesture, controller, voice, haptics and	12



	collaborative virtual spaces L12 – AR/VR data workflow: model simplification, textures, coordinate conversion, optimization and deployment	
IV	Applications in Geography and Spatial Decision Support L13 – AR/VR in physical and human geography L14 – Immersive DRR: hazard simulation, evacuation planning, risk communication and training L15 – Spatial intelligence for defence, infrastructure, smart cities, health and resource management	12
V	Design, Ethics and Future Directions L16 – Evaluation of AR/VR systems: usability, learning outcomes, accuracy, performance and accessibility L17 – Ethical concerns: privacy, surveillance, cybersickness, digital divide and inclusiveness L18 – Emerging trends: digital twins, metaverse, AI-assisted spatial intelligence, real-time GIS and cloud analytics	12

Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Exercise, Presentation and Interaction

References

Text Books	1. Burdea, G. C., & Coiffet, P. (2003). Virtual Reality Technology. John Wiley & Sons, Hoboken. 2. Craig, A. B. (2013). Understanding Augmented Reality: Concepts and Applications. Morgan Kaufmann, Waltham. 3. Jerald, J. (2016). The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York. 4. Kraak, M. J., & Ormeling, F. (2020). Cartography: Visualization of Geospatial Data. CRC Press, Boca Raton. 5. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic Information Science and Systems. John Wiley & Sons, Hoboken.
Additional Books/ Reports	1. Billinghurst, M., Clark, A., & Lee, G. (2015). A Survey of Augmented Reality. Foundations and Trends in Human-Computer Interaction, 8(2-3), 73-272. 2. Bowman, D. A., Kruijff, E., LaViola, J. J., & Poupyrev, I. (2004). 3D User Interfaces: Theory and Practice. Addison-Wesley, Boston. 3. Goodchild, M. F., & Janelle, D. G. (Eds.). (2004). Spatially Integrated Social Science. Oxford University Press, Oxford. 4. Maceachren, A. M. (1995). How Maps Work: Representation, Visualization, and Design. Guilford Press, New York. 5. Sherman, W. R., & Craig, A. B. (2018). Understanding Virtual Reality: Interface, Application, and Design. Morgan Kaufmann, Cambridge.
Multi-media	1. https://learn.unity.com/ 2. https://developers.google.com/ar 3. https://www.unrealengine.com/en-US/onlinelearning-courses 4. https://cesium.com/learn/ 5. https://www.esri.com/en-us/arcgis/products/arcgis-cityengine/overview 6. https://qgis.org/



Mapping of Program Outcomes with Course Outcomes					
	PO1	PO2	PO3	PO4	PO5
C01	X		X		X
C02	X	X	X		X
C03	X	X	X	X	X
C04	X	X	X	X	X



SEMESTER - VIII					
Course Code	Course Name	Hours / Week			Credits
		L	T	P	
GEOEC22	Geography of Gender	4	-	-	4

Course Outcomes (CO):

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO 1	Understand the relationship between gender, space, society, culture, economy and development at different spatial scales.	Understand
CO 2	Analyze gender inequalities using demographic, social, economic, environmental and spatial indicators.	Analyze
CO 3	Apply gender geographical concepts and analytical tools to examine the spatial patterns of gender inequality across different regions and sectors.	Apply
CO 4	Develop fundamental skills to interpret gender-disaggregated data and apply spatial perspectives for gender-sensitive planning and research.	Create

Syllabus:

Units	Contents	Hours
I	Introduction to Gender Geography: L1 - Nature, scope and significance of Gender Geography L2 - Sex, gender, patriarchy and gender relations; Feminism L3 - Gender, space and place: public, private and everyday spaces L4 - Gendered identities, power relations and spatial experience	12
II	Gender, Population and Society: L5 - Sex ratio, literacy, gender roles in household, marriage and care relations; Gender and migration L6 - Gender, nutrition, reproductive health and access to health services L7 - Social exclusion, marginality, violence and vulnerability L8 - Spatial patterns of gender inequality in developed and developing societies	12
III	Gender, Economy and Development: L9 - Gender division of labor and work participation L10 - Women in agriculture, informal sector, industry and services L11 - Unpaid care work; Gendered dimensions of poverty L12 - Gender and development indicators: GDI, SDG related measures	12
IV	Gender, Environment, Resources and Spatial Planning: L13 - Gendered access to land, water, forest and common resources L14 - Gender dimensions of climate change, disasters and resilience; sustainable development L15 - Gender and urban space: safety, mobility, transport and public	12



	infrastructure	
V	Contemporary Issues: L16 - Community participation, local governance and gender-responsive resource management L17 - Gender inequalities in India: regional patterns and major determinants L18 - National Policy for empowerment of women	12

Tasks for CIA

Internal Tests, Seminar, Assignment, Case Study, Interaction

References

Text Books	1. Datta, A. (2012). The Illegal City: Space, Law and Gender in a Delhi Squatter Settlement. Ashgate, Farnham. 2. McDowell, L. (1999). Gender, Identity and Place: Understanding Feminist Geographies. Polity Press, Cambridge. 3. Massey, D. (1994). Space, Place and Gender. University of Minnesota Press, Minneapolis. 4. Momsen, J. H. (2010). Gender and Development. Routledge, London. 5. Seager, J. (2018). The Women's Atlas. Myriad Editions, Brighton.
Additional Books/ Reports	1. Kabeer, N. (1994). Reversed Realities: Gender Hierarchies in Development Thought. Verso, London. 2. Agarwal, B. (1994). A Field of One's Own: Gender and Land Rights in South Asia. Cambridge University Press, Cambridge. 3. Chant, S. & McIlwaine, C. (2016). Cities, Slums and Gender in the Global South. Routledge, London. 4. International Institute for Population Sciences. National Family Health Survey Reports, Mumbai. 5. UN Women. Progress of the World's Women Reports, New York.
Multi-media	1. https://nfhsindia.org/ 2. https://hdr.undp.org/ 3. https://www.unwomen.org/ 4. https://sdgs.un.org/goals/goal5 5. https://www.worldbank.org/en/topic/gender

Mapping of Program Outcomes with Course Outcomes

	PO1	PO2	PO3	PO4	PO5
CO1	x	x			
CO2	x	x	x		
CO3	x	x	x	x	x
CO4	x	x	x	x	x