File Ref.No.24795/GA - IV - J2/2013/CU

UNIVERSITY OF CALICUT

Abstract

General and Academic IV- Faculty of Science- CUFYUGP Regulations 2024-B.Sc Geography Honours Programme-Scheme and Syllabus - Implemented with effect from 2024 Admission - Subject to ratification by the Academic Council - Orders Issued.

G & A - IV - K Section

U.O.No. 9179/2024/Admn — Dated, Calicut University.P.O, 13.06.2024

Read:-1.U.O.No. 3103/2024/Admn dated 22.02.2024.
2.Minutes of the meeting of the Board of Studies in Geography-UG held on 15.05.2024.
3.Remarks of the Dean, Faculty of Science dated 10.06.2024.
4. Orders of the Vice Chancellor in the file of even No and dated 11.06.2024.

ORDER

1. The Regulations of the Calicut University Four Year UG Programmes (CUFYUGP Regulations 2024) for Affiliated Colleges, has been implemented with effect from 2024 admission onwards, vide paper read as (1) above.

2. The meeting of the Board of Studies in Geography(UG) held on 15.05.2024, vide paper read as (2) above, has approved the scheme and syllabus of the B.Sc Geography Honours programme in tune with CUFYUGP Regulations 2024 with effect from 2024 Admission onwards.

3. The Dean, Faculty of Science vide paper read as (3) above, has approved the minutes of the meeting of the Board of Studies in Geography(UG) held on 15.05.2024.

4. Considering the urgency, the Vice Chancellor has approved the minutes of the meeting of the Board of Studies in Geography(UG) held on 15.05.2024 and granted permission to implement the scheme and syllabus of the B.Sc Geography Honours programme in accordance with CUFYUGP Regulations 2024 with effect from 2024 Admission onwards, subject to ratification by the Academic Council.

5. The scheme and syllabus of the B.Sc Geography Honours programme in tune with CUFYUGP Regulations 2024 is implemented with effect from 2024 Admission onwards.

6. Orders are issued accordingly. (Syllabus appended)

Ajayakumar T.K

Assistant Registrar

To

1.The Principals of all Affiliated Colleges,
Copy to: PS to VC/PA to PVC/ PA to R/PA to CE/JCE I/JCE IV/EX IV and EG Sections/GA IF/CHMK Library/Information Centres/SF/DF/FC

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

B.Sc. GEOGRAPHY HONOURS

(MAJOR, MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS & MODEL QUESTION PAPERS

w.e.f. 2024 admission onwards

(CUFYUGP Regulations 2024)

B.Sc. GEOGRAPHY (HONOURS)

(MAJOR, MINOR AND GENERAL FOUNDATION COURSES)

SYLLABUS

PROGRAMME OUTCOMES (PO):

At the end of the graduate programme at Calicut University, a student would:

PO1	Knowledge Acquisition: Demonstrate a profound understanding of knowledgetrends and their impact on the chosen discipline of study.
PO2	Communication, Collaboration, Inclusiveness, and Leadership: Become a team player who drives positive change through effective communication, collaborative acumen, transformative leadership, and a dedication to inclusivity.
PO3	Professional Skills: Demonstrate professional skills to navigate diverse career paths with confidence and adaptability.
PO4	Digital Intelligence: Demonstrate proficiency in varied digital and technological tools to understand and interact with the digital world, thus effectively processing complex information.
PO5	Scientific Awareness and Critical Thinking: Emerge as an innovative problem-solver and impactful mediator, applying scientific understanding and critical thinking to address challenges and advance sustainable solutions.
PO6	Human Values, Professional Ethics, and Societal and Environmental Responsibility: Become a responsible leader, characterized by an unwavering commitment to human values, ethical conduct, and a fervent dedication to the well-being of society and the environment.
PO7	Research, Innovation, and Entrepreneurship: Emerge as a researcher and entrepreneurial leader, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development.

PROGRAMME SPECIFIC OUTCOMES (PSO):

PROGRAMME SPECIFIC OUTCOMES (PSO):

At the end of the BSc Geography program at Calicut University, a student would:

PSO 1	Demonstrating a comprehensive grasp of foundational geography concepts, graduates establish a basis for advanced study and professional endeavours. They display systematic knowledge, enabling adept analysis and resolution of contemporary issues.
PSO2	Appreciate the relevance of geographical knowledge to everyday life, recognizing its significance in understanding global, regional, and local phenomena affecting human societies and the environment.
PSO3	Demonstrate proficiency in communicating geographic information through both lecture presentations and practical exercises, effectively conveying complex geographical concepts and findings to diverse audiences.
PSO 4	Develop proficiency in efficiently evaluating and solving geographical challenges, utilizing analytical skills and research tools to address issues in natural resource management, urban planning, disaster management, environmental sustainability, and societal development effectively.
PSO5	Developing the ability to effectively evaluate geographical problems through critical analysis and

	field-based observations, graduates will emerge as researcher and entrepreneurial leaders, forging collaborative partnerships with industry, academia, and communities to contribute enduring solutions for local, regional, and global development.

MINIMUM CREDIT REQUIREMENTS OF THE DIFFERENT PATHWAYS IN THE THREE-YEAR PROGRAMME IN CUFYUGP

<table>
<tr><th rowspan="3">Sl. No.</th><th rowspan="3">Academic Pathway</th><th>Major</th><th>Minor/ Other Disciplines</th><th>Foundation Courses AEC: 4 MDC: 3 SEC: 3 VAC: 3</th><th rowspan="3">Intern-ship</th><th rowspan="3">Total Credits</th><th rowspan="3">Example</th></tr>
<tr><td colspan="2" rowspan="2">Each course has 4 credits</td><td rowspan="2">Each course has 3 credits</td></tr>
<tr></tr>
<tr><td>1</td><td>Single Major (A)</td><td>68

(17 courses)</td><td>24

(6 courses)</td><td>39

(13 courses)</td><td>2</td><td>133</td><td>Major: Geography + six courses in different disciplines in different combinations</td></tr>
<tr><td>2</td><td>Major (A) with Multiple Disciplines (B, C)</td><td>68

(17 courses)</td><td>12 + 12

(3 + 3 = 6 courses)</td><td>39

(13 courses)</td><td>2</td><td>133</td><td>Major: Geography + Geography and Statistics</td></tr>
<tr><td>3</td><td>Major (A) with Minor (B)</td><td>68
(17 courses)</td><td>24

(6 courses)</td><td>39

(13 courses)</td><td>2</td><td>133</td><td>Major: Geography Minor: Geography</td></tr>
<tr><td>4</td><td>Major (A) with Vocational Minor (B)</td><td>68

(17 courses)</td><td>24

(6 courses)</td><td>39

(13 courses)</td><td>2</td><td>133</td><td>Major: Geography Minor: Geoinformatics/ Digital Surveying</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Double Major (A, B)</td><td rowspan="2">A: 48
(12 courses)

B: 44
(11 courses)</td><td>-</td><td>12 + 18 + 9</td><td>2</td><td rowspan="2">133</td><td rowspan="2">Geography and Mathematics double major

(Geography and Botany double major)

(Geography and</td></tr>
<tr><td colspan="3">The 24 credits in the Minor stream are distributed between the two Majors.

2 MDC, 2 SEC, 2 VAC and the Internship should be in Major A. Total credits in Major A should be 48 + 20 = 68 (50% of 133)</td></tr>
</table>

			1 MDC, 1 SEC and 1 VAC should be in Major B. Total credits in Major B should be 44 + 9 = 53 (40% of 133)		Economics double major)
Exit with UG Degree / Proceed to Fourth Year with 133 Credits					

B.Sc. GEOGRAPHY HONOURS PROGRAMME

COURSE STRUCTUREFOR PATHWAYS 1 – 4

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor
4. Major with Vocational Minor

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	GEO1CJ 101/ GEO1MN 100	Core Course 1 in Major – Fundamentals of Geography	75	5	4	30	70	100
		Minor Course 1	60/ 75	4/ 5	4	30	70	100
		Minor Course 2	60/ 75	4/ 5	4	30	70	100
	ENG1FA 101(2)	Ability Enhancement Course 1– English	60	4	3	25	50	75
		Ability Enhancement Course 2 – Additional Language	45	3	3	25	50	75
		Multi-Disciplinary Course 1 – Other than Major	45	3	3	25	50	75
		Total		**23/ 25**	**21**			**525**
2	GEO2CJ 101/ GEO 2MN100	Core Course 2 in Major –Fundamentals of Geomorphology	75	5	4	30	70	100
		Minor Course 3	60/ 75	4/ 5	4	30	70	100
		Minor Course 4	60/ 75	4/ 5	4	30	70	100
	ENG2FA 103(2)	Ability Enhancement Course 3– English	60	4	3	25	50	75
		Ability Enhancement Course 4 – Additional Language	45	3	3	25	50	75
		Multi-Disciplinary Course 2 – Other than Major	45	3	3	25	50	75
		Total		**23/ 25**	**21**			**525**

3	GEO3CJ 201	Core Course 3 in Major – Oceanography	60	4	4	30	70	100
	GEO3CJ 202/ GEO3MN 200	Core Course 4 in Major -Advanced Climatology	75	5	4	30	70	100
		Minor Course 5	60/ 75	4/ 5	4	30	70	100
		Minor Course 6	60/ 75	4/ 5	4	30	70	100
		Multi-Disciplinary Course 3 – Kerala Knowledge System	45	3	3	25	50	75
	ENG3FV 108(2)	Value-Added Course 1 – English	45	3	3	25	50	75
		Total		**23/ 25**	**22**			**550**
4	GEO 4CJ 203	Core Course 5 in Major – Soil Geography	75	5	4	30	70	100
	GEO4CJ 204	Core Course 6 in Major – Remote Sensing	75	5	4	30	70	100
	GEO 4CJ 205	Core Course 7 in Major – Field work in Physical Geography	75	5	4	30	70	100
	ENG4FV 109(2)	Value-Added Course 2 – English	45	3	3	25	50	75
		Value-Added Course 3 – Additional Language	45	3	3	25	50	75
	ENG4FS 111(2)	Skill Enhancement Course 1 – English	60	4	3	25	50	75
		Total		**25**	**21**			**525**
5	GEO 5CJ 301	Core Course 8 in Major – Human Geography	75	5	4	30	70	100
	GEO 5CJ 302	Core Course 9 in Major – Cartography	75	5	4	30	70	100
	GEO 5CJ 303	Core Course 10 in Major- Geography of India	60	4	4	30	70	100
		Elective Course 1 in Major	60	4	4	30	70	100
		Elective Course 2 in Major	60	4	4	30	70	100
	GEO5FS 112	Skill Enhancement Course 2- Spatial Information Technology	45	3	3	25	50	75
		Total		**25**	**23**			**575**

6	GEO 6CJ 304/ GEO 8MN304	Core Course 11 in Major – Field work in Human Geography	75	5	4	30	70	100
	GEO 6CJ 305/ GEO 8MN305	Core Course 12 in Major-Introduction to Geoinformatics	75	5	4	30	70	100
	GEO 6CJ 306/ GEO 8MN306	Core Course 13 in Major – Evolution of Thought Process in Geography	60	4	4	30	70	100
		Elective Course 3 in Major	60	4	4	30	70	100
		Elective Course 4 in Major	60	4	4	30	70	100
	GEO 6FS 113	Skill Enhancement Course 3 – Satellite Image Processing	45	3	3	25	50	75
	GEO6CJ 349	Internship in Major (Credit for internship to be awarded only at the end of Semester 6)	60		2	50	-	50
		Total		**25**	**25**			**625**
Total Credits for Three Years					**133**			**3325**
7	GEO 7CJ 401	Core Course 14 in Major – Applied Geomorphology	75	5	4	30	70	100
	GEO7CJ 402	Core Course 15 in Major – Applied Climatology	75	5	4	30	70	100
	GEO7CJ 403	Core Course 16 in Major – Geography of Water Resources	75	5	4	30	70	100
	GEO7CJ 404	Core Course 17 in Major – Environmental Geography	75	5	4	30	70	100
	GEO7CJ 405	Core Course 18 in Major – Regional Planning and Development	75	5	4	30	70	100
		Total		**25**	**20**			**500**
8	GEO8CJ 406/ GEO8MN 406	Core Course 19 in Major – Population Geography	75	5	4	30	70	100
	GEO 8CJ 407/ GEO 8MN407	Core Course 20 in Major – Urban Geography	60	4	4	30	70	100

	GEO 8CJ 408/ GEO 8MN408	Core Course 21 in Major- Agricultural Geography	60	4	4	30	70	100
	OR (instead of Core Courses 19 – 21 in Major)							
	GEO 8CJ 449	Project (in Honours programme)	360	13	12	90	210	300
	GEO8CJ 499	Project (in Honours with Research programme)	360	13	12	90	210	300
		Elective Course 5 in Major / Minor Course 7	60	4	4	30	70	100
		Elective Course 6 in Major / Minor Course 8	60	4	4	30	70	100
		Elective Course 7 in Major / Minor Course 9 / Major Course in any Other Discipline	60	4	4	30	70	100
	OR (instead of Elective Course 7 in Major, in the case of Honours with Research Programme)							
	GEO 8CJ 489	Research Methodology in Geography	60	4	4	30	70	100
		Total		**25**	**24**			**600**
Total Credits for Four Years					**177**			**4425**

The teacher should have 13 hrs/week of engagement (the hours corresponding to the three core courses) in the guidance of the Project(s) in Honours programme and Honours with Research programme, while each student should have 24 hrs/week of engagement in the Project work. Total hours are given based on the student's engagement.

CREDIT DISTRIBUTIONFOR PATHWAYS 1 – 4

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor
4. Major with Vocational Minor

Semester	Major Courses	Minor Courses	General Foundation Courses	Internship/ Project	Total
1	4	4 + 4	3 + 3 + 3	-	21
2	4	4 + 4	3 + 3 + 3	-	21
3	4 + 4	4 + 4	3 + 3	-	22
4	4 + 4 + 4	-	3 + 3 + 3	-	21
5	4 + 4 + 4 + 4 + 4	-	3	-	23
6	4 + 4 + 4 + 4 + 4	-	3	2	25

Total for Three Years	**68**	**24**	**39**	**2**	**133**
7	4 + 4 + 4 + 4 + 4	-	-	-	20
8	4 + 4 + 4	4 + 4 + 4	-	12	24
instead of three Major courses					
Total for Four Years	**88 + 12 = 100**	**36**	**39**	**2**	**177**

DISTRIBUTION OF MAJOR COURSES IN GEOGRAPHY FOR PATHWAYS 1 – 4

1. Single Major
2. Major with Multiple Disciplines
3. Major with Minor
4. Major with Vocational Minor

Semester	Course Code	Course Title	Hours/ Week	Credits
1	GEO 1CJ 101 / GEO1MN 100	Core Course 1 in Major – Fundamentals of Geography	5	4
2	GEO 2CJ 101 / GEO2MN 100	Core Course 2 in Major – Fundamentals of Geomorphology	5	4
3	GEO3CJ 201	Core Course 3 in Major – Oceanography	4	4
	GEO 3CJ 202 / GEO 3MN200	Core Course 4 in Major –Advanced Climatology	5	4
4	GEO 4CJ 203	Core Course 5 in Major – Soil Geography	5	4
	GEO 4CJ 204	Core Course 6 in Major – Remote Sensing	5	4
	GEO 4CJ 205	Core Course 7 in Major – Field work in Physical Geography	5	4
5	GEO 5CJ 301	Core Course 8 in Major – Human Geography	5	4

	GEO 5CJ 302	Core Course 9 in Major – Cartography	5	4
	GEO 5CJ 303	Core Course 10 in Major –Geography of India	4	4
		Elective Course 1 in Major	4	4
		Elective Course 2 in Major	4	4
6	GEO 6CJ 304 / GEO 8MN304	Core Course 11 in Major – Field work in Human Geography	5	4
	GEO 6CJ 305 / GEO 8MN305	Core Course 12 in Major– Introduction to Geoinformatics	5	4
	GEO 6CJ 306 / GEO 8MN306	Core Course 13 in Major – Evolution of Thought Process in Geography	4	4
		Elective Course 3 in Major	4	4
		Elective Course 4 in Major	4	4
	GEO 6CJ 349	Internship in Major	-	2
		Total for the Three Years		**70**
7	GEO 7CJ 401	Core Course 14 in Major – Applied Geomorphology	5	4
	GEO 7CJ 402	Core Course 15 in Major – Applied Climatology	5	4
	GEO 7CJ 403	Core Course 16 in Major – Geography of Water Resources	5	4
	GEO 7CJ 404	Core Course 17 in Major – Environmental Geography	5	4
	GEO 7CJ 405	Core Course 18 in Major – Regional Planning and Development	5	4
	GEO 8CJ 406 / GEO 8MN406	Core Course 19 in Major –Population Geography	5	4
	GEO 8CJ 407 / GEO	Core Course 20 in Major – Urban Geography	4	4

8	8MN407			
	GEO 8CJ 408 / GEO 8MN408	Core Course 21 in Major –Agricultural Geography	4	4
	OR (instead of Core Courses 20 and 21 in Major)			
	GEO 8CJ 449	Project (in Honours programme)	13	12
	GEO 8CJ 499	Research Project (in Honours with Research programme)	13	12
		Elective Course 5 in Major	4	4
		Elective Course 6 in Major	4	4
		Elective Course 7 in Major	4	4
	OR (instead of Elective course 7 in Major, in Honours with Research programme)			
	GEO 8CJ 489	Research Methodology in Geography	4	4
Total for the Four Years				**114**

ELECTIVE COURSES IN GEOGRAPHY WITH SPECIALISATION

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total
1		**SPATIAL PLANNING AND SUSTAINABLE DEVELOPMENT**								
	1	GEO 5EJ 301(1)	Rural Planning and Development	5	60	4	4	30	70	100
	2	GEO 5EJ 302(1)	Spatial and Urban Planning	5	60	4	4	30	70	100
	3	GEO 6EJ 301(1)	Watershed Management Planning and Development	6	60	4	4	30	70	100
	4	GEO 6EJ 302(1)/	Environmental Planning and Development	6	60	4	4	30	70	100
2		**SOCIETY AND CULTURE**								
	1	GEO 5EJ 303(2)	Cultural Geography	5	60	4	4	30	70	100
	2	GEO 5EJ 304(2)	Political Geography	5	60	4	4	30	70	100

	3	GEO 6EJ 303(1)	Social Geography of India	6	60	4	4	30	70	100
	4	GEO 6EJ 304(1)	Tribal Geography	6	60	4	4	30	70	100
3	**REGIONAL GEOGRAPHY**									
	1	GEO 5EJ 305(1)	World Regional Geography	5	60	4	4	30	70	100
	2	GEO 5EJ 306(1)	Geography of Asia	5	60	4	4	30	70	100
	3	GEO 6EJ 305(2)	Geography of Kerala	6	60	4	4	30	70	100
	4	GEO 6EJ 306(2)	Geography of Western Ghats	6	60	4	4	30	70	100
4	**GEOGRAPHY OF WATER RESOURCES**									
	1	GEO 5EJ 307(1)	Introduction to Water Resources Geography	5	60	4	4	30	70	100
	2	GEO 5EJ 308(1)	Efficient Land and Water Management – IWM Approach	5	60	4	4	30	70	100
	3	GEO 6EJ 307(2)	Hydro- Geography of India	6	60	4	4	30	70	100
	4	GEO 6EJ 308(2)	Application of Geoinformation Technology for Watershed Management	6	60	4	4	30	70	100
5	**LANDSCAPE STUDIES**									
	1	GEO 5EJ 309(1)	Introduction to Landscape Studies	5	60	4	4	30	70	100
	2	GEO 5EJ 310(1)	Landscape Ecology	5	60	4	4	30	70	100
	3	GEO 6EJ 309(2)	Cultural Landscape	6	60	4	4	30	70	100
	4	GEO 6EJ 310(2)	Landscape Planning and Management	6	60	4	4	30	70	100
6	**HEALTH GEOGRAPHY**									
	1	GEO 5EJ 311(1)	Geographical Landscapes of Health	5	60	4	4	30	70	100
	2	GEO 5EJ 312(1)	Spatial Analysis in Health Geography	5	60	4	4	30	70	100

	3	GEO 6EJ 311(2)	Disease Ecology and Environment	6	60	4	4	30	70	100
	4	GEO 6EJ 312(2)	Disease Mapping	6	60	4	4	30	70	100

ELECTIVE COURSES IN GEOGRAPHY WITH RESEARCH SPECIALISATION

Sl. No.	**Course Code**	**Title**	**Seme ster**	**Total Hrs**	**Hrs/ Week**	**Cre dits**	**Marks**		
							Inte rnal	**Exte rnal**	**Total**
1	GEO 8EJ 409	Hydrology	8	60	4	4	30	70	100
2	GEO 8EJ 410	Tourism Geography	8	60	4	4	30	70	100
3	GEO 8EJ 411	Economic Geography with Special Reference to India	8	60	4	4	30	70	100
4	GEO 8EJ 412	Disaster Management	8	60	4	4	30	70	100
5	GEO 8EJ 413	Biogeography	8	60	4	4	30	70	100
6	GEO 8EJ 414	Advanced GIS	8	60	4	4	30	70	100
7	GEO8EJ 415	Spatial Statistics for GIS Using R	8	60	4	4	30	70	100
8	GEO8EJ 416	Geography of Health and Wellbeing	8	60	4	4	30	70	100

GROUPING OF MINOR COURSES IN GEOGRAPHY

(Title of the Minor: **CLIMATE SCIENCE AND DISASTER MANAGEMENT**

Group No.	**Sl. No.**	**Course Code**	**Title**	**Semester**	**Total Hrs**	**Hrs/ Week**	**Credits**	**Marks**		
								Internal	**External**	**Total**
1		**CLIMATE SCIENCE** (Preferable for Geography and Humanities and Science students)								
	1	GEO1MN 101	Weather and Climate Change	1	75	5	4	30	70	100
	2	GEO 2MN 101	Climate Change and Sustainable Development	2	75	5	4	30	70	100
	3	GEO 3MN 201	Mitigation and Adaptation to Climate Change	3	75	5	4	30	70	100
2		**DISASTER MANAGEMENT** (Preferable for Geography and Humanities and Science students)								
	1	GEO 1MN 102	Introduction to Disaster Management	1	75	5	4	30	70	100
	2	GEO 2MN 102	Disaster Management Processes	2	75	5	4	30	70	100
	3	GEO 3MN 202	Disaster Mitigation and Management	3	75	5	4	30	70	100
3		**GEOSTATISTICS** (Preferable for Geography and Humanities and Science students)								
	1	GEO 1MN 103	**Geostatistics I**	1	75	5	4	30	70	100
	2	GEO 2MN 103	**Geostatistics II**	2	75	5	4	30	70	100
	3	GEO 3MN 203	**Geostatistics III**	3	75	5	4	30	70	100

GROUPING OF VOCATIONAL MINOR COURSES IN GEOGRAPHY

(Title of the Vocational Minor: **VOCATIONAL GEOINFORMATICS WITH DIGITAL SURVEYING)**

Group No.	Sl. No.	Course Code	Title	semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total
1		**GEOINFORMATICS**								
	1	GEO1VN 101	Introduction to Remote Sensing	1	75	5	4	30	70	100
	2	GEO2VN 101	Fundamentals of GIS	2	75	5	4	30	70	100
	3	GEO3VN 201	Spatial Analysis	3	75	5	4	30	70	100
	4	GEO8VN 301	Application of Geoinformatics	8	60	4	4	30	70	100
2		**DIGITAL SURVEYING**								
	1	GEO 1VN102	Fundamentals of Surveying	1	75	5	4	30	70	100
	2	GEO 2VN102	Conventional Surveying	2	75	5	4	30	70	100
	3	GEO 3VN202	Digital Surveying	3	75	5	4	30	70	100
	4	GEO 8VN302	Modern Surveying	8	60	4	4	30	70	100

(i). Students in Single Major pathway can choose course/courses from any of the Minor/ Vocational Minor groups offered by a discipline other than their Major discipline.

(ii). Students in Major with Multiple Disciplines pathway can choose as one of the multiple disciplines, all the three courses from any one of the Minor/ Vocational Minor groups offered by any discipline, including their Major discipline. If they choose one of the Minor/ Vocational Minor groups offered by their Major discipline as the first one of the multiple disciplines, then their choice as the second one of the multiple disciplines should be any one of the Minor/ Vocational Minor groups offered by a discipline other than the Major discipline. If the students choose any one of the Minor/ Vocational Minor groups in Geography as given above, then the title of the group will be the title of that multiple discipline.

(iii). Students in Major with Minor pathway can choose all the courses from any two Minor groups offered by any discipline. If the students choose any two Minor groups in Geography as given above, then the title of the Minor will be **Climate Science and Disaster Management.**

(iv). Students in Major with Vocational Minor pathway can choose all the courses from any two Vocational Minor groups offered by any discipline. If the students choose any two Vocational Minor groups in Geography as given above, then the title of the Vocational Minor will be **Vocational Geoinformatics.**

DISTRIBUTION OF GENERAL FOUNDATION COURSES IN GEOGRAPHY

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	GEO1FM105	Multi-Disciplinary Course 1 – Natural Resource Management	45	3	3	25	50	75
2	GEO2FM106	Multi-Disciplinary Course 2 – Climate Change Vulnerability and Adaptation	45	3	3	25	50	75
3	GEO3FV108	Value-Added Course 1 – Geographic Pattern and Process	45	3	3	25	50	75
4	GEO4FV110	Value-Added Course 2 – Ecosystem Services	45	3	3	25	50	75
5	GEO5FS112	Skill Enhancement Course 2 – Spatial Information Technology	45	3	3	25	50	75
6	GEO6FS113	Skill Enhancement Course 3 – Satellite Image Processing	45	3	3	25	50	75

COURSE STRUCTUREFOR BATCH A1(B2)
IN PATHWAY 5: DOUBLE MAJOR

A1: 68 credits in Geography (Major A) ***B1: 68 credits in Major B***

A2: 53 credits in Geography (Major A) ***B2: 53 credits in Major B***

The combinations available to the students: (A1 & B2), (B1 & A2)

Note: Unless the batch is specified, the course is for all the students of the class

Semester	Course Code	Course Title	Total Hours	Hours/ Week	Credits	Marks		
						Internal	External	Total
1	GEO1CJ 101 / GEO1MN 100	Core Course 1 in Major Geography – Fundamentals of Geography	75	5	4	30	70	100
	BBB1CJ 101	Core Course 1 in Major B –	60/ 75	4/ 5	4	30	70	100
	GEO1CJ 102 / GEO2CJ 102 / GEO4CJ 205	Core Course 2 in Major Geography– Field work in Physical Geography (for batch A1 only)	75	5	4	30	70	100
	ENG1FA 101(2)	Ability Enhancement Course 1 – English	60	4	3	25	50	75
		Ability Enhancement Course 2 – Additional Language	45	3	3	25	50	75
	GEO1FM 105	Multi-Disciplinary Course 1 in Geography– Introduction to Natural Resources (for batch A1 only)	45	3	3	25	50	75
		Total		**24/ 25**	**21**			**525**
2	GEO2CJ 101 / GEO2MN 100	Core Course 3 in Major Geography –Fundamentals of Geomorphology	75	5	4	30	70	100
	BBB2CJ 101	Core Course 2 in Major B –	60/ 75	4/ 5	4	30	70	100
	BBB2CJ 102 / BBB1CJ 102	Core Course 3 in Major B – (for batch B2 only)	60/ 75	4/ 5	4	30	70	100

	ENG2FA 103(2)	Ability Enhancement Course 3 – English	60	4	3	25	50	75
		Ability Enhancement Course 4 – Additional Language	45	3	3	25	50	75
	GEO2FM 106 / GEO3FM 106	Multi-Disciplinary Course 2 in Geography – Climate Change Vulnerability and Adaptation	45	3	3	25	50	75
		Total		**23 – 25**	**21**			**525**
3	GEO3CJ 201	Core Course 4 in Major Geography – Oceanography	60	4	4	30	70	100
	GEO3CJ 202 / GEO3MN 200	Core Course 5 in Major Geography – Advanced Climatology	75	5	4	30	70	100
	BBB3CJ 201	Core Course 4 in Major B	60/ 75	4/ 5	4	30	70	100
	BBB3CJ 202	Core Course 5 in Major B	60/ 75	4/ 5	4	30	70	100
	BBB3FM 106 / BBB2FM 106	Multi-Disciplinary Course 1 in B –	45	3	3	25	50	75
	GEO3FV 108	Value-Added Course 1 in Geography– Geographic Pattern and Process (for batch A1 only)	45	3	3	25	50	75
		Total		**23 – 25**	**22**			**550**
4	GEO4CJ 203	Core Course 6 in Major Geography –Soil Geography	75	5	4	30	70	100
		Core Course 6 in Major B	60/ 75	4/ 5	4	30	70	100
	GEO4CJ 204	Core Course 7 in Major Geography Remotesensing (for batch A1 only)	75	5	4	30	70	100
	GEO 4FV 110	Value-Added Course 2in Geography– Ecosystem Services	45	3	3	25	50	75
	BBB4FV 110	Value-Added Course 1in B –	45	3	3	25	50	75
	GEO4FS 112 / GEO5FS 112	Skill Enhancement Course 1 in Geography– Spatial Information Technology	45	3	3	25	50	75
		Total		**23/ 24**	**21**			**525**

5	GEO5CJ 302	Core Course 8 in Major Geography– Cartography	75	5	4	30	70	100
		Core Course 7 in Major B –	60/ 75	4/ 5	4	30	70	100
	GEO5CJ 303	Core Course 9 in Major Geography – Geography of India (for batch A1 only)	60	4	4	30	70	100
		ElectiveCourse 1 in Major Geography	60	4	4	30	70	100
		ElectiveCourse 1 in Major B	60	4	4	30	70	100
	BBB5FS 112 / BBB4FS 112	Skill Enhancement Course 1 in B	45	3	3	25	50	75
		Total		**24/ 25**	**23**			**575**
6	GEO6CJ 305/ GEO8MN 305	Core Course 10 in Major Geography – Intoduction to Geoinformatics	75	5	4	30	70	100
		Core Course 8 in Major B –	60/ 75	4/ 5	4	30	70	100
	BBB6CJ 305	Core Course 9 in Major B – (for batch B2 only)	60	4	4	30	70	100
		ElectiveCourse 2 in Major Geography	60	4	4	30	70	100
		ElectiveCourse 2 in Major B	60	4	4	30	70	100
	GEO6FS 113	Skill Enhancement Course 2 in Geography – Satellite Image Processing (for batch A1 only)	45	3	3	25	50	75
	GEO 6CJ 349	Internship in Major Geography (Credit for internship to be awarded only at the end of Semester 6)	60		2	50	-	50
		Total		**24/ 25**	**25**			**625**
Total Credits for Three Years					**133**			**3325**
For batch A1(B2), the course structure in semesters 7 and 8 is the same as for pathways 1 – 4, except that the number of the core and elective courses is in continuation of the number of courses in the two categories completed at the end of semester 6.								

The course code of the same course as used for the pathways 1 – 4

CREDIT DISTRIBUTION FOR BATCH A1(B2) IN PATHWAY 5: DOUBLE MAJOR

Semester	Major Courses in Geography	General Foundation Courses in Geography	Internship/ Project in Geography	Major Courses in B	General Foundation Courses in B	AEC	Total
1	4 + 4	3	-	4	-	3 + 3	21
2	4	3	-	4 + 4	-	3 + 3	21
3	4 + 4	3	-	4 + 4	3	-	22
4	4 + 4	3 + 3	-	4	3	-	21
5	4 + 4 + 4	-	-	4 + 4	3	-	23
6	4 + 4	3	2	4 + 4 + 4	-	-	25
Total for Three Years	**48**	**18**	**2**	**44**	**9**	**12**	**133**
	68			**53**		**12**	**133**
	Major Courses in Geography	Minor Courses					
7	4 + 4 + 4 + 4 + 4	-			-	-	20
8	4 + 4 + 4	4 + 4 + 4	12		-	-	24
instead of three Major courses							
Total for Four Years	**88 + 12 = 100**	**12**					**177**

COURSE STRUCTUREFOR BATCH B1(A2) IN PATHWAY 5: DOUBLE MAJOR

A1: 68 credits in Geography (Major A) ***B1: 68 credits in Major B***

A2: 53 credits in Geography (Major A) ***B2: 53 credits in Major B***

The combinations available to the students: (A1 & B2), (B1 & A2)

Note: Unless the batch is specified, the course is for all the students of the class

Semester	**Course Code**	**Course Title**	**Total Hours**	**Hours/ Week**	**Credits**	**Marks**		
						Internal	**External**	**Total**

1	GEO 1CJ 101 / GEO 1MN 100	Core Course 1 in Major Geography – Fundamentals of Geography	75	5	4	30	70	100
	BBB1CJ 101	Core Course 1 in Major B –	60/ 75	4/ 5	4	30	70	100
	BBB1CJ 102 / BBB2CJ 102	Core Course 2 in Major B – (for batch B1 only)	60/ 75	4/ 5	4	30	70	100
	ENG1FA 101(2)	Ability Enhancement Course 1 – English	60	4	3	25	50	75
		Ability Enhancement Course 2 – Additional Language	45	3	3	25	50	75
	BBB1FM 105	Multi-Disciplinary Course 1 in B – (for batch B1 only)	45	3	3	25	50	75
		Total		**23 – 25**	**21**			**525**
2	GEO 2CJ 101 / GEO 2MN100	Core Course 2 in Major Geography – Fundamentals of Geomorphology	75	5	4	30	70	100
	BBB2CJ 101	Core Course 3 in Major B –	60/ 75	4/ 5	4	30	70	100
	GEO 2CJ 102 / GEO 1CJ 102 / GEO 4CJ 205	Core Course 3 in Major Geography – Field work in Physical Geography (for batch A2 only)	75	5	4	30	70	100
	ENG2FA 103(2)	Ability Enhancement Course 3 – English	60	4	3	25	50	75
		Ability Enhancement Course 4 – Additional Language	45	3	3	25	50	75
	GEO 2FM 106 / GEO 3FM 106	Multi-Disciplinary Course 1 in Geography – Introduction to Natural Resources	45	3	3	25	50	75
		Total		**24/ 25**	**21**			**525**
3	GEO 3CJ 201	Core Course 4 in Major Geography – Oceanography	60	4	4	30	70	100

	GEO 3CJ 202 / GEO 3MN 200	Core Course 5 in Major Geography – Advanced Climatology	75	5	4	30	70	100
	BBB3CJ 201	Core Course 4 in Major B	60/ 75	4/ 5	4	30	70	100
	BBB3CJ 202	Core Course 5 in Major B	60/ 75	4/ 5	4	30	70	100
	BBB3FM 106 / BBB2FM 106	Multi-Disciplinary Course 2 in B –	45	3	3	25	50	75
	BBB3FV 108	Value-Added Course 1 in B – (for batch B1 only)	45	3	3	25	50	75
		Total		**23 – 25**	**22**			**550**
4	GEO 4CJ 203	Core Course 6 in Major Geography –SoilGeography	75	5	4	30	70	100
		Core Course 6 in Major B	60/ 75	4/ 5	4	30	70	100
		Core Course 7 in Major B – (for batch B1 only)	60/ 75	4/ 5	4	30	70	100
	GEO 4FV 110	Value-Added Course 1in Geography – Geographic Pattern and Process	45	3	3	25	50	75
	BBB4FV 110	Value-Added Course 2 in B –	45	3	3	25	50	75
	GEO 4FS 112 / GEO 5FS 112	Skill Enhancement Course 1 in Geography – Spatial Information Technology	45	3	3	25	50	75
		Total		**22 – 24**	**21**			**525**
5	GEO 5CJ 302	Core Course 7 in Major Geography – Cartography	75	5	4	30	70	100
		Core Course 8 in Major B –	60/ 75	4/ 5	4	30	70	100
		Core Course 9 in Major B – (for batch B1 only)	60	4	4	30	70	100
		ElectiveCourse 1 in Major Geography	60	4	4	30	70	100
		ElectiveCourse 1 in Major B	60	4	4	30	70	100

	BBB5FS 112 / BBB4FS 112	Skill Enhancement Course 1 in B	45	3	3	25	50	75
		Total		**24/ 25**	**23**			**575**
6	GEO 6CJ 305/ GEO 8MN305	Core Course 8 in Major Geography – Field work in Human Geography	75	5	4	30	70	100
		Core Course 10 in Major B –	60/ 75	4/ 5	4	30	70	100
	GEO 6CJ 306/ GEO 8MN306	Core Course 9 in Major Geography – Evolution of Thought Process in Geography (for batch A2 only)	60	4	4	30	70	100
		Elective Course 2 in Major Geography	60	4	4	30	70	100
		ElectiveCourse 2 in Major B	60	4	4	30	70	100
	BBB6FS 113	Skill Enhancement Course 2 in B – (for batch B1 only)	45	3	3	25	50	75
	BBB6CJ 349	Internship in Major B (Credit for internship to be awarded only at the end of Semester 6)	60		2	50	-	50
		Total		**24/ 25**	**25**			**625**
Total Credits for Three Years					**133**			**3325**

To continue to study Geography in semesters 7 and 8, batch B1(A2) needs to earn additional 15 credits in Geography to make the total credits of 68. Suppose this condition is achieved, and the student of batch B1(A2) proceeds to the next semesters to study Geography. The course structure in semesters 7 and 8 is the same as for pathways 1 – 4, except that the number of the core and elective courses is in continuation of the number of courses in the two categories completed at the end of semester 6, taking into account the number of courses in Geography taken online to earn the additional 15 credits.

The course code of the same course as used for the pathways 1 – 4

CREDIT DISTRIBUTION FOR BATCH B1(A2) IN PATHWAY 5: DOUBLE MAJOR

Semester	Major Courses in B	General Foundation Courses in B	Internship/ Project in B	Major Courses in Geography	General Foundation Courses in Geography	AEC	Total

1	4 + 4	3	-	4	-	3 + 3	21
2	4	-	-	4 + 4	3	3 + 3	21
3	4 + 4	3 + 3	-	4 + 4	-	-	22
4	4 + 4	3	-	4	3 + 3	-	21
5	4 + 4 + 4	3	-	4 + 4	-	-	23
6	4 + 4	3	2	4 + 4 + 4	-	-	25
Total for Three Years	**48**	**18**	**2**	**44**	**9**	**12**	**133**
	68			**53**		**12**	**133**
	Major Courses in B	Minor Courses					
7	4 + 4 + 4 + 4 + 4	-			-	-	20
8	4 + 4 + 4	4 + 4 + 4	12		-	-	24
instead of three Major courses							
Total for Four Years	**88 + 12 = 100**	**12**					**177**

EVALUATION SCHEME

1. The evaluation scheme for each course contains two parts: internal evaluation (about 30%) and external evaluation (about 70%). Each of the Major and Minor courses is of 4-credits. It is evaluated for 100 marks, out of which 30 marks is from internal evaluation and 70 marks, from external evaluation. Each of the General Foundation course is of 3-credits. It is evaluated for 75 marks, out of which 25 marks is from internal evaluation and 50 marks, from external evaluation.
2. The 4-credit courses (Major and Minor courses) are of two types: (i) courses with only theory and (ii) courses with 3-credit theory and 1-credit practical.
   - In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 10 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.
   - In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical. The

practical component is internally evaluated for 20 marks. The internal evaluation of the 4 theory modules is for 10 marks.

3. All the 3-credit courses (General Foundational Courses) in Geography are with only theory component. Out of the total 5 modules of the syllabus, one open-ended module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated for 5 marks. The internal evaluation of the remaining 4 theory modules is for 20 marks.

<table>
<tr><th rowspan="2">Sl. No.</th><th rowspan="2" colspan="2">Nature of the Course</th><th colspan="2">Internal Evaluation in Marks (about 30% of the total)</th><th rowspan="2">External Exam on 4 modules (Marks)</th><th rowspan="2">Total Marks</th></tr>
<tr><th>Open-ended module / Practical</th><th>On the other 4 modules</th></tr>
<tr><td>1</td><td>4-credit course</td><td>only theory (5 modules)</td><td>10</td><td>20</td><td>70</td><td>100</td></tr>
<tr><td>2</td><td>4-credit course</td><td>Theory (4 modules) + Practical</td><td>20</td><td>10</td><td>70</td><td>100</td></tr>
<tr><td>3</td><td>3-credit course</td><td>only theory (5 modules)</td><td>5</td><td>20</td><td>50</td><td>75</td></tr>
</table>

1. MAJOR AND MINOR COURSES

1.1. INTERNAL EVALUATION OF THEORY COMPONENT

<table>
<tr><th rowspan="3">Sl. No.</th><th rowspan="3">Components of Internal Evaluation of Theory Part of a Major / Minor Course</th><th colspan="4">Internal Marks for the Theory Part of a Major / Minor Course of 4-credits</th></tr>
<tr><th colspan="2">Theory Only</th><th colspan="2">Theory + Practical</th></tr>
<tr><th>4 Theory Modules</th><th>Open-ended Module</th><th>4 Theory Modules</th><th>Practical</th></tr>
<tr><td>1</td><td>Test paper/
Mid-semester Exam</td><td>10</td><td>4</td><td>5</td><td>-</td></tr>
<tr><td>2</td><td>Seminar/ Viva/ Quiz</td><td>6</td><td>4</td><td>3</td><td>-</td></tr>
<tr><td>3</td><td>Assignment</td><td>4</td><td>2</td><td>2</td><td>-</td></tr>
<tr><td colspan="2" rowspan="2">Total</td><td>20</td><td>10</td><td>10</td><td>20</td></tr>
<tr><td colspan="2">30</td><td colspan="2">30</td></tr>
</table>

Refer the table in section 1.2 for the evaluation of practical component

1.2. EVALUATION OF PRACTICAL COMPONENT

The evaluation of practical component in Major and Minor courses is completely by internal evaluation.

- Continuous evaluation of practical by the teacher-in-charge shall carry a weightage of 50%.
- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the teacher in-charge and an internal examiner appointed by the Department Council.
- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end-semester examination and viva-voce.

The scheme of continuous evaluation and the end-semester examination and viva-voce of practical component shall be as given below:

Sl. No.	Evaluation of Practical Component of Credit-1 in a Major / Minor Course	Marks for Practical	Weightage
1	Continuous evaluation of practical/ exercise performed in practical classes by the students	10	50%
2	End-semester examination and viva-voce to be conducted by teacher-in-charge along with an additional examiner arranged internally by the Department Council	7	35%
3	Evaluation of the Practical records submitted for the end semester viva–voce examination by the teacher-in-charge and additional examiner	3	15%
	Total Marks	20	

1.3. EXTERNAL EVALUATION OF THEORY COMPONENT

External evaluation carries 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR MAJOR AND MINOR COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks
2 Hours	Short Answer	10	8 – 10	3	24
	Paragraph/ Problem	8	6 – 8	6	36

	Essay	2	1	10	10
				Total Marks	70

2. INTERNSHIP

- All students should undergo Internship of 2-credits during the first six semesters in a firm, industry or organization, or training in labs with faculty and researchers of their own institution or other Higher Educational Institutions (HEIs) or research institutions.
- Internship can be for enhancing the employability of the student or for developing the research aptitude.
- Internship can involve hands-on training on a particular skill/ equipment/ software. It can be a short project on a specific problem or area. Attending seminars or workshops related to an area of learning or skill can be a component of Internship.
- A faculty member/ scientist/ instructor of the respective institution, where the student does the Internship, should be the supervisor of the Internship.

2.1. GUIDELINES FOR INTERNSHIP

1. Internship can be in Geography or allied disciplines.
2. There should be minimum 60 hrs. of engagement from the student in the Internship.
3. Summer vacations and other holidays can be used for completing the Internship.
4. In BSc. Geography (Honours) programme, institute/ industry visit or study tour is a requirement for the completion of Internship. Visit to minimum one national research institute, research laboratory and place of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos and analysis.
5. The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.
6. The log book and the typed report must be submitted at the end of the Internship.
7. The institution at which the Internship will be carried out should be prior-approved by the Department Councilof the college where the student has enrolled for the UG Honours programme.

8. Upon program completion, students are required to submit a report in the specified format provided by the external internship supervisor. This report must include the agency/institute certificate, attendance statement, work details, and acquired skills/knowledge.
9. In cases where students intern within the institute, a designated faculty member will serve as the external supervisor.

2.2. FORMAT OF THE INTERNSHIP REPORT

1. Title page
2. Statement of attendance forwarded by the external supervisor
3. Internship Certificate, from where the internship is done which contains Name of internship centre, the area of internship, duration, performance evaluation, and date, should be included and signed by the internship supervisor and head of the internship institution, internal supervisor and principal.
4. Introduction-Details and Profile of the institute
5. Report - should contain the timeline of the work, report of the work done. At the end of the report, an introspective report of the participants on their experience, new learning etc should be added
6. Summary
7. Appendix include any supplementary materials like modules developed, cases recorded, notable interventions etc.

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2.2. EVALUATION OF INTERNSHIP

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Councilof the college where the student has enrolled for the UG Honours programme.
- The credits and marks for the Internship will be awarded only at the end of semester 6.
- The scheme of continuous evaluation and the end-semester viva-voce examination based on the submitted report shall be as given below:

Sl. No.	Components of Evaluation of Internship		Marks for Internship 2 Credits	Weightage
1	Continuous evaluation of internship through interim presentations and reports by the committee internally constituted by the Department Council	Acquisition of skill set	10	40%
2		Interim Presentation and Viva-voce	5	
3		Punctuality and Log Book	5	
4	Report of Institute Visit/ Study Tour		5	10%

5	End-semester viva-voce examination to be conducted by the committee internally constituted by the Department Council	Quality of the work	6	35%
6		Presentation of the work	5	
7		Viva-voce	6	
8	Evaluation of the day-to-day records, the report of internship supervisor, and final report submitted for the end semester viva–voce examination before the committee internally constituted by the Department Council		8	15%
		Total Marks	50	

3. PROJECT

3.1. PROJECT IN HONOURS PROGRAMME

- In Honours programme, the student has the option to do a Project of 12-credits instead of three Core Courses in Major in semester 8.
- The Project can be done in the same institution/ any other higher educational institution (HEI)/ research centre/ training centre.
- The Project in Honours programme can be a short research work or an extended internship or a skill-based training programme.
- A faculty member of the respective institution, where the student does the Project, should be the supervisor of the Project.

3.2. PROJECT IN HONOURS WITH RESEARCH PROGRAMME

- Students who secure 75% marks and above (equivalently, CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the fourth year.
- A relaxation of 5% in marks (equivalently, a relaxation of 0.5 grade in CGPA) is allowed for those belonging to SC/ ST/ OBC (non-creamy layer)/ Differently-Abled/ Economically Weaker Section (EWS)/ other categories of candidates as per the decision of the UGC from time to time.
- In Honours with Research programme, the student has to do a mandatory Research Project of 12-credits instead of three Core Courses in Major in semester 8.
- The approved research centres of University of Calicut or any other university/ HEI can offer the Honours with Research programme. The departments in the affiliated colleges under University of Calicut, which are not the approved research centres of the University, should get prior approval from the University to offer the Honours with Research programme. Such departments should have

minimum two faculty members with Ph.D., and they should also have the necessary infrastructure to offer Honours with Research programme.

- A faculty member of the University/ College with a Ph.D. degree can supervise the research project of the students who have enrolled for Honours with Research. One such faculty member can supervise maximum five students in Honours with Research stream.
- The maximum intake of the department for Honours with Research programme is fixed by the department based on the number of faculty members eligible for project supervision, and other academic, research, and infrastructural facilities available.
- If a greater number of eligible students are opting for the Honours with Research programme than the number of available seats, then the allotment shall be based on the existing rules of reservations and merits.

3.3. GUIDELINES FOR THE PROJECT IN HONOURS PROGRAMME AND HONOURS WITH RESEARCH PROGRAMME

1. Project can be in Geography or allied disciplines.
2. Project should be done individually.
3. Project work can be of experimental/ theoretical/ computational/Quantitative/ Qualitative or exploratory in nature
4. There should be minimum 240 hrs. of engagement from the student in the Project work in Honours programme.
5. There should be minimum 13 hrs./week of engagement (the hours corresponding to the three core courses in Major in semester 8) from the teacher in the guidance of the Project(s) in Honours programme and Honours with Research programme.
6. The various steps in project works are the following:
   - Wide review of a topic.
   - Investigation on a problem in systematic way using appropriate techniques.
   - Systematic recording of the work.
   - Reporting the results with interpretation in a standard documented form.
   - Presenting the results before the examiners.

7. Students are encouraged to employ suitable methodologies tailored to the nature of the problem at hand. Studies may encompass quantitative, qualitative, or mixed methods approaches.

8. Project reports must utilize A4 sized pages printed on both sides.

9.The report's length should range from a minimum of 40 pages to a maximum of 80 pages, inclusive of references.

10.Adherence to the latest APA format is required for report preparation.

11. Two printed copies of the final study report must be submitted by students.

12. Students are required to include a plagiarism check report with their study submission. Any reputable plagiarism-checking software may be utilized for this purpose, in accordance with the University of Calicut's plagiarism regulations.

13.During the Project the students should make regular and detailed entries in to a personal log book through the period of investigation. The log book will be a record of the progress of the Project and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Project supervisor should periodically examine and countersign the log book.

14The log book and the typed report must be submitted at the end of the Project. A copy of the report should be kept for reference at the department. A soft copy of the report too should be submitted, to be sent to the external examiner in advance.

15.It is desirable, but not mandatory, to publish the results of the Project in a peer reviewed journal.

16The project report shall have an undertaking from the student and a certificate from the research supervisor for originality of the work, stating that there is no plagiarism, and that the work has not been submitted for the award of any other degree/ diploma in the same institution or any other institution.

17.The project proposal, institution at which the project is being carried out, and the project supervisor should be prior-approved by the Department Council of the college where the student has enrolled for the UG (Honours) programme.

3.4. EVALUATION OF PROJECT

- The evaluation of Project will be conducted at the end of the eighth semester by both internal and external modes.
- The Project in Honours programme as well as that in Honours with Research programme will be evaluated for 300 marks. Out of this, 90 marks is from internal evaluation and 210 marks, from external evaluation.
- The internal evaluation of the Project work shall be done through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme. 30% of the weightage shall be given through this mode.
- The remaining 70% shall be awarded by the external examiner appointed by the University.
- The scheme of continuous evaluation and the end-semester viva-voce of the Project shall be as given below:

Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)	Weightage
Continuous evaluation of project work through interim presentations and reports by the committee internally constituted by the Department Council	90	30%
End-semester viva-voce examination to be conducted by the external examiner appointed by the university	150	50%
Evaluation of the day-to-day records and project report submitted for the end-semester viva–voce examination conducted by the external examiner	60	20%
Total Marks	300	

INTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)
1	Skill in doing project work	30
2	Interim Presentation and Viva-Voce	20
3	Punctuality and Log book	20
4	Scheme/ Organization of Project Report	20
	Total Marks	90

EXTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research) 12 credits
1	Content and relevance of the Project, Methodology, Quality of analysis, and Innovations of Research	50
2	Presentation of the Project	50
3	Project Report (typed copy), Log Book and References	60
4	Viva-Voce	50
	Total Marks	210

4. GENERAL FOUNDATION COURSES

- All the General Foundation Courses (3-credits) in Gegraphy are with only theory component.

4.1. INTERNAL EVALUATION

Sl. No.	Components of Internal Evaluation of a General Foundation Course in Geography	Internal Marks of a General Foundation Course of 3-credits in Geography	
		4 Theory Modules	Open-ended Module
1	Test paper/ Mid-semester Exam	10	2
2	Seminar/ Viva/ Quiz	6	2
3	Assignment	4	1
		20	5
	Total	25	

4.2. EXTERNAL EVALUATION

External evaluation carries about 70% marks. Examinations will be conducted at the end of each semester. Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system (refer section 5).

PATTERN OF QUESTION PAPER FOR GENERAL FOUNDATION COURSES

Duration	Type	Total No. of Questions	No. of Questions to be Answered	Marks for Each Question	Ceiling of Marks
1.5 Hours	Short Answer	10	8 – 10	2	16
	Paragraph/ Problem	5	4 – 5	6	24
	Essay	2	1	10	10
				Total Marks	50

5.LETTER GRADES AND GRADE POINTS

- Mark system is followed for evaluating each question.
- For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given below.
- The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester.
- The Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study.

- Only the weighted grade point based on marks obtained shall be displayed on the grade card issued to the students.

LETTER GRADES AND GRADE POINTS

Sl. No.	Percentage of Marks (Internal & External Put Together)	Description	Letter Grade	Grade Point	Range of Grade Points	Class
1	95% and above	Outstanding	O	10	9.50 – 10	First Class with Distinction
2	Above 85% and below 95%	Excellent	A+	9	8.50 – 9. 49	
3	75% to below 85%	Very Good	A	8	7.50 – 8.49	
4	65% to below 75%	Good	B+	7	6.50 – 7.49	First Class
5	55% to below 65%	Above Average	B	6	5.50 – 6.49	
6	45% to below 55%	Average	C	5	4.50 – 5.49	Second Class
7	35% to below 45% aggregate (internal and external put together) with a minimum of 30% in external valuation	Pass	P	4	3.50 – 4.49	Third Class
8	Below an aggregate of 35% or below 30% in external evaluation	Fail	F	0	0 – 3.49	Fail
9	Not attending the examination	Absent	Ab	0	0	Fail

- When students take audit courses, they will be given Pass (P) or Fail (F) grade without any credits.
- The successful completion of all the courses and capstone components prescribed for the three-year or four-year programme with 'P' grade shall be the minimum requirement for the award of UG Degree or UG Degree Honours or UG Degree Honours with Research, as the case may be.
-

5.1. COMPUTATION OF SGPA AND CGPA

- The following method shall be used to compute the Semester Grade Point Average (SGPA):

  The SGPA equals the product of the number of credits (Ci) with the grade points (Gi) scored by a student in each course in a semester, summed over all the courses taken by a student in the semester, and then divided by the total number of credits of all the courses taken by the student in the semester,

  $$\text{i.e. SGPA (Si)} = \Sigma i\,(Ci \times Gi) / \Sigma i\,(Ci)$$

  where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th}course in the given semester. Credit Point of a course is the value obtained by multiplying the credit (Ci) of the course by the grade point (Gi) of the course.

$$\text{SGPA} = \frac{\text{Sum of the credit points of all the courses in a semester}}{\text{Total credits in that semester}}$$

ILLUSTRATION – COMPUTATION OF SGPA

Semester	Course	Credit	Letter Grade	Grade point	Credit Point (Credit x Grade)
I	Course 1	3	A	8	3 x 8 = 24
I	Course 2	4	B+	7	4 x 7 = 28
I	Course 3	3	B	6	3 x 6 = 18
I	Course 4	3	O	10	3 x 10 = 30
I	Course 5	3	C	5	3 x 5 = 15
I	Course 6	4	B	6	4 x 6 = 24
	Total	20			139
	SGPA				139/20 = 6.950

- The Cumulative Grade Point Average (CGPA) of the student shall be calculated at the end of a programme. The CGPA of a student determines the overall academic level of the student in a programme and is the criterion for ranking the students.

  CGPA for the three-year programme in CUFYUGP shall be calculated by the following formula.

$$\text{CGPA} = \frac{\text{Sum of the credit points of all the courses in six semesters}}{\text{Total credits in six semesters (133)}}$$

  CGPA for the four-year programme in CUFYUGP shall be calculated by the following formula.

$$\text{CGPA} = \frac{\text{Sum of the credit points of all the courses in eight semesters}}{\text{Total credits in eight semesters (177)}}$$

- The SGPA and CGPA shall be rounded off to three decimal points and reported in the transcripts.
- Based on the above letter grades, grade points, SGPA and CGPA, the University shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

Programme	B. Sc. Geography				
Course Title	**Fundamentals of Geography**				
Type of Course	**Major With Practical**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Fundamentals of Geography " that delves into the essence and evolution of geography as a discipline. Covering core concepts such as location, scale, and spatial distribution, students navigate through the intricate interplay between physical and human systems. From analyzing the Earth's physical processes to understanding the dynamics of human populations and settlements, learners gain insight into the complexities of our planet. Through hands-on activities with maps, spatial technologies, and case studies, students learn to apply geographical knowledge to interpret the past, understand the present, and plan for the future, emphasizing the relevance and importance of geography in our daily lives.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental concepts of geography, including location, scale, and spatial distribution.	U	C	Instructor-created exams / Quiz
CO2	Analyze the processes shaping the Earth's physical features and ecosystems.	An	C	Quizzes and exams assessing knowledge of core geographical concepts.

CO3	Evaluate the dynamics of human populations and settlements across different geographical contexts.	E	C	Map interpretation tasks to gauge spatial understanding and proficiency.
CO4	Apply spatial technologies and mapping techniques to interpret geographical data effectively.	Ap	C	Case study analyses evaluating students' ability to apply geographical knowledge to real-world scenarios.
CO5	Demonstrate critical thinking skills through the analysis of case studies and real-world examples.	C	C	Presentations or papers discussing the relevance of geography in addressing contemporary issues.
CO6	Recognize the significance of geography in addressing contemporary global challenges and planning for sustainable futures.	Ap	C	Reflective essays or discussions on the importance of geography in personal and societal contexts.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)	Marks (70+30)
I		Introduction to Geography	**8**	**10**
	1	What Is Geography?	2	
	2	Evolution of the Discipline	2	
	3	Subfields of Geography	2	
	4	Why Geography matters	2	
	Sections from References:			
II		Concept and themes in Geography	**10**	**20**
	5	Core Geographic Concepts Location, Direction, Distance, Size and Scale	3	
	6	Physical and Cultural Attributes	1	
	7	Place and space	2	
	8	Regions Spatial Distributions -Types of Regions	2	
	9	Traditions in Geography	2	
	Sections from References:			
III		Physical System and human systems	**14**	**25**
	10	Physical Processes Shaping Earth's Surface Patterns	2	
	11	Characteristics of Ecosystems ,Spatial Distribution of Ecosystems	2	
	12	Impact of Physical Processes on Ecosystem Distribution	2	
	13	Characteristics of Human Populations	2	
	14	Distribution of Human Populations	2	
	15	Human Population Migration	2	
	16	Human Settlement Patterns	2	
	Sections from References:			
IV		Geography for life	**13**	**15**
	17	Human Modification of the Physical Environment	2	
	18	Interactions between Physical and Human Systems	2	
	19	Changes in Resource Dynamics	2	

	20	Resource Management and Sustainability	2	
	21	Applying Geography for Historical Interpretation	3	
	22	Applying Geography for Present Understanding and Future Planning	2	
	Sections from References:			
V	Techniques of Geographic analysis		**30**	
	1	Locating Points on a Sphere -The Geographic Grid Land Survey Systems Map Projections -Area Shape Distance Direction Scale - Representation of Scale Construction of Plain scale Diagonal scale ,Comparative scale Time scale Vernier scale Types of Maps Topographic Maps and Terrain Representation Thematic Maps and Data Representation Point Symbols Area Symbols Line Symbols Contemporary Spatial Technologies Remote Sensing – GIS and The Global Positioning System	30	
	Sections from References:			

1. Holden, J. (2012). Physical Geography: The Basics. Routledge.

2. Knox, P. L., & Marston, S. A. (2019). Human Geography: Places and Regions in Global Context. Pearson.

3. de Blij, H. J., Muller, P. O., & Nijman, J. (2013). Geography: Realms, Regions, and Concepts. Wiley.

4. Getis, A., Bjelland, M., & Getis, V. (2017). Introduction to Geography. McGraw-Hill Education.

5. Matthews, J. A., & Herbert, D. T. (2008). Geography: A Very Short Introduction. Oxford University Press.

6. DK. (2018). Geography: A Visual Encyclopedia. DK Children.

7. Waugh, D. (2018). Geography: An Integrated Approach. Nelson Thornes.

8. Rubenstein, J. M. (2019). Geography: A Study Guide to Accompany The Cultural Landscape: An Introduction to Human Geography. Pearson.

9. Heatwole, C. A. (2011). Geography For Dummies. For Dummies.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	2	-	3				1	2
CO 2	3	-	-	-	-	-		3	2			
CO 3	2	-	3	2	-	-	3		3	3		
CO 4	3	-	2	3	-	-				2	2	
CO 5	3	3	-	-	3	-	3				3	2
CO 6	-	-	2	2	-	-		1		2		3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓

CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Fundamentals of Geomorphology**				
Type of Course	**Major with practical**				
Semester	II				
Academic Level	100 – 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	**3**	**-**	**2**	**75**
Pre-requisites	Nil				
Course Summary	This introductory course in Geomorphology provides students with a comprehensive understanding on the evolution of the Earth and the activities of different endogenic agents and process engaged in the formation of new landforms on the earth's surface. Geomorphic evaluation of the Earth's surface is utmost important for sustainable development as it helps ground water exploration and storage, housing and construction, flood control, waste disposal, smart city development,oil and natural gas exploration, and Natural hazard studies and management.				

Course Outcomes(CO):After the completion of this course, students should be able to:

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Outline the geological history and the evolution of the Earth	U	C	Instructor-created exams / Quiz
CO2	Illustrate and explain the forces affecting the crust of the earth and its effect on it	U	C	Instructor-created exams / Quiz
CO3	Infer the dynamic nature of the Earth's surface and it's interior	U	C	Instructor-created exams / Quiz
CO4	Differentiate the landforms formed by endogenic processes and their representation	An	C	Discussion / among Groups and Seminars
CO5	Critiquethe planet's	E	P	Instructor-

	dynamic processes and helps explain the ever-changing nature of its surface.			created exams / Quiz/ Seminars

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45+30)	Marks (70+30)
I		**Fundamental Concepts**	**8**	**15**
	1	Nature and Scope of Geomorphology	1	
	2	Geological Time Scale	1	
	3	Origin of the Earth	2	
	4	Fundamental Concepts of Geomorphology	2	
	5	Forces and Earth Movements. Emphasis on Endogenetic forces	2	
II		**Structure of Earth and Plate Tectonics**	**17**	**20**
	6	The Composition and Structure of Earth	2	
	7	The Continental Drift	2	
	8	Developments leading to Plate tectonics ; Convection Current Sea Floor Spreading Paleomagnetism,	2	
	9	Theory of Plate Tectonics	2	
	10	Volcanism, Types of Volcano, Distribution and Relation to Plate Tectonics	2	
	11	Mountain building Processes	2	
	12	Geosyncline Orogen Theory by Alfred Kober	2	
	13	Earthquakes and Plate Tectonics	1	
	14	Isostasy ; Theories of Airy and Prat	2	
III		**Geomorphic Processes**	**8**	**10**
	15	Exogenic processes	2	
	16	Weathering – Mechanical, Chemical and Biological- Significance of weathering	3	
	17	Mass wasting – types and factors	3	
IV		**Landform Evolution**	**12**	**25**
	18	Drainage systems and patterns ,Running water as an agent of Erosion, Erosional and depositional landforms	3	
	19	Evolution of Aeolian landforms - Erosional and depositional landforms	3	
	20	Evolution of Aeolian landforms - Erosional and depositional landforms	2	
	21	Karst landforms - Erosional and depositional landforms	2	
	22	Glacial landforms - Erosional and depositional landforms	2	
V		**Geomorphological mapping and Topographic profile drawing: (Practical)**	**30**	
	1	Methods of relief representation – qualitative and quantitative	6	
	2	Identification of relief features from Toposheet and their representation by contours – construction of profiles – serial, superimposed, projected, and composite profiles	6	
	3	Calculation of gradient from Toposheet	4	

	4	Basin Morphometry - Stream ordering- Strahler's and Horton's method – Calculation of Drainage density, Drainage Texture, Elongation ratio, Bifurcation Ratio and Ruggedness number	10	
	5	Measurement of Area by Graphical Method / Planimeter	4	

1. Bloom, A. L. (1998). Geomorphology: A Systematic Analysis of Late Cenozoic Landforms. Prentice-Hall.

2. Easterbrook, D. J. (1999). Surface Processes and Landforms. Prentice Hall.

3. Montgomery, D. R., & Gillespie, A. R. (2000). Dynamics of Geomorphology. Cambridge University Press.

4. Summerfield, M. A. (1991). Global Geomorphology. Pearson Education Limited.

5. Twidale, C. R., & Campbell, E. M. (2005). Australian Landforms: Understanding a Low, Flat, Arid, and Old Landscape. Rosenberg Publishing.

6. Fookes, P. G. (2000). Geomorphology in Environmental Management: A New Introduction. Oxford University Press.

7. Culling, W. E. H. (1963). Analytical Geomorphology: A Comprehensive Text on the Practice of Analytical Geomorphology. John Wiley & Sons.

8. Summerfield, M. A. (1991). Geographical Systems: Processes and Patterns. Routledge.

9. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). Geomorphology. Methuen & Co. Ltd.

10. Thornbury, W. D. (1969). Principles of Geomorphology. John Wiley & Sons.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	2	1	2	3	3	2	2	1	2
CO 2	3	3	3	2	2	2	3	3	3	2	2	2
CO 3	3	3	3	2	2	2	3	3	3	2	2	3
CO 4	3	3	3	3	2	2	3	3	3	3	2	3
CO 5	3	3	3	3	3	2	3	3	3	3	3	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	✓

Programme	B. Sc. Geography				
Course Title	**Oceanography**				
Type of Course	**Major**				
Semester	**III**				
Academic Level	**200-299**				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Oceanography is the study of the physical ,chemical and biological features of the ocean including the ocean's ancient history, its current condition, and its future. Students engage with ocean related topics such as Ocean theories, distributions, techniques and practical's in the field ocean studies. The ocean water movements, climate and Ocean relations, ocean resources and economy, international oceanic cooperation and agreement are the areas of scope. The field and laboratory techniques are more productive, and there is provision for handling real-world problems related to ocean and marine environment and its conservation and management .Through these students become capable in identifying the knowledge and solve the issues that related Marine				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	The study of oceanography provides essential knowledge about our oceans' physical, biological, chemical, and geological aspects.	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts such as Evolution, historical development, distributions and topography movements, marine resources, conservation and management.	U	C	Group discussions and Seminars
CO3	The main goal of researching oceanography is to increase our comprehension of the intricate systems and processes of the seas in order to solve environmental issues, aid in conservation efforts, forecast the effects of climate change, and advance sustainable development strategies.	An	C	Evaluate the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	This enhances the skills of ocean studies and increases the awareness among students for participating ocean conservation to protect the life of the Earth. Students understand that international cooperation in the fields such as data sharing, policy development, trade, and ocean routes, capacity building and disaster response plays a crucial role in advancing oceanography and achieving the goals related to ocean resource management.	E	C	Discussion, Practical Assignments and exams
CO5	Understanding of the oceans is enhanced by the complementary roles that GIS and remote sensing technologies play in providing spatial analysis capabilities, integrating varieddatasets, supporting decision-making processes, and providing wide coverage and consistent temporal observations.	An	P	Practical assignmentSeminars and open text exams
CO6	Climate change, Cyclone Tracking, sea profile Analysis, and laboratory techniques made practical knowledge and capable of applications for the betterment of oceans.	Ap	P	Filed visits, project writing and Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Contents	Hrs (48+12)	Marks (70+30)
		Historical Review and Development of Oceanography	**13**	**15**
I	**1**	Geographer and Oceanographer.	2	
	2	Oceans ;International Cooperation and Development Challenge Scope of Learning Oceanography	3	
	3	Early Explorations and Development of Oceanography	2	
	4	Oceanography as a Systemic Science	2	
	5	Major Oceans-Distribution and Extend of allOceans and Marginal Seas.	2	
	6	Oceanographic Institutions Oceans ;International Cooperation andDevelopment Challenges	2	
II		**Geomorphology of the Ocean Bottom ,Ocean deposits and Physical ,Chemical Properties of Ocean Water**	**15**	**25**
	7	Origin of Earth's Oceans	1	
	8	Ocean Bottom Topography-Pacific, Atlantic ,Indian Oceans	3	
	9	Plate Tectonics and Ocean Floor, OceanDeposits	2	
	10	Coral Reefs-Types ,Theories of CoralFormation	3	
	11	Composition of Sea Water and its Salinity	2	
	12	Horizontal and Vertical Distribution of Temperature, Ocean Water Temperature	2	

	13	Global Thermostatic Effects, Climate Changeand Sea Level	2	
III		**Movements of Ocean Water**	**10**	**15**
	14	Waves ,Tides, Ocean Currents, Upwelling andDownwelling	5	
	15	Thermohaline Circulation, El Nina and LaNina, Ocean Extremes-Tsunami	5	
IV		**Resources of the Oceans andInternational Cooperation**	**10**	**15**
	16	Physical Resources and Biological Resources	2	
	17	Environmental Concerns-Oil Sleek, WasteIslands, Coastal Pollution	1	
	18	Marine Energy	1	
	19	Exclusive Economic Zone	1	
	20	International Cooperation in Managing OceanResources: United Nations Convention on theLaw of the Sea(UNCLOS),Regional Agreements and Organisations for Ocean Resource Management	2	
	21	United Nations and International Law of theSeas	1	
	22	Mapping of ocean water salinity and temperature using Remote sensing	2	

		techniques(SST,MODIS,AMSR)		
V		**Practicum**	**12**	
	1	Ocean water Assessment and Mapping :Temperature and Salinity	3	
	2	Cyclone Tracking(Arabian Sea):Using SatelliteImagery and Remote Sensing Technology, Roleof IMD, Interpretation of Weather Models for Tracking Cyclones	3	
	3	Sea Profile Analysis :Measurement process ,Data collection, Shape Analysis, ErosionStudies, Management Planning	2	
	4	Field Trip: Hands on experience with coastalenvironments	2	
	5	Dissertation Work	2	

References

1. Oceanography: An Integrative Approach by Robert W.Berner,John T Huthnance,and Richard A Phleger
2. Principles of Oceanography by Robert W Lyman and John P Decrouseau
3. Introduction to Marine Biology and Ecology by Charles C Sheldon and Terry L Erwin
4. Marine Biology:Function,Biodiversity,Ecology by James P Hawkes and Andrew C Young
5. R A Anthes 1982, Tropical Cyclones: Their Evolution, Structure and Effects.

6. Coastal Profiles: An Introduction to the Natural and Human Environments by Miles OHayes and Jacqueline Michel
7. Introduction to Oceanography by Paul Eebb

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (10 marks) and the first four modules (20 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	3	-	3	3	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	3	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Advanced Climatology**				
Type of Course	**Major With Practical**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Advanced Climatology delves into the intricacies of atmospheric processes and their profound influence on Earth's climate. Beginning with an exploration of climatology's essence, we dissect its branches and elucidate the distinction between weather and climate. Understanding atmospheric composition and solar radiation distribution sets the stage for comprehending temperature dynamics and phenomena like temperature inversions. The course further explores atmospheric pressure and circulation, unraveling the complexities of wind patterns, air masses, and weather systems such as cyclones and anti-cyclones. Atmospheric moisture dynamics are then scrutinized, encompassing humidity variations, condensation mechanisms, cloud formation, precipitation types, and their climatic implications. Moreover, significant climatic phenomena like El Niño, Indian monsoon, and global warming are critically examined, highlighting their impacts on regional and global climates. Through this comprehensive exploration, students gain a nuanced understanding of climatic processes, preparing them to address contemporary challenges and contribute to sustainable climate management strategies.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental concepts of Climate and weather	U	C	Instructor-created exams / Quiz
CO2	Evaluate students' ability to Interpret structure and composition of atmosphere.	E	C	Evaluate the relationship between each Atmospheric layers
CO3	Analyze the Atmospheric Pressure and its relation with winds	An	C	Evaluate the relationship of Atmospheric Pressure and its relation with winds
CO4	Apply students knowledge to climate change mitigation and adaptation	Ap	C	Discussion / Practical Assignments
CO5	Understanding of the atmospheric moisture and its forms	U	C	Instructor-created exams / Quiz/ Seminars
CO6	Relate climate with other environmental and human issues .Enhancing the skills of the students in Cloud watching, and Constructions of climatic diagram, Collection of Local Weather Data and preparation of weather report of a locality.	Ap	C	Discussion and Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45 +30)	Marks (70+30)
I	**Introduction to Climatology**		**10**	**15**
	1	Definition, nature, and scope of climatology	1	
	2	Branches of Climatology ;Physical, Regional, Applied Climatology	3	
	3	Concept of weather and climate	2	
	4	Elements of Weathers and Climatic controls	4	
	Sections from References:			
II	**Atmosphere and Solar Radiation**		**10**	**15**
	5	Composition and Structure of the Atmosphere	3	
	6	Solar Radiation- : Factors affecting on the distribution -Terrestrial Radiation	3	
	7	Temperature: Horizontal and Vertical distribution of Atmospheric Temperature -Heat balance	2	
	8	Temperature Inversion and types	2	
	Sections from References:			
III	**Atmospheric Pressure and Atmospheric Circulation**		**15**	**20**
	9	Atmospheric Pressure - : Concept and Factors affecting on pressure distribution	1	
	10	Vertical and Horizontal distribution of pressure	1	
	11	Wind Types- Planetary winds	2	
	12	Periodic winds	3	
	13	Local winds	2	
	14	Upper air circulation – jet stream (concept, origin and effects)	1	
	15	Air Masses and types	1	

	16	Fronts and types	2	
	17	Cyclones and Anti-cyclones	2	
	Sections from References:			
IV	**Atmospheric Moisture**		**10**	**20**
	18	Humidity: Types - absolute, relative and specific	1	
	19	Condensation and forms of Condensation	2	
	20	Clouds, Precipitation and its types	2	
	21	El Nino and Indian monsoon	2	
	22	Global warming and climate change.	3	
	Sections from References:			
V	**Practical Component**		**30**	
	1	1 Cloud watching and prepare cloud list **2.** Collection of Local Weather Data **3.** Reading and Interpretation of Weather Maps 4 Constructions of the Hyther Graph, Climograph and Wind Rose.	20	
	2	**Project:** Write a report on weather condition of locality	10	
	Sections from References:			

Books and References:.

1.Bara A. K. (2005), "Climatology" Dominant publisher & Distributors, New Delhi.

2.Barry R. G. &Chorley R. G " Atmosphere, weather and climate Rouiledga 1998.

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7.Critsfield,H.J.,1975:General Climatology, Prentice Hall,New Delhi.

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9.Lal,D.S.,1998: Climatology, ShardaPustakBhawan, Allahabad.10).

10.Oliver J E & Hidore J J, Climatology: an atmospheric science

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	2	2	3	3	2	2	1	2
CO 2	3	-	-	-	-	-	3	3	3	2	2	2
CO 3	2	2	3	2	-	-	3	3	3	2	2	2
CO 4	3	-	2	3	3	1	3	3	3	3	2	2
CO 5	3	3	-	-	-	-	3	3	3	3	3	2
CO 6	-	-	2	2	-	-	2	2	3	2	2	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓

CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓	✓	✓	

Programme	B. Sc. Geography				
Course Title	**Soil Geography**				
Types of Course	**Major with Practical**				
Semester	IV				
AcademicLevel	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	This course provides theoretical and practical knowledge to students witha comprehensive understanding of soil, encompassing its origin, development, significance and characteristics of soil and practical applications soil conservation and management. Students engage with soil techniques and practices in the field. The physical and chemical quality analysis, profile identification, soil erosion, factors and effects, soil conservation and its methods, and soil mapping provide an opportunity for the students to understand and examine the various geographical and scientific knowledge about the soil. The field and laboratory techniques were more productive, and there is provision for handling real-world problems related to soil conservation and management and assessing students' ability to apply their knowledge to solve the issues related to soil.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Soil geography is a tool of soil science that focuses on the spatial distribution and variability of soils. It involves studying how different soils exist in various locations, understanding the dynamic properties of soil, and creating soil maps to match land use and management planning to the capabilities of different soils.	U	C	Discussions and debates
CO2	Evaluate students ability to articulate key concepts (pedogenesis, profile, taxonomy, properties, conservation and management, mapping) and explain their practical applications.	U	C	Group discussions and Seminars
CO3	Soil geography provide an opportunity to analyzing soil distribution, composition, properties, factors influencing formation, classification systems, and human activities, preparing them for effective land use planning and conservation.	An	C	Evaluate the clarity, accuracy, and effectiveness of their conceptual understanding and practical's
CO4	Government may contribute significantly to the promotion of sustainable soil management methods that safeguard soil health, preserve soil resources, lessen the effects of agriculture, and guarantee long-term food security by successfully putting these plans, policies, and schemes into action.	E	C	Discussion, interactions with stake holders, filed visits, Practical Assignments and exams
CO5	Geographic Information Systems (GIS) and remote sensing technologies to improve research and comprehension of soil qualities, erosion processes, soil quality monitoring and land management.	An	P	Practical assignment, Seminars and open text exams
CO6	Soil mapping techniques, physical and chemical quality assessments, and field and laboratory techniques made practical knowledge and capable of applications for the betterment of nature.	Ap	P	Filed visits, project writing and Practical Assignments

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Contents	Hrs (45+30)	Marks (70+30)
I	**Introduction to Soil**		**10**	**15**
	1	Soil: Concept, Meaning and Definition	2	
	2	Formation of Soil (Pedogenesis) and theFactors	2	
	3	Soil Profile: Process and Formation, Composition, Types and Soil Horizons	2	
	4	Soil Profiles in Geography: RelationshipBetween Soil Profile And Landforms, Impact on Vegetation and Ecosystems	2	
	5	Soil Taxonomy: Introduction, History and Development of Soil Classification Systemsand its Importance	2	
	Sections From References			
II		**Soil Taxonomy and Classification**	**15**	**25**
	6	Taxonomy and Classification of Soil	1	
	7	Differentiate Mineral Soils and Organic Soils: Definition ,Mineral Soil Material, Organic Soil Material, Distinction BetweenMineral and Organic Soils	2	
	8	Application of Soil Taxonomy to Soil Surveys: Mapping Soil Geographic Order,The Soil-Landscape Paradigm and Soil Survey, Labelling Soil Geographic Order With Soil Taxonomy, Soil Geographic Order and Soil Taxonomy in Soil Survey	3	
	9	The Categories of Soil Taxonomy-Orders:Alfisols,Andisols,Gelisols,Aridisols, Histosols,Inceptisols,Entisols,Mollisols, Oxisols,Vertisols,Spodosols,Ultisols	2	
	10	Types of Soil :Geographical Classification,Geological Classification	1	

	11	Soil of India and its geographical classification	1	
	12	Soils of Kerala and its geographicalclassification	1	
	Properties of Soil			
	13	Physical Properties: Texture, Bulk Density t,Structure, Colour, Temperature , Porosity ,Permeability, Consistency Assessment SoilHorizon	2	
	14	Chemical Properties : pH, EC, AvailableNutrients, CEC, Sodicity, Mineralogy, Organic Carbon	2	
	Sections from References			
III	**Soil Erosion and Conservation**		**10**	**15**
	15	Soil Erosion, Types, Causes, Factors andEffects	2	
	16	Soil Erosion Assessment Techniques:Significance and Factors	2	
	17	Major Assessment Techniques- Field BasedAssessment Technique-USLE (Universal Soil Loss Equation),RUSLE(Revised Universal Soil Loss Equation),GIS Based Modelling , Remote Sensing Applications	4	
	18	Soil Conservation-Methods of conservation	2	
	Sections From References			
IV	**Soil Conservation and Management**		**10**	**15**
	19	Importance of Soil Conservation, Sustainable Agricultural Practices for Maintaining Soil Fertility	2	
	20	Management Practices for Soil Conservation: Cover Cropping,Conservation Tillage, Terracing Soil Management Plans: Site Assessments,Planning, Implementation Strategies, Monitoring and Adaptation	3	

	21	Soil Government Authorities: Key Government Authorities-Ministry of Agriculture and Farmers Welfare, Indian Council for Agriculture Research(ICAR)-IARI,IISS	2	
	22	Government Initiatives and Programmes forSoil Management-Soil Health Card Scheme(SHCS), National Mission for Sustainable Agriculture (NMSA),Nutrient Based Subsidy (NBS)	3	
	Sections from references			
V	**Practicum**		**30**	
	1	Soil Mapping Techniques :Soil Mapping using Remote Sensing and GIS Interpretation and Analysis of Soil Maps	5	
	2	Physical and Chemical Quality Assessment :Physical Quality Assessment-Soil TextureAnalysis, Bulk Density Measurement, SoilStructure Evaluation, Soil Colour Assessment	10	
	3	Chemical Quality Assessments: pHMeasurement, Soil Analysis(NPK)	5	
	4	Field and Laboratory Techniques: Soil Sampling, Profile Identification and Assessment of soil Horizons, Data Collection, Interpretation and Reporting	10	
	Sections from reference			

Suggested Readings:

1. Clarke G.R.1957 Study of the Soil in the Field, Oxford University Press, Oxford.
2. Brady, N.C., and R.R. Weil. 2017. The Nature and Properties of Soils, the, 15th Edition**.**
3. Backman, H.O and Brady, N.C, 1960,The Nature and Properties of Soils, Mc Millan NewYork.
4. Mahapatra G B ,1994, Text Book of Physical Geology
5. Bennet, Hugh H.: Soil Conservation, McGraw Hill, New York.
6. Bunting, B.T.(1973) The Geography of Soils, Hutchinson, London
7. Daji, J. A., (1970): A Text Book of Soil Science, Asia Publishing House, Londaon.
8. Foth H.D. and Turk, L.M(9172) Fundamentals of Soil science, John Wiley, New York.
9. MathurNeeru, (2012): Soils, Rajat Publications, New Delhi-02 (India).
10. GovindaRajan, S.V. and Gopala Rao, H.G.(9178) Studies on Soils of India Vikas, New Delhi .
11. John Jerrad, (2000)Fundamentals of Soils(Routeledge Fundamentals of Physical Geography).
12. Das D K,(2008)Practical Manual on Soil Physics and Soil Chemistry.New Age International
13. Yadav R S .et.al, Practical Handbook of Soil Science , Agrotech Publishing Academy
14. Soil Geography-An Integrated Approach-M Lal
15. Remote Sensing and GIS –Basudeb Bhatta
16. Soil Taxonomy: A Basis System of Soil Classification for Making and Interpreting Soil Surveys(1999)USDA

Note: The syllabus has five modules. There should be total 18 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 18 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	2-	3	3	3	2	2	1	2
CO 2	3	2	-	-	-	-	3	3	3	2	2	

CO 3	2	-	3	2	3-	-	2	3	3	2	2	
CO 4	3	-	2	3	-	-	3	3	3	3	2	
CO 5	3	3	-	-	3	-	2	3	3	3	3	3
CO 6	-	-	2	2	-	3				2		

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B.Sc.Geography				
CourseTitle	**Remote Sensing**				
Type ofCourse	**Major With Practical**				
Semester	IV				
Academic Level	200-299				
CourseDetails	Credit	Lectureper week	Tutorial perweek	Practical perweek	TotalHours
	4	3	-	2	75
Pre-requisites	Nil				
CourseSummary	This course provides an introduction to the principles, techniques, and applications of remote sensing. It covers the fundamentals of electromagnetic radiation, sensors, platforms, image processing, and interpretation methods. The course also explores various applications of remote sensing in different fields such as environmental monitoring, agriculture, urban planning, natural resource management, and disaster management.This course offers an integrated approach to understanding remote sensing principles and digital image processing techniques. Additionally, the course delves into digital image processing methods, including enhancement, filtering, and classification, to extract valuable information from remotely sensed data. Through hands-on exercises and practical applications, students gain the skills necessary to analyze remote sensing imagery effectively and apply digital image processing techniques in various domains.				

CourseOutcomes(CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Toolsused
CO1	Explain physical principles and sensing process in remote sensing.	U	C	Instructor-createdexams/Quiz
CO2	Differentiate between the types of remote sensors and platforms and analyze	E	C	Evaluate the relationship between remote sensors and platforms
CO3	Evaluate the applications of remote sensing, including the new satellite programs of India.	E	C	Evaluate the applications of remote sensing
CO4	Describe preprocessing requirements and discuss various Digital Image Processing techniques.	Ap	C	Practical Assignments
CO5	Analyse digital imageries	Ap	C	Practical Assignments
CO6	Apply the knowledge of remote sensing in various thematic studies	Ap	C	Practical Assignments
- Remember(R),Understand(U),Apply(Ap),Analyse(An),Evaluate(E),Create(C)#-FactualKnowledge(F)ConceptualKnowledge (C)ProceduralKnowledge (P) MetacognitiveKnowledge(M)				

Module	Unit	Content	Hrs(45+30)	Marks(70+30)
I		**Introduction to Remote Sensing**	**7**	**15**
	1	Definition and Evolution of Remote Sensing	1	
	2	Theories of EMR & Electromagnetic Spectrum	2	
	3	Types of Remote Sensing: Based on Energy source and Electro - Magnetic Spectrum	2	
	4	Future Trends and Advances in Remote Sensing Technology	2	
		Sections from References:		
II		**Energy Interaction with Atmosphere & Earth Surface**	**8**	**15**
	5	Energy Interaction with Atmosphere & Earth Surface: Reflection, Absorption, Transmission	2	
	6	Scattering: Rayleigh, Mie and Non-selective; Absorption, and Refraction;	2	
	7	Atmospheric Windows	2	
	8	Spectral Signature: Interaction with soil, water and vegetation, and other features;	2	
		Sections fromReferences:		
III		**Platforms, Sensors, & Orbits**	**15**	**20**
	9	Remote Sensing platforms	2	
	10	Types of Platforms (Satellites, Aircraft, UAVs)	2	
	11	Characteristics and Capabilities of Different Platforms	2	
	12	Overview of Remote Sensing Sensors&Types of Sensors (Passive and Active)	2	
	13	Resolution and its types: Spatial, Spectral, Radiometric, andTemporal.	3	
	14	Sensor Technologies (Optical, Radar, LiDAR, Thermal)	2	
	15	Unmanned Aerial Vehicles (UAVs) in Remote Sensing	2	
		Sections fromReferences:		

IV		**Image Analysis &Digital Elevation Models**	**15**	**20**
	16	Image Pre-processing (Radiometric and Geometric Correction)	2	
	17	Image Classification (Supervised and Unsupervised)	2	
	18	Accuracy Assessment	2	
	19	Change Detection	2	
	20	Principles and utilities of different band ratio-based indices	2	
	21	Concept of DEM; Attributes of DSM and DTM; DEM preparation methods and accuracy	3	
	22	Basic principles of digital terrain analysis: parameters and computations	2	
	Sections from References:			
V	**Practical and Course Project - Exercises on Satellite Images**		**30**	
	Image Georeferencing and Image Enhancements		10	
	Image Mosaicking and Creating Multispectral Images		5	
	Image Classification – Unsupervised and Supervised and Accuracy Assessment		10	
	NDVI and NDBI based mapping using Landsat and Sentinel images		5	

References:

1.Lillesand, T. M., Kiefer, R. W., and Chipman, J. W., (2008): Remote Sensing and Image Interpretation, John Wiley & Sons

2. Jensen, J. R., (2005): Introductory Digital Image Processing, Prentice Hall

3. Reddy, A. M., (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication.

4. Campbell, J., (2002): Introduction to Remote Sensing, Taylor & Francis.

5. Joseph, G., (2004): Fundamentals of Remote Sensing, Universities Press.

6. Bhatta, B. (2011). *Remote Sensing and GIS*, 2nd ed, Oxford Univ. Press.

Mapping of Cos with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	1	2	2	3	3	2	2	1	1
CO 2	3	2	2	-	1	-	3	3	3	2	2	2
CO 3	2	-	3	2	-	2	3	3	3	2	2	3
CO 4	3	-	2	3	-	-	3	3	3	3	2	3
CO 5	3	3	-	-	2	-	3	3	3	3	3	3
CO 6	-	-	2	2	-	-	3	2	2	2	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓

CO 6	✓		✓	✓

Programme	B. Sc. Geography
Course Title	**Field work in Physical Geography**
Type of Course	**Major With Practical**
Semester	IV
Academic Level	200-299

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Pre-requisites	Nil
Course Summary	Fieldwork in Physical Geography is a practical, hands-on course designed to provide students with opportunities to engage in direct observation, data collection, and analysis of geographical phenomena in real-world settings. Through fieldwork activities, students explore the dynamic interactions between natural and human systems, develop essential field research skills, and deepen their understanding of geographical concepts and processes. The course emphasizes experiential learning, critical thinking, and the application of geographic principles to solve real-world problems.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students will demonstrate the ability to critically analyze geographical phenomena observed during fieldwork, identify patterns, and interpret data collected in the field	U	C	Fieldwork Reports and Journals
CO2	Students will develop keen observational skills by actively engaging with the environment during fieldwork activities, accurately documenting spatial features, and recognizing geographical patterns.	E	C	Oral Presentations and Group Discussions

CO3	Students will communicate their fieldwork findings effectively through written reports, oral presentations, and visual representations, demonstrating clarity, coherence, and relevance in their communication.	E	C	Practical Field Assessments
CO4	Students will achieve a deeper understanding of geographical concepts and processes by applying theoretical knowledge to real-world situations encountered during fieldwork, thereby consolidating their learning.	A	F	Map Interpretation and Spatial Analysis Tasks
CO5	Students will acquire practical field research skills and interdisciplinary knowledge that prepare them for careers in fields such as environmental science, urban planning, natural resource management, and geographic information systems (GIS).	E	C	Peer Evaluation and Self-Assessment
CO6	Students will develop a sense of responsibility as informed global citizens by engaging in fieldwork activities that address contemporary geographical challenges, promoting environmental stewardship and social awareness	C	P	Synthesis and Application Tasks
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	**Geography and field work**		**10**	**15**
	1	Field work in geographical studies	1	
	2	Nature and scope of geographical field work	3	
	3	Field ethics	4	
	4	Methods and tools of geographical field work	2	
	Sections from References:			
II	**Understanding Landforms**		**10**	**15**
	5	landforms–identification and observation	1	
	6	landform analysis based on contours	3	
	7	Representation of landforms based on contours	3	
	8	Interpretation	3	
	Sections from References:			
III	**Understanding water resource**		**15**	**25**
	9	Observing and Identifying Water Resources	1	
	10	Methods of Hydrological Data Collection	1	
	11	Analysis of Hydrological Data	3	
	12	Interpretation of Hydrological Data	2	
	13	Representation of Hydrological Data	2	
	14	Hydrological Monitoring and Field Measurements	1	
	15	Analysis of Hydrological Processes	1	
	16	Assessment of Water Resource Management Practices	2	
	17	Field-based Research Projects	2	
	Sections from References:			
IV	Geographical Survey techniques		**10**	**15**

	18	Surveying	1	
	19	Chain or tape survey	2	
	20	Prismatic compass survey	2	
	21	Plain table survey and Indian clinometer	2	
	22	GPS survey	3	
	Sections from References:			
V	**Practical**		**30**	
	1	Field survey		
		The practical component of this course will entail a fieldwork program encompassing significant geographical locations across India. The fieldwork activities are expected to span approximately 6 to 7 days, excluding travel time. Fieldwork will be conducted in alignment with Modules 2, 3, and 4, with students tasked to compile a comprehensive report consolidating their findings for final evaluation		
	Sections from References:			

1. Bennett, D., & van Wyk, A. (Eds.). (2018). Fieldwork in Geography: Reflections, Perspectives, and Actions. Routledge.

2. Warf, B. (Ed.). (2017). The SAGE Handbook of Human Geography: Two Volume Set. SAGE Publications.

3. Clifford, N., Holloway, S., Rice, S., & Valentine, G. (Eds.). (2016). Key Concepts in Geography. SAGE Publications.

4. Hay, I. (2017). Qualitative Research Methods in Human Geography. Oxford University Press.

5. Smith, S. J., Pain, R., Marston, S. A., & Jones III, J. P. (2018). The SAGE Handbook of Social Geographies. SAGE Publications.

6. Lee, R. B., & Field, J. (2018). The Routledge Handbook of Research Methods in the Study of Religion. Routledge.

7. Johnston, R. J., Gregory, D., Pratt, G., & Watts, M. J. (Eds.). (2016). The Dictionary of Human Geography. Wiley-Blackwell.

8. Shaw, S. L., & Francis, C. A. (2017). GIS and Spatial Analysis for the Social Sciences: Coding, Mapping, and Modeling. Routledge.

9. Hoggart, K., & Newman, J. (Eds.). (2016). The Uses of Social Science: Reflections on Speaking Truth to Power from the Fields. Policy Press.

10. Kitchin, R., & Tate, N. J. (Eds.). (2018). Fieldwork in Geography: Reflections, Perspectives, and Actions. Routledge.

Detailed Syllabus:

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	-	-	3	2	-	-	3	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	3	3	-	2	3	-	3
CO 5	3	3	-	-	2	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓

CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Human Geography**				
Type of Course	**Major with Practical**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3		2	75
Pre-requisites	Nil				
Course Summary	This course grants theoretical and realistic knowledge about the concept of evolution of culture, traits and development. This paper discusses about methodological framework in the studies of Human Geography. Paper deals with the changing paradigms of man-environmental relationship and Geography as a principal component in the evolution of modern landscape. Further, this paper deals with geographical spaces at globalised world with its changing population dynamics.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic knowledge on understanding space and human society.	U	C	Discussions and debates
CO2	Examine the students understanding in identifying issues of cultural landscape.	E	C	Group discussions and Seminars
CO3	Evaluation of geographies of man-environmental relationship.	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Understand the modern cultural dynamics and the response of state and society.	U	C	Discussion, Practical Assignments and exams
CO5	Evaluation of changing relationship between population, mobility, politics and well-being	An	P	Practical assignment Seminars and open text exams
CO6	Pragmatic evaluation and understanding of a cultural landscape.	Ap	P	Filed visits, project writing and Practical Assignments

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45+30)	Marks (70+30)
I	**Geography and Human Geography**		10	10
	1	Ontology, Epistemology, Ideology, Methodology	2	
	2	Production of Knowledge, Scientific and Situated Knowledge	3	
	3	Definitions and Fundamental Concepts of Human Geography; Space, Place, Nature	3	
	4	Principles, Approaches, Development of Human geography.	2	
II	**Contemporary Trends in Human Geography**		15	10
	5	Cultural Turn	2	
	6	Critical Geographies –Geographies of domination and resistance	3	
	7	Postmodern Geographies – Speaking from the margins	4	
	8	Post Structural Geographies – Power Politics of Representation, Identity and Difference	4	
	9	Geographic Pattern of Culture-World Cultural realms	2	
III	**Practices of Contemporary Human Geography**		15	15
	10	Human activities on environment: Deforestation, Excessive mining, Intensive agriculture and Industrialization on environment	3	
	11	Environmental conservation and management; Sustainable resource use; Wood Imperialism	3	
	12	Geographies of body: Performativity, Representation and Sensory sites	3	
	13	Geographies of text: Theorising the landscape	3	
	14	Geographies of Governance: Citizenship, governance and social justice	3	
IV	**Population and Functions**		15	15
	15	Geographies of Globalisation: Space, time and mobility	**2**	
	16	Concepts of Over population, Under population, Optimum population, Zero population growth.	2	
	17	Theories: Malthusian Theory, Demographic Transition Theory	2	
	18	Migration, Models, Theories and Types- Internal and International; Population and Human Well-being	2	
	19	Frontiers and Boundaries	2	
	20	Heartland and Rimland Theories	2	
	21	Nation, state and nation-state; Geo-politics, Indian Ocean and World politics	2	
	22	Global power relations and Economies	1	
V	**Practicum of Human Geography**		30	
	1	Reports of Cultural/civilisational evolution of the society	7	
	2	Field study on man-environmental relations	7	
	3	Field study on politics and resource occupancy	7	
	4	Project Report	9	

Reading List

1. Agnew, John et. al. (ed.) (1996), Human Geography, Blackwell Publishers London.
2. Bonnet, Alastair (2008) What is Geography? Sage, New Delhi.
3. Cloke, Paul and Johnston, Ron (2005) Spaces of Geographical Thought, Sage, London.

4. DeLyser, S. Herbert, S. Aitken, M.Crang, and L.McDowell (2010) The SAGE Handbook of
5. Qualitative Geography. Los Angeles, CA: SAGE.
6. Dickinson, R.E. (1969), The Makers of Modern Geography, London.
7. Dictionary of Human Geography
8. Dikshit, R.D. (1999), Geographical Thought - A Contextual History of Ideas, Prentice Hall of India, New Delhi.
9. Dikshit,Aitken Stuart & Gill Valentine ed. (2006) Approaches to Human Geography, Sage, London.
10. Hartshorne, R. (1959), Perspective on Nature of Geography, Rand McNally& Co.
11. Harvey, David (1969), Explanation in Geography, Edward Arnold, London.
12. Harvey, David (1990) The Condition of Postmodernity, Blackwell, London.
13. Harvey, Miltan E and Brian P. Holly (1981), Themes in Geographic Thought, Croom Helm, London.
14. Hubber, Phil et. al. (2002), Thinking Geographically: Space Theory and Contemporary,
15. Human Geography, Continuum, New York.
16. Introducing of Human geography, Clock, Crank and Goodwin (2014)
17. Iain Hey (eds) (2000). Qualitative Techniques in Human Geography. Oxford University Press
18. James P.E. and Martin J. Geoffret (1972) All Possible Worlds, John Wiley and Sons ,New York.
19. Johnston, R.J. (1988) The Future of Geography, Methuen, London.
20. Johnston, R.J. (2004) Geography and Geographers, Arnold London.
21. Key thinkers in Geography of Space and Place.
22. Local literature work indicative towards transformation of society
23. Peet, Richard (2003) Radical Geography, (Indian Reprint), Rawat Publication, NewDelhi.
24. Peet, Richard (1998) Modern Geographical Thought, Oxford Blackwell.
25. Soja, Edward W. (1997) Postmodern Geographies, Indian edn. Rawat Publications, New Delhi.
26. Unwin, Tim (1992) The place of Geography, Pearson Education Limited, Essex.

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	2	2	3	-	2	-	-	3
CO 2	3	-	3	-	-	2	3	-	-	-	-	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	2
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	2	-	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Cartography**				
Type of Course	**Major With Practical**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	This introductory course in cartography provides students with a comprehensive understanding of cartography as a fundamental discipline in geography, encompassing its historical development, diverse methodologies, and practical applications. Through an exploration of map design principles, spatial data visualization techniques, and geographic information systems (GIS), the course aims to cultivate a deep appreciation for the art and science of mapmaking. By delving into topics such as cartographic projections, symbolization, and map scale, students will gain insight into the complexities of representing spatial information accurately and effectively. Through hands-on exercises and projects, students will develop practical skills in map creation and analysis, equipping them with the tools necessary to navigate and interpret spatial data in various contexts.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Explain different perspectives of Cartography	U	C	Instructor-created exams / Quiz
CO2	Evaluate students' ability to articulate key concepts and explain their practical applications.	E	C	Ask students to create concept maps illustrating the relationships between key concepts in

				conservation and their practical applications. This visual representation can help assess their understanding and ability to articulate complex ideas.
CO3	Task students with creating a thematic map based on provided spatial data, focusing on appropriate symbolization, colour choice, and layout and.	An	C	Evaluate the clarity, accuracy, and effectiveness of their map design in conveying information
CO4	Apply students with a series of maps and accompanying questions to assess their ability to interpret and analyze spatial data.	Ap	C	Fieldwork or Laboratory Reports
CO5	Provide a real-world scenario or problem related to cartography, and assess students' ability to apply their knowledge to solve it	U	C	Problem-Based Learning (PBL) Scenarios
CO6	Implement a peer review component where students assess each other's map designs or solutions to practical problems based on specified criteria.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Evolution of Cartography**	**10**	**15**
	1	What is Cartography?	1	
	2	The Evolution of Cartography- - Historic Development of Cartography -	3	
	3	Define Maps , Properties of Maps - Scale, Direction and Shape • Institutions of Cartography • Survey of India - The Great Trigonometric Survey	4	
	4	Branches of cartography, Nature and Scope of Cartography – cartography Today.	2	
	Sections from References:			
II		Earth as a Cartographic Problem	**10**	**15**
	5	Shape of the earth	1	
	6	Size of the earth	3	
	7	Gravity of the earth	3	
	8	Role of Cartography and Geodesy in Spatial Data Infrastructure National Spatial Data Infrastructure	3	
	Sections from References:			
III		Classification of Maps and Map Making Process	**15**	**25**
	9	Classification of Maps	2	
	10	Cartographic Coverage of The World	2	
	11	Survey of India -Topographic Maps- Classification and Naming and Numbering Scheme	2	
	12	Conventional Signs and Symbols Used by Survey of India	2	
	13	Map Making Processes	2	
	14	Map Design and Layout	1	
	15	Compilation and generalization	1	
	16	Lettering and Toponymy	2	
	17	Mechanics' of Map Construction	1	
	Sections from References:			

IV	Visualization		**10**	**15**
	18	Representation of Relief	1	
	19	Mapping Weather and Climate Data	2	
	20	Mapping Socio-economic Data	2	
	21	Thematic Mapping	2	
	22	Qualitative and quantitative thematic mapping	3	
	Sections from References:			
V	**Map Projection and Thematic mapping**		**30**	
	1	i. Maps–grids of latitude and longitudes. ii. The globe and maps–their merits and demerits. iii. Developable and non-developable surfaces. iv. Classification of map projections. v. Types–Graphical construction–Properties and uses of:- a. Zenithal–Equi-distant &Equal area projection–Gnomonic, Stereographic,Orthographic b. Conical–Simpleconical,Twostandardparallel Cylindrical–Equi-distant,Equal-area	15	
	2	Carry-out any four experiments of the following: 1. Thematic Mapping 2. Qualitative Thematic maps: 3. Quantitative Thematic maps: 4. Problems of Thematic mapping:	15	
	Sections from References:			

Books and References:.

1.Ramesh and Misra fundamentals of cartography 2006

2. "Cartography: Visualization of Geospatial Data" by Menno-Jan Kraak and Ferjan Ormeling. Publisher: ESRI Press. Year: 2011.

3. "Cartography: Thematic Map Design" by Borden D. Dent, Jeffrey S. Torguson, and Thomas W. Hodler. Publisher: McGraw-Hill Education. Year: 2009.

4. "Maps and Civilization: Cartography in Culture and Society" by Norman J.W. Thrower. Publisher: University of Chicago Press. Year: 2008.

5. "How to Lie with Maps" by Mark Monmonier. Publisher: University of Chicago Press. Year: 1996.

6. "Making Maps: A Visual Guide to Map Design for GIS" by John Krygier and Denis Wood. Publisher: The Guilford Press. Year: 2016.

6 Jones, C. B. (2014). Geographical Information Systems and Computer Cartography. London, UK: Taylor& Francis 7. Elements of Cartography Robinson et al., (1995), 6th Edition. New York: John Wiley & Sons

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	-	3	2-	2	-	-	3
CO 2	3	-	-	2	-	2	3	-	-	-	-	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-3	3	3	-	-	-	2
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	√		√	√
CO 2	√	√		√
CO 3	√	√		√
CO 4	√	√	√	√
CO 5	√	√		√
CO 6	√		√	

Programme	B. Sc. Geography				
Course Title	Geography of India				
Type of Course	**Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This introductory course in Geography of India provides students with a comprehensive understanding of physical and cultural aspects of India. This course helps to develop an in-depth understanding of agricultural and irrigation facilities available in the nation. The student can acquire knowledge about the resource base and industrial activities of India in general. The student can analyse the demographic aspects and available facilities and power resources of the nation to cater its population				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Comprehensive understanding on physiographic settings of India	U	C	Instructor-created exams / Quiz
CO2	Appreciation of agricultural development of India	E	C	Writing reflective journals

CO3	Acquires skills to measure and evaluate resources in India	An	C	Evaluate the clarity, accuracy, and effectiveness of Information
CO4	Understanding and analysis of Population characteristics of India	Ap	C	Discussion / Practical Assignments
CO5	Identify the process of Urbanization , urban characteristics and urban problems of India	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Understanding transportation networks and industries of India	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I		**Physical Settings of India**	**15**	**15**
	1	India-Location-States- Union Territories- Neighbouring Countries	3	
	2	Physical features – Major Physiographic Divisions Drainage Systems- Himalayan Rivers- Peninsular Rivers	4	
	3	Indian Climate- Monsoon- Local Winds-Recent Cyclones	4	

		Soil types – their characteristics and distribution		
	4	Forest-National Parks-Wild Life Sanctuaries-Community Reserve- Environmental Movements	4	
	Sections from References:			
II	**Agriculture and Irrigation**		**15**	**15**
	5	Geographical distribution of major crops – Rice, Wheat, Millets, Cotton, Sugarcane - Oil seeds- Spices	4	
	6	Beverage crops in India - Tea, and Coffee	4	
	7	Irrigation in India – types –Agricultural problems in India	3	
	8	Multipurpose River Valley Projects	4	
	Sections from References:			
III	**Resources**		**15**	**25**
	9	Minerals – Types	3	
	10	Distribution of iron ore- manganese- bauxite- mica and copper	3	
	11	Power resources –Hydel- Thermal- Atomic	3	
	12	Distribution of Coal- Petroleum and Natural Gas	3	
	13	Nonconventional Energy – Solar-Tidal-Wind- Geo-Thermal	3	
	Sections from References:			
IV	**Demography, Industries and Transportation**		**18**	**15**
	14	Distribution of population – Density of population	2	
	15	Literacy, Sex-ratio, Life expectancy, Birth Rate-Death Rate	2	
	16	Urbanization in India-Major urban infrastructure development programmes in India	2	
	17	Major Urban problems	2	
	18	Industries- Iron and Steel	2	
	19	Cotton Textile-Jute Industry	**2**	
	20	Sugar and IT industries	1	
	21	Transport – Road, Railway, Inland Waterways and Airways	3	
	22	Major Ports	2	

		Sections from References:		
V		**Practical Work in Geography of India**	**12**	
1		1. Study of Indian Topographical maps: Layout and Numbering – Conventional Signs and Symbols – Grid reference – Measurement of Distance – Measurement of area: Grid Square Method 2. Interpretation of Topographical maps (1:50,000 and 1:25,000): Marginal Information, Physical features: Relief, Drainage, Natural Vegetation, Cultural features: Settlements, Occupation, Agriculture and Irrigation, Industry, Transport, and communication	12	

1. Deshpande C D : India – A Regional Interpretation, Northern Book Centre, New Delhi, 1992.

2. Farmer B H:– An Introduction to South Asia, Metheun, London 1983.

3. Learmonth ATA et.al (ed) : Man and Land of South Asia, Concept Publishers, New Delhi.

4. Mitra A : Levels of Regional Development India, Census of India, Vol. I, Part I-A(i) and (ii) New Delhi, 1967.

5. Routray, J.K : Geography of Regional Disparity, Asian Institute of Technology, Bangkok, 1993.

6. Shafi M : Geography of South Asia, McMillan & Co, Calcutta, 2000.

7. Singh R L (ed) : India – A Regional Geography, National Geographical Society, India, Varanasi, 1971.

8. Spate OHK and Learmonth ATA : India and Pakistan – Land, People and Economy, Methuen & Co. London 1967.

9. Valdiya K S : Dynamic Himalaya, University Press, Hyderabad, 1998.

10. Wadia D N : Geology of India, McMillan & Co. London 1967.

11. Khullar D R – India - A Comprehensive Geography, Kalyani Publishers, New Delhi, 2006.

12. www.ibm.nic.in

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module Vis designed to equip students with practical skills. The 10marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (10 marks) and the first four modules (20 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	2	-	3	-	-	-	2	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓

CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Field work in Human Geography**				
Type of Course	**Major With Practical**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	"Field work in Human Geography explores the dynamic relationship between humans and their environment through immersive fieldwork. This interdisciplinary course integrates geographical principles with social sciences to analyze the spatial patterns of human activities, cultural landscapes, and environmental impacts. Through hands-on fieldwork and case studies, students investigate topics such as urbanization, migration, land use, and sustainable development. By examining real-world scenarios, students develop critical thinking skills and an understanding of the complex interactions shaping our world. This course equips students with practical tools for addressing contemporary issues at the intersection of geography and human studies.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	1. Demonstrate proficiency in conducting geographical fieldwork, including data collection, analysis, and interpretation.	U	C	Fieldwork Reports
CO2	Analyze and interpret the interactions between landscapes and human	A	F	Data Analysis Projects

	activities.			
CO3	3. Apply theoretical concepts to practical field observations, enhancing understanding of geographical processes.			GIS Mapping Assignment
CO4	4. Develop skills in geographic information systems (GIS) for spatial analysis and mapping.	A	F	Oral Presentations
CO5	5. Critically evaluate the environmental and socio-economic impacts of human interventions on landscapes.	E	C	Group Discussions and Peer Review
CO6	6. Communicate findings effectively through written reports, presentations, and visual aids.	C	P	Final Research Paper
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	**Community resource mapping**		**10**	**15**
	1	Interlinking community and resource	1	
	2	Identification and classification of community resources	3	
	3	Scope of community resource mapping	4	
	4	Field ethics	2	
	Sections from References:			
II	**Data and tools of data collection**		**10**	**15**
	5	methods of data collection – Natural resources Direct – (GPS survey, hydrological survey, biodiversity survey etc)Indirect (remote sensing , satellite image, toposheet)	1	
	6	methods of data collection – Cultural(Census, sampling)	3	
	7	Tools of data collection (interview, PRA,FGD,Sociometry)	3	
	8	Representation of data (Graphs, Maps, Diagrams)	3	
	Sections from References:			
III	**Data Analysis in Geography**		**15**	**25**
	9	Spatial data analysis methods	2	
	10	Geographic Information Systems (GIS) applications	2	
	11	Remote sensing data interpretation	1	
	12	Cartographic analysis techniques	2	
	13	Geostatistical analysis methods	2	
	14	Environmental modeling and simulation	2	
	15	Socio-economic data analysis	1	
	16	Spatial pattern recognition	1	
	17	Geospatial data visualization techniques	2	
	Sections from References:			

IV	**Field work**		**10**	**15**
	18	Planning filed work Preparing schedule , tools	1	
	19	Conducting filed work	2	
	20	Mapping natural and cultural resources	2	
	21	Interpreting collected Data	2	
	22	Preparation of report	3	
	Sections from References:			
V	**Practical**		**30**	
	1	The practical component of this course entails a fieldwork program encompassing significant geographical locations across India. The fieldwork will span 6 to 7 days, excluding travel time. Field activities will align with the plan outlined in Module 4. A comprehensive report based on the fieldwork will be submitted for final evaluation.	30	
	Sections from References:			

1. Cox, K. R. (2013). Spaces of globalization: Reasserting the power of the local. Guilford Press.

2. Harvey, D. (2012). Rebel cities: From the right to the city to the urban revolution. Verso Books.

3. Massey, D. (2005). For space. Sage Publications.

4. Thrift, N. (2008). Non-representational theory: Space, politics, affect. Routledge.

5. Cresswell, T. (2013). Geographic thought: A critical introduction. John Wiley & Sons.

6. Jackson, P. (2011). Social and cultural geography: A critical introduction. John Wiley & Sons.

7. Soja, E. W. (2010). Seeking spatial justice. University of Minnesota Press.

8. Smith, S. J., & Pain, R. (2013). Introducing social geographies. Routledge.

9. Mitchell, D. (2008). Critical geography. Ashgate Publishing.

10. Peet, R., & Thrift, N. (2012). New models in geography: The political-economy perspective. Routledge.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	3	3	3	-	2	-	-	3
CO 2	3	-	-	-	-	3	3	-	-	-	3	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	2
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	2	-	3	3	-	-	2	-
CO 6	-	-	2	2	-	2	2	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓

CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓	✓	✓	

Programme	B. Sc. Geography				
Course Title	**Introduction to Geoinformatics**				
Type of Course	**Major With Practical**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Introduction to Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Global Positioning Systems (GPS), and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Gain a solid understanding of geospatial concepts such as spatial data types, coordinate systems, and data structures used in Geoinformatics.	U	C	Instructor-created exams / Quiz
CO2	Students gain knowledge of electromagnetic radiation, sensors, platforms, and the interaction of electromagnetic waves with Earth's surface.	E	C	Discussion / Practical Assignments
CO3	Students learn techniques for geospatial data analysis, including spatial queries,	An	C	Discussion / Practical

	overlay analysis, and geostatistical analysis, to derive meaningful insights from geospatial datasets.			Assignments / Internal Exams / Practicals
CO4	Acquire the ability to solve spatial problems related to environmental management, urban planning, natural resource assessment, and disaster management using geospatial tools and techniques.	Ap	C	Discussion / Practical Assignments
CO5	Utilizing remote sensing data for spatial analysis, such as change detection, classification, and modelling, to support decision-making processes.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Students learn to effectively communicate geospatial information through maps, charts, and reports, enhancing their ability to convey complex spatial information to diverse stakeholders.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Basics of Geoinformatics**	**10**	**15**
	1	Conceptual background of Geoinformatics.	2	
	2	Historical Milestones of Geographical Information System	3	
	3	Meaning and Scope, Science and technologies involved in geoinformatics - Geographic Information System – Remote Sensing – Global Positioning System – Geodesy – Photogrammetry - Cartography	3	
	4	Recent advancement in Geoinformatics, Advantages, Limitations and Applications	2	
	Sections from References:			
II		**Introduction to Geographical Information System**	**10**	**15**
	5	Define GIS, Geoinformatics, Geospatial Technologies	1	
	6	Key Components of Geographical Information System, Types of GIS	3	
	7	Coordinate Refencing System CRS: Geographic Coordinate System, Projected Coordinate System, EPSG.	3	
	8	Data Abstraction Model in GIS, Advantages and Limitations of GIS	3	
	Sections from References:			
III		**Logical Data Models**	**15**	**25**
	9	Raster Data Models, Field Based Raster Model, Object Based Data Models	1	
	10	Raster Compression Methods, Run Length Encoding, Quadtree Encoding, Block Encoding, Chain Encoding	2	
	11	Vector Data Model – Object Based Data Model, Field Based Data Models.	2	
	12	Spaghetti Data Model, Topology, Topological Data Model, Topological Rules	2	
	13	Spatial Data Sources: Primary and Secondary Sources	2	
	14	Raster Analysis: Local Operation – Neighborhood Operation – Global Operation – Map Algebra	2	

	15	Vector Data Analysis: Buffer, Area Calculation, Spatial and Non spatial Query, Overlay Analysis: Union and Intersection	2	
	16	Comparison of Raster and Vector Data Models.	1	
	17	Advantages and Limitations of Raster and Vector Data Model,	1	
	Sections from References:			
IV	**Data in GIS**		**10**	**15**
	18	Representation of spatial and temporal relationships	2	
	19	Geodetic datum- coordinate system- errors in representing geographic space- spatial and temporal relationship of spatial features,	2	
	20	spatial data models – vector, raster, TIN, DTM/DEM, network data models.	2	
	21	Data in GIS platform - spatial and attribute data, sources of GIS data – Errors in GIS data and its types; Data precision and data organization;	2	
	22	Ethics of using GIS data metadata, Standards and significance, Data Catalogues – Indian standards, NSDI metadata standards, data model in GIS	2	
	Sections from References:			
V	**Practical and Course Project**		**30**	
	1	Students have to do following practicals 1. Georefencing a Scanned Map 2. Vectorization and Spatial Data Management 3. Spatial Analysis	20	
	2	**Project:** Students have to do a mini project using simple spatial algorithms	10	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
6. Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)
7. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind - Geographic Information Systems and Science (2005) (22nd ed.)(en)(536s)-Wiley (2005).

8. Carver, Steve_ Cornelius, Sarah_ Heywood, D. Ian - An introduction to geographical information systems [electronic resource]-Langara College (2015)

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	3	-	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓

CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Evolution of Thought Process in Geography**				
Type of Course	**Major With Theory**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This introductory course in Geography provides students with a comprehensive understanding of how Geography has evolved as a fundamental discipline, encompassing its historical development, Various schools of thoughts, debates within the subjects regarding its philosophy, methodology and approach etc. It Gives an overview of how the subject has started, (the thrust areas, then and now) and finally throw some hints how the approaches (philosophy and methodology) is likely to change in order to cater the needs and fears of human beings.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	To Evaluate where does the subject stand among other disciplines	E	C	Instructor-created exams / Quiz
CO2	To Understand the Evolution of Geography as a discipline	U	C	Instructor-created exams / Quiz
CO3	To Evaluate the contributions of Various schools of Taught	E	C	Instructor-created exams / Quiz
CO4	To Analyze different Dichotomic positions and its role in the growth of discipline.	An	C	Discussion / among Groups and Seminars
CO5	To Understand the current thrust	U	C	Instructor-

	areas in the Discipline.			created exams / Quiz/ Seminars
CO6	To Understand the future Thrust areas and application aspects of the subject.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs** **(60)** **(48+12)**	**Marks** **(70+30)**
I		**Evolution of Geographical Thought Process**	**12**	**18**
	1	Introducing Key concepts; Location, Place, Space and Scale.	3	
	2	Knowledge Definition and types,	3	
	3	Domain of Geography among Classification of Knowledge.	3	
	4	Ramifications within and its interaction with other Natural and Social Sciences.	3	
	Sections from References:			
II		**Ancient and Classical Period**	**12**	**18**
	5	Application of Geographical understandings in Birth, Growth and Decline of major Civilizations	3	
	6	Indus Valley Civilization and Application of Geographical Knowledge.	3	
	7	Greeks,	1	
	8	Romans	1	
	9	India and	3	
	10	China	1	
	Sections from References:			
III		**Medieval and Modern Period**	**12**	**17**
	11	Contribution of Arabs	2	
	12	Age of Explorations and Discoveries and rise of imperialism.	2	
	13	Contribution from German School of thought.	2	
	14	Contribution from French School of thought.	2	
	15	Contribution from British School of thought.	2	
	16	Contribution from American School of thought.	2	
	Sections from References:			
IV		**Dichotomies, Dualism and Unification**	**12**	**17**
	17	Determinism vs Possibilism,	2	

	18	Systematic Vs Regionalism	2	
	19	General vs Particular,	2	
	20	Quantitative Vs Qualitative	2	
	21	Unification attempt by Richthofen and Hettner.	2	
	22	Traditions in Geography	2	
	Sections from References:			
V	**Past, Present and future of Geographic Philosophy and Methodology.**		**12**	
	23	Structuralism vs Post Structuralism	4	
	24	Quantitative Revolutions and rise of positivism and Location analysis Reactions to Positivism and rise of Behaviouralist, Humanistic and Radical approaches	6	
	25	Nature of Contemporary Geography with Future of Geography	2	
Sections from References:				

Note: The syllabus has five modules. There should be total 25 units in the five modules together, composed fully of theory topics. There are 60 lecture hours distributed equally among all Modules i.e. 12 hrs for each Modules. And marks for all modules consist of 70 which can also be equally distributed among first and Second as 18 per Module and for module Third and Fourth 17 marks respectively. Fifth module is an open module for which internal exam for ten marks will be carried out by the course in charge. The paper is designed to have a comprehensive understanding of the changing philosophy and methodology of the subject.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	3	-	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Applied Geomorphology**				
Type of Course	**Major**				
Semester	VII				
Academic Level	400 – 499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	**3**		**2**	**75**
Pre-requisites	Nil				
Course Summary	The advanced course in geomorphology provides students valuable insights for land use planning, infrastructure development, and natural resource management. Understanding the geomorphology and topography of an area can help in making informed decisions about construction, agriculture, and environmental conservation. Additionally, knowledge of geomorphological processes such as erosion, sedimentation, and landform evolution can contribute to hazard mitigation and disaster management, which are crucial for sustainable development.				

Course Outcomes(CO):After the completion of this course, students should be able to:

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Illustrate the historical evolution and concepts of geomorphology	U	C	Instructor-created exams / Quiz
CO2	Interpret the conceptual and dynamic aspects of landform development	U	C	Instructor-created exams / Quiz
CO3	Evaluate critically the theories and models with different perspectives.	E	P	Instructor-created exams / Quiz
CO4	Analyse the role of humans as	An	M	Discussion /

	agents of geomorphologic processes.			among Groups and Seminars
CO5	Apply conceptual and theoretical methods to analyse geomorphic processes.	An	P	Instructor-created exams / Quiz/ Seminars
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45+30)	Marks (70+30)
I		**Geomorphology- Introduction**	**15**	**15**
	1	Scope and significance of Geomorphology	2	
	2	Approaches - Empirical, Genetic and System approach	2	
	3	Fundamental concepts	8	
	4	Principle of Uniformitarianism and Catastrophism	1	
	5	Multicyclic and Polygenetic Evolution of landscapes	2	
II		**Theories on Landform Development**	**7**	**20**
	6	Geomorphic principles by G. K Gilbert	1	
	7	Cycle of erosion by W M Davis	1	
	8	Morphological analysis by W.Penk	1	
	9	Pediplanation Cycle by L.C King	1	
	10	Geomorphic model by J.T Hack	1	
	11	Tectono-geomorphic model by M Morisawa	1	
	12	Episodic erosion model by S.A Schumm	1	
III		**Theories on Evolution of Slope**	**10**	**20**
	13	Theory of slope decline by W M Davis	2	
	14	Theory of slope replacement by W Penck	2	
	15	Parallel retreat of slope by A Wood	2	
	16	Scarp retreat theory of L C King	2	
	17	The concept of equilibrium slope by A N Strahler	2	
IV		**Anthropogenic Geomorphology and Geomorphic systems**	**13**	**15**
	18	Humans as agents of geomorphic processes,	2	
	19	Slope failures, landslides, and other geomorphic hazards	3	
	20	Causes, consequences, and mitigation	2	
	21	Geomorphic hazards with reference to Kerala	2	

	22	Geomorphic system based on Agents, Climate and Structure, Characteristics of landforms associated with geomorphic system	4	
V	**Block diagrams, Geomorphological mapping and slope analysis: (Practicum)**		**30**	
	23	Preparation of block diagrams from contour maps - Features produced by Running water, Wind, Waves, Underground water, Glacier	8	
	24	Methods of preparation of geomorphological map - Identification and mapping of landforms	8	
	25	Calculation and determination of slopes by G.H. Smith's method, Robinson's method, Wentworth method and its significance.	8	
	26	Altimetric frequency analysis, Hypsometric and area height curves and Clinographic curve	6	

Reading List:

Visualizing physical Geography, Alan Strahler, Wiley and The National Geographic Society.

Introducing Physical Geography, Arthur N Strahler, Wiley

World Geomorphology, Bridges E. M., Cambridge University Press,Cambridge.

Principles of Physical Geology, Homes A. 3rd Edition, ELBSS Edn.

Fundamentals of Geomorphology, Richard John Huggett, Routledge

Principles of Geomorphology, Thornbury W. D., Wiley.

An Outline of Geomorphology: Wooldridge W. S. and Morgan R. S., ThePhysical Basis of Geography, Longmans.

Geomorphological Mapping: Methods and Applications, Mike J. Smith, Paolo Paron and James S. Griffiths (Eds.), Developments in Earth Surface Processes 15, Elsevier Science.

Physical Geology – 2nd Edition, Steven Earle, Creative Commons Attribution 4.0 International License, BCcampus publishers.

Geoinformatics in Applied Geomorphology. Anbazhagan, S.; Subramanian, S. K. and Yang X., 2011. CRC Press, Taylor & Francis Group.

Mapping Geomorphological Environments, Kosmas Pavlopoulos, Niki Evelpidou, Andreas Vassilopoulos, Springer.

‘Geomorphology: A Systematic Analysis of Late Cenozoic Landforms’, Bloom, A. L., Pearson Education Pvt. Ltd

Geomorphology,Sparks, B.W., Longman

Quaternary geology and geomorphology of coastal plains of Kerala,Nair, K. K, Geological Survey of India

Process and Form in Geomorphology (Edited).Stoddart,D. R, *Routledge*

Terrain Evaluation, Mitchell, C.W, Longman

Origin of Landscapes A synthesis in Geomorphology,Garner, H.F., Oxford University Press

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO 1	3	2	1	-	-	-	-	3	2	1
CO 2	3	3	1	-	-	1	-	-	-	-
CO 3	3	3	1	-	-	2	-	2	-	1
CO 4	3	3	2	2	1	2	1	-	-	2
CO 5	2	3	3	2	1	2	1	-	1	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	BSc Geography				
Course Title	**Applied Climatology**				
Type of Course	**Major With Practical**				
Semester	VII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Applied Climatology provides a multifaceted exploration of climate's practical implications across diverse sectors. It integrates meteorology with agro-meteorology, highlighting climate's role in agriculture and human life. Through case studies like rain shadow regions, it delves into macro and micro-climate concepts. Understanding atmospheric stability, Indian monsoons, and cyclones elucidates weather patterns crucial for various regions. Climatic classification methods, including Koppen and Thornthwaite, equip students with tools to analyze global climates. Lastly, the course addresses climate change causes, impacts on water, agriculture, health, and forests, emphasizing mitigation strategies to combat greenhouse effects and ozone layer depletion, fostering sustainable environmental practices.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand climatology and its related field	U	C	Instructor-created exams / Quiz
CO2	Evaluate the role of Climate on human life	E	C	Discussion and Practical Assignments
CO3	Analyze the Earth's relation to the sun	An	C	Practical Assignments and seminar
CO4	Apply climatic knowledge to classify the climate types of the world	Ap	C	Discussion / Practical Assignments
CO5	Analyze the Climate Changes and its impact on human	An	C	Instructor-created exams / Seminars/
CO6	Enhance the skills of the students in spatial interpolation of climatic data and preparation of weather report of a region	Ap	C	Practical Assignments and seminar
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	**Climatology and climate region**		**10**	**15**
	1	Climatology and Meteorology	1	
	2	Agro-meteorology and Applied climatology	3	
	3	Concept of macro and Micro-climate region(case study of Rain shadow region)	2	
	4	Role of Climate on human life	4	
	Sections from References:			
II	**Atmospheric Stability and Instability**		**10**	**15**
	5	Earth and the sun Relation	2	
	6	Atmospheric Stability and Instability	2	
	7	Mechanism of Indian Monsoon and Cyclones	2	
	8	Indian Ocean Dipole (IOD) – ENSO- Walker circulation- El Nino and Lal Nina with Monsoon winds (case study of India).	4	
	Sections from References:			
III	**Climatic classification**		**15**	**25**
	9	Climatic classification	2	
	10	Approaches to climatic classification	3	
	11	Empirical climatic classification	2	
	12	Generic climatic classification	2	
	13	Climatic classification of Koppen	2	
	14	Climatic classification of Thornthuwaite.	1	
	15	Major climates of the world – tropical climates	1	
	16	Temperate climates	1	
	17	Polar climates	1	

	Sections from References:			
IV	**Climate Changes and Mitigation Strategies**		**10**	**20**
	18	Climate Changes: Causes and consequences	1	
	19	Anthropogenic activities and climate change	2	
	20	Climate change impacts on water, agriculture, health and forests	3	
	21	Greenhouse effect ,Global warming and Depletion of ozone layer	2	
	22	Mitigation Strategies for Climate Change	2	
	Sections from References:			
V	**Practical Component**		**30**	
	1	1. Spatial interpolation of the Climatic data of a region (Rainfall &Temperature) by GIS. **2** Prepare a weather chart of a locality **3.** Identify the climate change based on natural vegetation and land use change and prepare a report. 4. Prepare a field report of a micro climate region	20	
	2	**Project:** Write a report on human induced climate change and mitigation strategies	10	
	Sections from References:			

Books and References:.

1. Trewartha, G.T. (Latest edition) Introduction to Climate, McGraw Hill, New York.

2. Das, P.K. (1987), Monsoons, National Book Trust, New Delhi.

3. Fein, J.S. and Stephens, P.N. (1987), Monsoons, Wiley, London.

4. Peterson, S. (1969), Introduction to Meteorology, McGraw Hill Book, London.

5. Thompson, R.D. and Perry, A. (ed.) (1997), Applied Climatology: Principles and Practice, Routledge, London.

6. Barry, R.G. and Chorely, R.J., (2004), Atmosphere, Weather and Climate, Methuen, London.

7. Bhutani S., (2000), Our Atmosphere, Kalyanai Publishers, New Delhi.

8. Critchfield, H.J. (1987), Climatology, Prentice Hall, New Delhi.

9. Griffith, J.F. and Driscell, D.M. (1982), Survey of Climatology, Charles Merril, New York.

10. Lal, D.S. (1993), Climatology, Chaitanya Publishing House, Allahabad.

11. Riehl, H. (1968), Introduction to Atmosphere, McGraw Hill, New York.

12. Robinson, P.J. and Sellers, H. (1986), Contemporary Climatology, Longman, London.

13. Menon, P.A. (1989), Our Weather, N.B.T., New Delhi.

. **Note:** The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	3	3	-	2	-	-	3
CO 2	-	3	-	2	2	-	3	2	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Geography of Water Resources**				
Type of Course	**Major With Practical**				
Semester	VII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Geography of Water Resources explores the spatial distribution, availability, and management of Earth's water. Topics include hydrology, water cycle dynamics, global water scarcity, and geopolitical implications. Students analyze human impacts on water resources, sustainable development strategies, and the role of technology in water management. Case studies offer practical insights.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental principles of hydrology and the water cycle dynamics.	U	C	Quizzes and exams assessing understanding of hydrological principles and spatial distribution of water resources.
CO2	Analyze the spatial distribution of global water resources and factors influencing water scarcity.	E	C	Research papers analyzing human impacts on water resources and ecosystems.

CO3	Evaluate human impacts on water resources and ecosystems.	E	C	GIS projects evaluating and managing water resources spatially.
CO4	Apply geographic information systems (GIS) to assess and manage water resources.	A	F	Class presentations discussing strategies for sustainable water management.
CO5	Critically examine strategies for sustainable water management and conservation.	E	C	Participation in discussions and debates on water-related issues.
CO6	Demonstrate proficiency in communicating water-related issues through written reports and presentations.	C	P	Final projects or reports synthesizing course concepts and applying them to real-world water resource challenges.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Fundamentals of Water Resources**	**10**	**15**
	1	Introduction to Water Resources:	1	
	2	Hydrological Cycle Dynamics:	3	
	3	Water in Soil, Vegetation, and Atmosphere	4	
	4	Heat Balance and Water Budget	2	
	Sections from References:			
II		**World Distribution of Surface Water Resources – Surface Water**	**10**	**15**
	5	World Distribution of Surface Water Resources	1	
	6	Types and Significance of Surface Water Bodies	3	
	7	Watershed as a Geohydrological Unit- Watershed as a Planning Unit and Review of Integrated Watershed Management Programs (IWMP):	3	
	8	Wet lands and their significance Surface water pollution and Environmental	3	
	Sections from References:			
III		**Groundwater**	**15**	**25**
	9	Introduction to Groundwater: Definition of groundwater and its importance.	1	
	10	Groundwater Dynamics Exploration of the water table and its variations.	2	
	11	Springs and Artisan Wells:	2	
	12	Types of Aquifers	2	
	13	Groundwater Management:	2	
	14	Human Dependence on Groundwater:	1	
	15	Groundwater Pollution:	1	
	16	Legal and Policy Frameworks: - Overview of laws and regulations governing groundwater use and protection.	2	

	17	Future Challenges and Solutions: Exploration of emerging issues such as climate change impacts on groundwater	2	
	Sections from References:			
IV	**Water conservation**		**10**	**15**
	18	The Importance of Public Participation in Water Governance	1	
	19	Innovative Water Conservation Technologies	2	
	20	Policy Analysis: Evaluating Water Governance Frameworks	2	
	21	Community-Based Approaches to Water Conservation	2	
	22	Corporate Water Stewardship	3	
	Sections from References:			
V			**30**	
	1	1. Field Trip to a Local Watershed: Organize a field trip to a nearby watershed to observe various aspects of water resources firsthand. Students can study the hydrological cycle, water quality, and the impact of human activities on the watershed. 2. Hydrological Monitoring: Set up hydrological monitoring stations in different locations to measure parameters such as precipitation, streamflow, and groundwater levels. Students can analyze the data collected to understand hydrological dynamics. 3. Soil and Vegetation Sampling: Conduct soil and vegetation sampling exercises to analyze their water content and moisture retention capacity. Students can learn about the role of soil and vegetation in the water cycle. 4. Water Budget Calculations: Assign students to calculate water budgets for specific areas or ecosystems based on inputs such as precipitation, evapotranspiration, and runoff. This exercise can help students understand the balance of water within different systems. 5. Case Study Analysis of Surface Water Bodies: Assign case studies of different surface water bodies around the world for students to analyze their types, significance, and current management practices.	10	
	2	Ground water survey-Groundwater Exploration: Organize a groundwater exploration exercise where students use techniques such as, groundwater sampling, and water table measurement to understand groundwater dynamics. Aquifer Mapping and Analysis: Have students create maps of aquifers in a given region and analyze their characteristics, such as permeability, storage capacity, and vulnerability to contamination.	10	

	3	Wetland Assessment: Conduct a wetland assessment in a local area to evaluate its ecological significance and the threats it faces. Students can propose conservation measures based on their findings. Groundwater Management Simulation: Develop a simulation exercise where students role-play as stakeholders involved in groundwater management decisions. They can assess competing demands and develop sustainable management strategies. Policy Analysis and Debate: Assign students to analyze existing laws and policies related to water conservation and governance. Then, organize a debate where students argue for or against proposed policy changes based on their analysis.	10	
	Sections from References:			

Books and References:.

1. Griffin, R. C. (2006). Water Resources Management: Principles, Regulations, and Cases. McGraw-Hill Education.

2. Tarlock, A. D., Corbridge Jr., J. N., & Getches, D. H. (2008). Water Resource Management: A Casebook in Law and Public Policy. Foundation Press.

3. Mays, L. W. (2010). Water Resources Engineering. John Wiley & Sons.

4. Karar, E., & Hofer, T. (Eds.). (2017). Integrated Water Resources Management: Concept, Research, and Implementation. Springer.

5. Griffin, R. C. (2012). Water Resource Economics: The Analysis of Scarcity, Policies, and Projects. The MIT Press.

6. Melesse, A. M. (2016). Water Resources Management in the Face of Climatic/Hydrologic Uncertainties. Springer.

7. Mays, L. W. (Ed.). (2012). Handbook of Water Resources Management: Discourses, Concepts, and Examples. John Wiley & Sons.

8. Loucks, D. P., & van Beek, E. (2017). Water Resource Systems Planning and Management: An Introduction to Methods, Models, and Applications. Springer.

9. Renzetti, S., & Dupont, D. P. (Eds.). (2007). Water Policy in Canada: Problems and Possible Solutions. Oxford University Press.

10. Cech, T. V. (2010). Principles of Water Resources: History, Development, Management, and Policy. John Wiley & Sons.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	3	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations

CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Environmental Geography**				
Type of Course	**Major**				
Semester	VII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	0	2	75
Pre-requisites	Nil				
Course Summary	Environmental geography provides fundamental insights into the intricate relationship between the environment and geography. It explores the dynamic interactions between humans and their surroundings, emphasizing the resulting impacts. This field delves into various forms of pollution and the corresponding conservation strategies. Moreover, it examines global endeavors towards sustainable development and encompasses environmental movements spanning across the globe, including those in India. From analyzing human-environment interactions to advocating for conservation efforts and sustainable practices, environmental geography serves as a critical discipline in understanding and addressing contemporary environmental challenges.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	To Evaluate where does the subject stand among other disciplines	E	C	Instructor-created exams / Discussion
CO2	To Understand the impact of human intervention in our environment.	U	C	Instructor-created exams / Seminar
CO3	To Analyze global and Indian initiative To Environmental sustainability	An	C	Instructor-created exams / Quiz
CO4	To understand Laws and policies to sustain	U	C	Discussion /

	our environment.			among Groups and Seminars
CO5	To get Procedural Knowledge through some experiments in this discipline	P	C	Instructor-create Experiments/
CO6	To Understand the future Thrust areas and application aspects of the subject.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45+30)**	**Marks (70+30)**
I		**Concepts in Environmental Geography**	**10**	**15**
	1	Nature and scope of Environmental Geography	2	
	2	Types of Environments- Components- Biotic and Abiotic	2	
	3	Man, and Environmental Relationships. Different approaches.	2	
	4	Human ecological adaptations	1	
	5	Human impacts on Land, Water and Air	1	
	6	Human Impacts on Agriculture and industrial environment.	1	
	7	Concepts of Ecosystem – Structure and functions and types Biodiversity and its types	1	
		Sections from References:		
II		**Consequences of Human intervention on Environment**	**10**	**20**
	8	Environmental Pollution –Causes, effects and controlling measures.	3	
	9	Air Pollution, Water Pollution, Land Pollution, Marine pollution, Noise Pollution, Thermal Pollution and Nuclear Hazard.	3	
	10	Global Environmental issues – Global Warming, Ozone Depletion and Acid rains	4	
		Sections from References:		
III		**Global and Indian Initiatives in Environmental Sustainability**	**15**	**20**
	11	Environmental Policies and Earth summits – Rio de Janeiro, Johannesburg and Stockholm.	3	
	12	Global initiatives for environmental management with special reference to Montreal, Kyoto and Paris.	3	

	13	Environmental Movements in India with special reference to Himalayas and Western Ghats	3	
	14	Madhav Gadgil and Kasthuri Rangan report.	3	
	15	Significant environmental movements --Chipko ,Appico and Narmada Bachavo Andholan	3	
	Sections from References:			
IV	**Environmental policies and management**		**10**	**15**
	16	Environmental management and planning. Problems in ecosystem management. Leopold Matrix	2	
	17	National Environmental Policy: National Policy on EIA and regulatory frame work. Green Tribunal	2	
	18	Anti-Pollution Acts: The Water Acts 1974. The Air Act 1981.	2	
	19	The Environmental Protection Act1986. Role of Central and State Pollution Control Boards.	1	
	20	Environmental Impact Assessment(EIA), Environment management planning (EMP) and Environment Performance Assessment(EPA)	1	
	21	Carbon Concentration and Sequestration.	1	
	22	Ecological Foot Print. Green Economy. Red, Brown and Green technology.	1	
	Sections from References:			
V	**Practicum**		**30**	
		Make report on any kind of pollution at your locality	14	
		Water quality analysis – By kit/ Lab	8	
		Soil quality analysis- By kit /Lab	8	
	Sections from References:			

Books and References:.

1. Aber, J. S., & Jordan, T. E. (2012). Wetlands. Wiley-Blackwell.

2. Bradshaw, M. J., & Small, M. J. (2019). Environmental Ethics. Wiley-Blackwell.

3. Brinkmann, R. (2016). Environmental Geography: Science, Land Use, and Earth Systems. Wiley.

4. Buell, L. L. (1995). The Environmental Imagination: Thoreau, Nature Writing, and the Formation of American Culture. Belknap Press.

5. Haines-Young, R., & Petch, J. R. (2016). Environmental Modelling: Finding Simplicity in Complexity. John Wiley & Sons.

6. Huggett, R. J. (2004). Fundamentals of Biogeography. Routledge.

7. Matthews, J. A. (2011). The SAGE Handbook of Environmental Geography. SAGE Publications.

8. Middleton, N. J. (2014). Deserts: A Very Short Introduction. Oxford University Press.

9. Robbins, P. (2012). Political Ecology: A Critical Introduction. Wiley-Blackwell.

10. Turner, B. L., & Robbins, P. (2008). Political Ecology: Science, Myth, and Power. Routledge.

11. Odum, E. P. (1971). Fundamentals of Ecology. Publisher.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	3	3	-	2	-	2	3
CO 2	3	2	-	-	3	-	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	2	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Regional Planning and Development**				
Type of Course	**Major**				
Semester	VII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	This course provides theoretical and practical knowledge to students with a comprehensive understanding of regional planning, it encompassing its historical development of the concept of regional planning, diverse methodologies, and practical applications. Students engaging with regional development perspectives and evaluate the blockages such as ecological, economical and social. Analysis Urban-Industrial Growth Pole Strategies and the Diffusion of Modernization. the Polarization and the Development of Underdevelopment. These provide an opportunity to the students understand and examine the various regional development theories. Neo-Populist Regional Development Strategies. Space and Explanation in Regional Development Theory. Provision for handling a real-world problems related to regional development and assess students' ability to apply their knowledge to solve the regional issues through proper planning principles.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Regional Imbalance as a Policy Problem and Explain different perspectives of Regional Planning and Development	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts (Growth, Income Distribution and Spatial Inequality) and explain their practical applications.	U	C	Group discussions and Seminars
CO3	Engaging with regional development perspectives and evaluate the blockages such as ecological, economical and social. Analysis Urban-Industrial Growth Pole Strategies and the Diffusion of Modernization. The Polarization and the Development of Underdevelopment.	An	C	Evaluate the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Understand and examine the various regional development theories. Neo-Populist Regional Development Strategies. Space and Explanation in Regional Development Theory.	E	C	Discussion, Practical Assignments and exams
CO5	Provide a real-world problems related to regional development and assess students' ability to apply their knowledge to solve the regional issues through proper planning principles.	An	P	Practical assignment Seminars and open text exams
CO6	Limits of Spatial Policy & Territorial Regional Planning and State, Development and Regional Planning Practice. Preparation of master plan for the development of the nearby region that are particularly connected with ecological, economical and social issues.	Ap	P	Filed visits, project writing and Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45+30)	Marks (70+30)
I	**Foundations and Dimensions Regions and Regional Planning**		**10**	**15**
	1	Concept of region: Origin and development of regional studies, region in a Place, region as a place.	2	
	2	Foundations of Regional Studies: ecological foundations, economic foundations, social and cultural dimensions.	3	
	3	Functional and Formal Regions, Techniques of Regional Delimitation.	3	
	4	Regional Planning: Principles and Typology.	2	
	Sections from References:			
II	**Theories in Regional Development**		**15**	**25**
	5	Regional Organization of Space: regional consciousness and identity, region and political life Economic Systems: Types and Nature	2	
	6	Theories: Classical theory of Economic Development.	2	
	7	Marxian Theory of Economic Development, Schumpeterian Theory of Economic Development, Rostow's Stages of Economic Growth,	3	
	8	Myrdal Theories of Circular Causation, Leontief-Input Output Model, Francis Perroux – Growth Pole Theory,	4	
	9	Theory of Balanced and Unbalanced Growth, J. Friedmann - Core Peripheral model and R.P. Mishra's Growth Foci Theory.	4	
	Sections from References:			
III	**Strategies and adaptation for Sustainable Regional Development**		**9**	**15**
	10	Modern Regional Developmental thoughts: Hardin's model, "the tragedy of the commons",	2	
	11	Theory of limits to Growth and Beyond the Limits.	2	
	12	The Environment and Development: Sustainable development, historical development, Policies, ,	2	
	13	Environmental Impact Assessment (EIA), Green Economy, Ecosystem valuation methods	2	
	14	Environmental committees, Millennium Development Goals and Global treatise	1	
	Sections from References:			
IV	**Regional Imbalance and human development inequalities**		**11**	**15**
	15	Concept of Regional inequalities; Obstacles of Regional Imbalance, Factors of Regional Imbalance,	1	

	16	Characteristics of Underdeveloped Regions, Vicious Cycle of Poverty,.	1	
	17	The dependency theory of under Development	2	
	18	Measures and indexes for regional development: GDP, HDI,	2	
	19	Measures and indexes for regional development GDI, MPI, EPI and GHI.	1	
	20	History of Planning Programs in India:	1	
	21	Five-year plans in India,	2	
	22	NITI Aayog, and Studies in Regional Imbalances and methods of regionalization in India.	1	
	Sections from References:			
V		**Practicum of Regional Planning:**	**30**	
	1	Preparation of location specific master plan for Regional Development, Micro watershed plan preparation for any nearby local bodies, Drafting Regional Imbalances assessment report of any developmental issues.	10	
	2	evaluation of EIA and ESV in the particular issues at Local level, Students organizes seminar and workshop at college level in the topics regional development.	10	
	3	Project:	10	
	Sections from References:			

Suggested Readings:

1. Abler R., Adams J. S., and Gould P. R., 1971. Spatial Organization: A Geographer's View of the World, Englewood Cliffs, Prentice-Hall.
2. Glasson, J., 1974. An introduction to regional planning; Concepts, theory and practice, The Built Environment Series, Hutchinson Educational.
3. Claval Paul, 1998. An Introduction to Regional Geography, Blackwell Publishers, Oxford and Massachusetts.
4. De Blij H. J. 1971. Geography: Regions and Concepts, John Wiley and Sons.
5. Deshpande C. D. 1992. India: A Regional Interpretation, ICSSR, New Delhi.
6. Johnson E. A. J. 1970. The Organization of Space in Developing Countries, MIT Press, Massachusetts.
7. Johnston R. J. And Hauer J. 1990. Regional Geography: Current Developments and Future Prospects, Taylor and Francis.
8. Johnston R. J. and Sidaway J. D. 2004. Geography and Geographers: AngloAmerican Human Geography since 1945, Arnold, London.

9. Mandal R. B. (ed.), 1990. Patterns of Regional Geography – An International Perspective. Vol. 1 – Conceptual Development.
10. Minshull Roger, 2007. Regional Geography: Theory and Practice, Transaction Publishers.
11. Singh R. L. 1971. India: A Regional Geography, National Geographical Society of India.
12. Spate O. H. K. and Learmonth A. T. A. 1954. India and Pakistan – A General and Regional Geography, Methuen.
13. Problems of Regional Economic Planning – Boudeville. J. R.
14. Regional Planning in India - Chand. M, Puri.V. K.
15. Economic Development and Social Opportunity - Dreze.J and Sen. A.
16. Geography: Realms Regions and Concepts - De Blij. H. J and Muller. P. O.
17. Regional Planning: Concepts, Techniques, Policies and Case Studies - Misra, R.P.
18. Economic Development: Past and Present - Gill, R
19. Introduction to Regional Science - Walter, Issard
20. An Introduction to Development and Regional Planning – Ray Chaudhuri, Jayasr

Note: The syllabus has five modules. There should be total 18 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 18 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	3	-3	2	-	2	3
CO 2	3	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	2	-
CO 6	2	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Population Geography**				
Type of Course	**Major**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Population Geography explores spatial patterns, migration, and demographic trends. Topics include population distribution, urbanization, aging, and environmental impacts. Students analyze data, policies, and theories to understand human-environment interactions. This course equips learners with insights into global population dynamics and their societal implications.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Demonstrate Understanding of Population Dynamics:	U	C	Written exams assessing knowledge of demographic theories, principles, and trends.
CO2	Analyze Spatial Patterns of Population Distribution:	E	C	Evaluation Tool: Mapping exercises and spatial analysis projects evaluating students' ability to interpret population distribution maps and identify influencing factors.
CO3	Evaluate Impacts of Migration Patterns	An	C	Research papers or case studies examining the economic, social, and environmental impacts of migration on origin and destination regions.

CO4	Critically Assess Population Policies and Programs:	Ap	C	Policy analysis assignments where students evaluate the effectiveness and ethical implications of population policies and programs.
CO5	Apply Demographic Methods for Data Analysis: -	U	C	Data analysis projects requiring students to collect, analyze, and interpret demographic data using statistical software or geographic information systems (GIS).
CO6	Examine Population-Environment Interactions:	Ap	C	Presentations or reports exploring the relationship between population dynamics and environmental processes, including assessments of sustainability and resource management strategies.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45 +30)	Marks (70+30)
I	Development of Population Geography		8	15
	1	Understanding the Scope and Evolution of Population Geography	1	
	2	Scope and Content of Population Geography	3	
	3	-Methodological Challenges in Population Geography Recent Developments in Population Geography -Overview of Population Geography in India	2	
	4	Attributes of Population: Demographic, Social, and Economic Distribution Sources and Quality of Population Data Various Sources of Population Data Assessment of Quality and Reliability Population Studies and Research Trends in India	2	
	Sections from References:			
II	Determinants and World Patterns of Population Distribution		10	15
	5	Factors Influencing Population Distribution - Distribution and Density Patterns Fertility and Mortality	2	
	6	Population Growth Patterns - Understanding Migration Patterns	2	
	7	Laws of Migration (Ravenstein) - Gravity Model (WJ Reilly and John Q Stewart) - Principle of Least Effort (George K Swift) - Intervening Opportunities (Stouffer) - Push-Pull Theory (Everett Lee)	4	
	8	Examination of Age and Sex Composition, Literacy, Urbanization, and Occupation	2	
	Sections from References:			
III	Process Population-Resource Dynamics		17	25
	9	Concept of Optimum Population	2	
	10	- Challenges of Overpopulation and Under population	1	
	11	- Population-Resource Regions (Ackerman Model)	2	

	12	Theoretical Perspectives on Population	2	
	13	Malthusian Theory	2	
	14	Ricardo's Theory	2	
	15	Marxian Theory	2	
	16	Demographic Transition Theory	2	
	17	Population problems	2	
	Sections from References:			
IV	**Spatial andTemporal Trends of population in India**		**10**	**15**
	18	Distribution Density Growth	1	
	19	Sustainable development strategies to promote a balanced distribution	2	
	20	Population Policy and Strategies	2	
	21	Rural – Urban Population	2	
	22	Sustainable Development Goals and Population Policy of India	3	
	Sections from References:			
V	**Population mapping**		**30**	
	1	Growth rate of population: Arithmetic growth comparing two decadal datasets 2. Representation and interpretation of population density of Indian states or Kerala districts by Choropleth method 3. Identification of types of settlements according to sites from Survey of India 1:50k topographical maps 4. Construction of proportional squares depicting number of houses 5 Construction and interpretation of gender-wise bar showing work participation rate 6. Construction and interpretation of proportional divided circles showing state-wise variation in occupational structure 7.Time series analysis of population of India using moving average	15	
	2	Population problems in India	15	
	Sections from References:			

Books and References:.

1. Fotheringham, A. S., & Rogerson, P. A. (2019). The SAGE Handbook of Spatial Analysis. SAGE

Publications Ltd.

2. Boyle, P. J., & Halfacree, K. H. (Eds.). (2012). Migration, Mobility and Modernization. Routledge.

3. Stillwell, J., & Congdon, P. (Eds.). (2020). The Routledge Handbook of Census Resources, Methods and Applications: Unlocking the UK 2011 Census. Routledge.

4. Champion, A. G., & Hugo, G. J. (Eds.). (2004). New Forms of Urbanization: Beyond the Urban-Rural Dichotomy. Routledge.

5. Findlay, A. M., Graham, E., & Johnson, J. H. (Eds.). (2019). Population, Space and Place. John Wiley & Sons.

6. Rees, P., & Stillwell, J. (2015). Population Migration in the European Union. Routledge.

7. White, M. J., & Lindstrom, D. P. (Eds.). (2017). Internal and International Migration: Chinese Perspectives. Routledge.

8. Weeks, J. R. (2012). Population: An Introduction to Concepts and Issues. Cengage Learning.

9. Boden, P., & Wise, S. (Eds.). (2017). Migration and Health in the European Union. Routledge.

10. Bell, M., Charles-Edwards, E., Kupiszewska, D., Kupiszewski, M., Stillwell, J., & Zhu, Y. (Eds.). (2015). Internal Migration in the Developed World: Are We Becoming Less Mobile?. Routledge.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	3	1	2	1	-	3
CO 2	1	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	1	3	2	-	3	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-

CO 6	1	-	2	2	3	-	-	-	2	2	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

<table>
<tr><td>Programme</td><td colspan="5">B. Sc. Geography</td></tr>
<tr><td>Course Title</td><td colspan="5">Urban Geography</td></tr>
<tr><td>Type of Course</td><td colspan="5">Major</td></tr>
<tr><td>Semester</td><td colspan="5">VIII</td></tr>
<tr><td>Academic Level</td><td colspan="5">400-499</td></tr>
<tr><td rowspan="2">Course Details</td><td>Credit</td><td>Lecture per week</td><td>Tutorial per week</td><td>Practical per week</td><td>Total Hours</td></tr>
<tr><td>4</td><td>4</td><td>-</td><td>0</td><td>60</td></tr>
<tr><td>Pre-requisites</td><td colspan="5">Nil</td></tr>
<tr><td>Course Summary</td><td colspan="5">The Urban Geography course at the postgraduate level provides an in-depth exploration of urban spaces, their formation, dynamics, and socio-spatial characteristics. It delves into theoretical frameworks, empirical research, and practical applications in understanding the complexities of urban environments. Through a multidisciplinary approach, students analyze urbanization processes, urban morphology, social structures, economic activities, and environmental challenges within the context of globalization and urban development.

Upon completion of the course, students will develop a comprehensive understanding of urban geography theories, empirical research methods, and practical applications. They will gain critical thinking skills to analyze complex urban issues, formulate policy recommendations, and contribute to scholarly debates in the field of urban studies. Additionally, students will be equipped with the knowledge and skills necessary for careers in urban planning, community development, policy analysis, and related fields.</td></tr>
</table>

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students should be able to identify and discuss global trends in urbanization, including factors driving urban growth, the rise of megacities, and the challenges associated with rapid urbanization in different parts of the world.	U	C	Instructor-created exams / Quiz
CO2	Students should enhance their critical thinking skills by evaluating different perspectives on urban issues and communicating their ideas effectively through writing, presentations, and class discussions.	E	C	Writing reflective journals
CO3	Students should be able to comprehend the spatial organization and structure of cities, including patterns of land use, transportation networks, and the distribution of population and activities.	An	C	Instructor-created exams / Quiz
CO4	Students should gain the ability to analyze the processes that shape urban areas, including urbanization, industrialization, suburbanization, gentrification, and urban sprawl.	Ap	C	Discussion /
CO5	Students should gain an understanding of the role of government and planning agencies in shaping urban development policies, including zoning regulations, land-use planning, transportation planning, and urban revitalization initiatives.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Students should develop skills in geographic information systems (GIS), spatial analysis, and other geographic techniques for studying urban phenomena and solving urban problems.	Ap	C	Discussion Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)				

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I		History of Urbanization	12	15
	1	Nature, Scope and approaches of Urban Geography	1	
	2	Urbanization – Definitions, Terminologies (urbanization, urbanism, Rural-Urban Continuum, conurbation, suburbanization, hinterland, gentrification, urban neighborhood, ghettoisation, edge cities, world cities, mega cities), Global urban trends and patterns	3	
	3	World Urbanization – The Classic City, The Medieval city, The Neoclassical City	4	
	4	Colonization, Industrial Revolution and Urbanization, Post-Industrial Cities	2	
	5	Urbanization in Third World- History and salient characteristics	2	
	Sections from References:			
II		Patterns and Classification	10	15
	6	Classification of Urban Place – Based on Physical Characteristics, Functional, SocioCultural, Historical)	1	
	7	Census classification of Indian Towns Ashok Mitra's Classification of Indian Cities	3	
	8	Land Use Models of North-American Cities- Burgess Model, Sector Model, Multiple Nuclei Model Land use models of Latin American Cities- Urban Realms Model (James E Vance Jr.) Bazar Model and Colonial- based model of South Asian cities, African City Model, South East Asian City Model (McGee Model) Borchert's Model of Urban Evolution, Urban Demographic	3	
	9	Urban Demographic Model – Density Model Law of Primate city, Rank -Size rule, Central Place Theory (Spacing of settlement system, central places, functions, range, threshold)	3	
	Sections from References:			
III		Urban Social Life	10	15

	10	Classical Theories of urban sociology- Max Weber,	1	
	11	Louis Wirth	1	
	12	Chicago school of theories- Park and Burgess	1	
	13	Introduction to New Urban Sociology: Henri Lefebvre, David Harvey	1	
	14	Social segregation in the city – class, caste, race, gender and occupational divisions	1	
	15	Urban social area analysis of Shevky and Bell	1	
	16	Contemporary city ecology, Cities and Climate Change	2	
	17	Social problems: Immigration, Crime, Urban poverty, Housing and Slums, Transport, Basic Services, Urban Pollution	1	
	18	Urban climate, urban heat island	1	
	Sections from References:			
IV	Urban Planning and Governance		16	25
	19	Urban Governance: Meaning and Principle of Urban Governance, Urban Governance structure and hierarchy in India and challenges	4	
	20	Planning: National Urban Policy and Urban land use planning,Urban Planning through five-year plans, 74thCAA and its implication on urban, Concept of Master Plans and its critical perspective, City Development Plans	4	
	21	Urban Renewal and Development Programmes in India – JnNURM, Post JnNURM – Smart Cities, HRIDAY, AMRUT, NERUDP, PMAY-U, Swachh Bharat Mission	4	
	22	Future urbanism: sustainable city, smart city, compact city, virtual city, network city, world class city, global city and inclusive city	4	
		Sections from References:		
V		Urban Applications	12	
		Urban GIS, Urban Spatial Data Types -Raster and Vector, Attributes and metadata, Sources of data	4	
		Land use land cover change analysis, Network analysis, Site suitability analysis, Poverty and Crime analysis	4	
		Application of Remote Sensing and GIS in urban planning and management in India	4	
	Sections from References:			

Suggested Readings

	BookTitle	Author
1	Urban Geography - An Introductory Analysis	James H. Johnson
2	Cities: Steering Towards Sustainability	Pierre Jacquet
3	The Urban Pattern – City Planning and Design	Arthus B Gallion, Simon Eisner
4	New Forms of Urban Governance in India	I S A Baud , J De Wit
5	Introduction to Settlement Geography	Sumita Ghosh
6	Town Planning	Rangwala
7	Urban and Regional Planning	K S Rame Gowda
8	Urbanisation and Urban Systems in India,	Ramachandran, R.
9	The Geography of Towns.	Smailes, A.E.
10	Global City-Regions,	Simmonds, R. and Hack, G. (2000)
11	Geographic Perspectives on Urban Systems	Berry, B.J.L. and Horton F.F.
12	The Study of Urbanisation	Hauser, P.M. and Schnore L.F
13	Models in Geography	Chorley, R.J. and Haggett, P
14	Urban and Regional Planning,	Hall P
15	The Urbanization of Capital, John Hopkins University Press	David Harvey (1985)
16	Confronting the Crisis of Urban Development	Edgar Pieterse, (2008)
17	Social Justice and the City, Arnold	Harvey, D.(1973)
18	World Cities in a World System	Knox, P.L., and Taylor. P.J.(1995)
19	Global City-Regions, Trends, Theory & Policy	Allen J. Scott (ed.), (2001)
20	The Urban Geography Reader	Fyfe, N. R. and Kenny, J. T. (2020).
21	Sustainable Cities	Graham H. and Colin H. (2003)
22	Urbanization: An Introduction to Urban Geography	Knox, P. L., and McCarthy, L. (2005)
23	The Urban World	Palen, J.J. (2012)

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	3	3	-	2	2	1	3
CO 2	2	-	-	2	2	-	3	3	-	-	3	-
CO 3	2	-	3	2	-	3	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2

CO 5	3	3	-	-	-	3	3	3	-	-	-	1
CO 6	1	-	2	2	3	-	-	-	2	2	3	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B.Sc Geography				
Course Title	**Agricultural Geography**				
Type of Course	Major with Practical				
Semester	VIII				
Academic level	400-499				
Course details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	60
Pre requisites	NIL				
Course summary	This course aims to help the students to understand the agricultural geography its development, theoretical knowledge, measurements that create holistic understanding of the agricultural Geography. To encouragement scientific mode of thinking and scientific method of enquiry in the field of agricultural Geography. That create sound knowledge and skill to solve problems. To Familiarize the students with new modern technical methods and their applications in Agricultural activities.				

Course Outcome (CO):

CO	CO statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO.1	To Introduce students Agricultural activities and its relation with Geography In a more fundamental sense it can be categorized as an applied Science, the object of which is crop cultivation and management for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.	U	C	Instructor - Created Exam/ Assignment/Group activity/ Quiz
CO.2	To enable students to apply Previously knowledge in Problems and Prospects in agriculture	U	C	Interactive Lectures/ Writing reflective journals/ Seminars
CO.3	To demonstrate the ability to analyse agricultural data and make appropriate quantitative conclusions. To demonstrate the aptitude to communicate efficiently both orally and in writing	An	C	Evaluate the clarity, accuracy and effectiveness through quantitative analysis surveying and mapping.
CO.4	To understand and analyse the current events and issues that are occurring in agriculture and how they affect futuristic agriculture	U	P	Discussion/ Practical Assignment
CO.5	Able to recognize and examine the relationships between inputs and outputs in their agricultural field to make effective and profitable decisions and make proper agricultural development strategy.	Ap	P	Instructor - Created Exam/ Assignment/Group activity/ Quiz

CO.6	Knowledge about Indian Agriculture and importance, present status, scope and future prospects	An	C	Discussion/ Practical Assignment
CO.7	Make proper management, and conservation agricultural practices in land , water and soil	E	F	Individual and group field visit and make project
-Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate(E), Create(C) # - Factual Knowledge (F) Conceptual Knowledge (C) Procedural Knowledge (P), Metacognitive Knowledge (M)				

Unit	Module	Content	Hrs(48+12)	Marks (70+30)
		Concept of Agricultural Geography	9	15
I	1	Meaning; Nature and Scope; Approaches; Significance; Elements of Agricultural Geography; Origin and Evolution of Agriculture;	2	
	2	Diffusion of Crop ; Major Agricultural Hearth; Dispersal; Development; Model; Principles and Basic Concepts in Agricultural Geography	3	
	3	Agricultural Types and System; Agricultural Systems of the World (Whittelesey's Classification)	2	
	4	Determinants of Agriculture	2	
		Section from reference:		
		Theoretical foundation of Agricultural Geography	10	15
	5	Agricultural Theories- Von Thunan Theory of Agricultural Location, Application of Von Thunan Model In India,	2	
II	6	Game Theory by Neuman and Morgenstein	1	
	7	Agricultural Land Use Theories; L.D Stamp, G.Baker, S.P.. Chatterjee,M.Shafi;	3	
	8	Transforming Traditional Agriculture by Schults, Mellor's Theory of Agricultural Development;	3	
	9	Sustainable development theory	1	
		Section from reference:		
	10	**Measurement in Agricultural Geography**	15	20
	11	Agricultural Regionalization; Cropping Pattern; Land Use Survey and Techniques-Land Capability-	3	
	12	Concept of Carrying Capacity Of Land; Land Suitability Evaluation Survey; Crop Suitability	2	
III	13	Agricultural Productivity and Efficiency;	1	
	14	Farm Management Principle and Tools; Measurement of Farm Efficiency and Farm Conservation Planning;	3	
	15	Agriculture and Economic Development- Instability in Agriculture; Food Security;	3	

	16	Agriculture Ecology; Integrated Pest Management; Sustainable Agricultural Development.	2	
	17	Application of Remote Sensing and GIS in Agriculture.	1	
		Section from reference:		
		Contemporary Strategies in agricultural issues and Prospects and problems of Indian Agriculture	11	20
	18	Agricultural Planning ; Agro-Climatic; Agro-Ecological Regions In India;	3	
	19	Land Reforms In India and its implication	2	
IV	20	Green Revolution-Green, White, Blue, Pink; Agricultural Development In India Under Five Year Plan;	3	
	21	Role Of GATT,WTO And F AO; New Agricultural Policies and Problems	2	
	22	New Dimensions in Indian Agriculture.	1	
		Section from reference:		
		Practicum	12	
	1	1.Prioritization of Micro Watershed Using Soil Survey –Silt Yield Index –runoff and Runoff Potential Index-Soil Loss Equation-	6	
		2. Irrigation Water Efficiency-Irrigation Water Productivity-Crop Water Productivity-		
		3. Agricultural Crop Index; Agricultural development index; livelihood index		
		4. Measuring Sustainability Index-Food Security-Precision Farming.		
	2	**Project** Prepare any one project using above mentioned practicum	6	

Reference:

1. Singh, J., and Dhillon, S.S., (1984): Agricultural Geography, Tata McGraw Hill, New Delhi.
2. Tarrant, J. R., (1973): Agricultural Geography, David and Charles, Devon.
3. Shafi, M., (2006): Agricultural Geography, Doring Kindersley India Pvt. Ltd., New Delhi
4. Mohammad, N., (1992): New Dimension in Agriculture Geography, Vol. I to VIII, Concept Pub., New Delhi.
5. . Basu, D.N., and Guha, G.S., (1996): Agro-Climatic Regional Planning in India, Vol.I& II, Concept Publication, New Delhi.
6. Gautam, Alka (2021): Agricultural Geography, Sharda Pustak Bhawan, Allahabad.

Husain, Majid (2019): Systematic Agricultural Geography, 2 nd Edition, Rawat Publications, Jaipur.

7. Joseph, George and Jeganathan, C. (2018): Fundamentals of Remote Sensing, 3 rd Edition, University Press, Hyderabad.
8. Shafi, M. (2006): Agricultural Geography,Dorling Kindersley India Pvt. Ltd., New Delhi.

Singh, Jasbir and Dhillon, S.S. (2004): Agricultural Geography, 3 rd Edition, Tata McGraw Hill, New Delhi.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of CO s with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	3	-	3	3	-	2	-	1	3
CO2	-	2	-	2	2	-	3	1	-	-	3	-
CO3	2	-	3	2	-	3	2	-	3	2	-	-
CO4	3	1	2	3	-	-	3	-	2	3	1	2
CO5	3	3	-	-	-	3	3	3	-	-	-1	-
CO6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation level	
Level	Correlation
-	Nil
1	Slightly/Low
2	Moderate/Medium
3	Substantial/High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓

CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Research Methodology in Geography**				
Type of Course	**Major**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course will cultivate the student for pursuing investigations in different dimensions of geography as a spatio-temporal sciences. Paper will be helpful for understanding various approaches in geographical investigations and different methods of collection data in empirical research. This course will play a key role in introducing methods of sampling, analysis of data with different methods of presentation of results.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic understanding of Geography as science	U	C	Discussions and debates

CO2	Examine the methods of scientific investigations and explanations	E	C	Group discussions and Seminars
CO3	Introduce various methods of data collection	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Understand and examine the various methods of sampling and analysis of data	U	C	Discussion, Practical Assignments and exams
CO5	This section will introduce the student how to present results of investigations and analysis	An	C/P	Practical assignment and writing
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Note: Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
I	**Geography as a Science**		**10**	**15**
	1	Geography as a Science	2	
	2	Approaches to the study of Geography- Systematic and Regional, Environmental and Humanistic	3	
	3	Four traditions in Geography- Earth Science tradition	3	
	4	Man –land tradition, Spatial tradition and Area studies tradition	2	
II	**Models and Paradigms**		**10**	**15**
	5	Data, Information and knowledge	1	
	6	Types of Knowledge- Practical, Theoretical, and Scientific knowledge	2	
	7	Science & Its characteristics	3	
	8	Fact, concept, hypothesis, theories, laws, and Models in the geographical explanation	2	
	9	Paradigms in geography	2	
III	**Data Collection**		**10**	**15**
	10	Identification of problems from Local geography-	1	
	11	Field work- Data collection- primary data	1	
	12	Methods of collection – Observation methods, interview	2	
	13	Schedules and Questionnaire and case study method	2	
	14	Secondary data -Published and unpublished sources	2	
	15	Selection of appropriate methods for data collection - problems in data	2	
IV	**Sampling and Analysis of Data**		**18**	**25**
	16	Sampling- purposes and principles of sampling-key terms in sampling	3	
	17	Population, sample, sampling frame, sampling estimate and sampling error- Types of sampling- Probability sampling	2	
	18	Simple random sampling, stratified, systematic, multi- stage, and cluster sampling-Non probability sampling- incidental, purposive, quota, and judgment sampling	2	
	19	Classification and tabulation of data; Processing and Analysis of collected Data: Editing;	2	
	20	Cartographic presentation: Need, significance, Selection of Cartographic methods- maps, diagrams, combination of maps and diagram.	3	
	21	Measurement of averages, ratios central tendency, dispersion and relationship.	3	
	22	Hypothesis testing, use of recent available computer added methodologies	3	
V	**Analysis of data and Report Writing**		**12**	
	1	Writing literature reviews/ research articles	3	
	2	Writing Project Reports	3	
	3	Writing Chapters	3	
	4	Writing Dissertation	3	

Suggested Readings

1. Ahuja, Ram, Research Methods, Rawat Publications, 2018
2. Chorley, R.J. and P.Haggett(ed.) Models in Geography, Methuen London,1967.
3. Goode ,W.I .and P.K.Hatt. Methods in Social Research, McGraw Hill, Tokyo,1962
4. Harvey, David. Explanation in Geography, Edward Arnold London, 1971.
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Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module Vis designed to equip students with practical skills. The 10marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (10 marks) and the first four modules (20 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	1	2	3	-	3
CO 2	3	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	1	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2

CO 5	3	3	-	-	-	3	3	3	-	-	3	-
CO 6	3	-	2	2	3	-	-	-	2	2	3	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

ELECTIVE COURSES IN GEOGRAPHY WITH SPECIALISATION

I SPATIAL PLANNING AND SUSTAINABLE DEVELOPMENT

Programme	B. Sc. Geography				
Course Title	**Rural Planning and Development**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Nil				
Course Summary	"Rural planning and development explores strategies for sustainable development in rural areas. This course delves into the unique challenges and opportunities present in rural communities, covering topics such as land use planning, infrastructure development, environmental conservation, and community engagement. Students will analyze case studies, examine policy frameworks, and develop practical solutions to foster resilient and vibrant rural economies. By the end of the course, participants will gain a comprehensive understanding of the complexities involved in rural development and the tools necessary to create positive change in these landscapes."				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	To Evaluate where does the subject stand among other disciplines	E	C	Instructor-created exams / Quiz
CO2	To Understand the Concepts of Rural Planning	U	C	Instructor-created exams / Quiz
CO3	To understand Evolution of rural development, theories, and practice of design	E	C	Instructor-created exams / Quiz

CO4	To Analyze changing profile of the rural areas	An	C	Discussion / among Groups and Seminars
CO5	To Understand the current thrust areas in the Discipline.	U	C	Instructor-created exams / Quiz/ Seminars
CO6	To Understand the future Thrust areas and application aspects of the subject.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	**Unit**	**Content**	**Hrs (48+12)**	**Marks (70+30)**
I		**Rural development**	**10**	**15**
	1	Introduction to Rural Society – concept of village, aspects	3	
	2	Definition Nature, Strategies and Scope of Rural Development	2	
	3	Need for Rural Development	2	
	4	Historical evolution of the concept of Rural Development	3	
	Sections from References:			
II	**Development strategies**		**10**	**15**
	5	Principles of Rural Economic Development	2	
	6	Types of Rural Development Strategies	2	
	7	Rural Development	2	
	8	Major Initiatives	2	
	9	Causes of Rural Backwardness	2	
	Sections from References:			
III		**Theories of rural development**	**12**	**20**
	10	Rostow’s Stages of Growth	3	
	11	Lewis Theory of Development	3	

	12	Theory of Big Push	2	
	13	Marxian Concept of Development	2	
	14	Schultz's Transformation of Traditional Agriculture	2	
	Sections from References:			
IV	**Changing profile of the rural areas**		**16**	**20**
	15	Changing Profile of the Rural areas of India.	2	
	16	Inclusive Development	2	
	17	Participatory Planning Process	2	
	18	Participatory Learning and Action Tools	2	
	19	Challenges	2	
	20	Impact of Decentralized Governance on Rural Development	2	
	21	Need for Environmental awareness in rural area	2	
	22	Trends in Research in Rural Development India	2	
	Sections from References:			
V	**Rural development plans**		**12**	
	Preparation of locational specific master plans		3	
	Micro Watershed Plan		3	
	Local Development plans.		3	
	Application of ICT's for Rural Development in India		3	

References

1. Chakravarty, Sukhamoy (1987), Development Planning: The Indian Experience, Claredon Press, Oxford.
2. Ghatak, Subrata (1986), An Introduction to Development Economics, Allen and Unwin, London.
3. Misra, S.N. (1984), Rural Development Planning – Design and Method, Satvahan Publications, New Delhi.
4. Tadaro, Michel, P. (1985), Economic Development in the Third World, Orient Longman, New Delhi.
5. India Rural Development Report 2013-14.
6. Issues on Rural Finance Infrastructure and Rural Development.
7. Rural Development Programmes in India.
8. Globalization and Rural Development.
9. Rural Development and Poverty Alleviation in India Policies and Programmes.
10. Rural Management in Post Reform Era.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	3	-	3	3	-	2	1	1	3
CO 2	-	1	-	2	2	-	3	-	-	-	3	-
CO 3	2	3	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Spatial and Urban Planning**				
Type of Course	**Elective Major**				
Semester	V				
AcademicLevel	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Spatial and Urban Planning is a multidisciplinary field that focuses on designing and managing the physical environment in urban areas to ensure sustainable development, efficient land use, and improved quality of life for residents. This course provides students with a comprehensive understanding of the principles, theories, and practices of urban planning, along with the tools and techniques used in spatial analysis and decision-making. Overall, this course equips students with the knowledge, skills, and analytical tools needed to address complex urban challenges and contribute to the creation of livable, inclusive, and sustainable cities and communities. Through lectures, discussions, case studies, and practical exercises, students gain a deeper understanding of the interconnectedness of social, economic, environmental, and spatial factors in urban planning and development.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Utilize the Geoinformatics techniques in various spatial planning	U	C	Instructor-created exams / Quiz
CO2	Utilize the possibilities of latest developments in Geoinformatics and assess its advantage and disadvantages.	An	E	Discussion / Practical Assignments
CO3	Apply interdisciplinary knowledge in	Ap	C	Discussion /

	application of Geoinformatics in various research fields.			Practical Assignments / Practicals
CO4	Engage in various types of spatial planning in different stages for scientific and geospatial application.	E	C	Discussion / Practical Assignments
CO5	Apply Geoinformatics techniques in various spatial planning work.	Ap	F	Instructor-created exams / Quiz/ Seminars
CO6	Assess the implementation and possibilities of Geoinformatics in Spatial Planning.	An	C	Discussion / Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs** **(48+12)**	**Marks** **(70+30)**
I	**Regional Planning**		**8**	**15**
	1	Norms and standards of regional planning	2	
	2	Theories of regional planning and economic development.	2	
	3	Spatial patterns of regional imbalance in India – micro and macro level	2	
	4	Government planning programmes in india	2	
	Sections from References:			
II	**Urban Land use Planning**		**9**	**15**
	5	Land use classification, types of land use survey, Issues and challenges related to land use survey	3	
	6	Land use planning – Significance and difficulty of land use planning and land use management, critical issues of land use planning in India.	2	
	7	Urban land use plan, Methods of Land Use/Land Cover Mapping Survey,	2	
	8	Important Consideration for the Classification, Urban land use classification	2	
	Sections from References:			
III	**Network based planning**		**16**	**20**
	9	Definition and concept of utility or flow network	3	
	10	Importance and applications of network theory	2	
	11	Application of Geoinformatics in network based planning	2	
	12	Vehicle routing problem, water distribution, sewage line and telecom.	2	
	13	Real-world applications of network-based planning in different domains	3	
	14	Principles of sustainable transportation planning	2	
	15	Analysis of case studies highlighting challenges and solutions	2	

	Sections from References:			
IV	**Spatial analysis in the Urban planning**		**15**	**20**
	16	Overview of spatial analysis concepts & Importance of spatial thinking in urban planning	2	
	17	Urban definition, Structure of cities, Size and scale of cities, Urban Growth, Urban environmental problems, and issues	3	
	18	Urban governance, Urban planning, Sustainable urban development, Smart city and City bylaws.	2	
	19	Urban GIS, Urban Spatial Data Types –Raster and Vector, Attributes and metadata, Sources of data, Site selection	3	
	20	Land suitability analysis, Land use and transport modelling, impact assessment. Spatial Analysis and Spatial decision support system.	3	
	21	Time-series analysis in urban planning	1	
	22	Presentations and discussions of case studies	1	
V	**Practical Works & Projects**		**12**	
	Land use suitability analysis		3	
	Group projects applying planning principles to real-world scenario		3	
	Field visits to observe urban planning in action		3	
	Internship opportunities with local planning agencies or firms		3	

Reference Books:

1. Johnson, J. H., (2013): Urban Geography: An Introductory Analysis, 2nd Edition, Fisher W. B. (Ed.), Pergamon Oxford Geographies.

2. Ghosh, S. (1998): Introduction to Settlement Geography by, Orient Longman, 1998

3. Singh, R.B. (Ed.), (1991): Environmental Monitoring: Application of Remote Sensing and GIS, Geocarto Int. Centre.

4. Singh, R.B. and Murai, S. (Eds.), (1998): Space Informatics for Sustainable Development, Oxford & IBH Publications.

5. Burrough, P. A., and Mc Donnell, R. A., (1998): Principles of Geographic Information Systems, Oxford University Press.

6. Chang, K. T., (2006): Introduction to Geographic Information Systems, Tata McGraw- Hill.

7. De Mers, M. N., (1999): Fundamentals of Geographic Information Systems, John

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Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	3	3	1	2	1	-	3
CO 2	3	2	-	2	2	-	3	2	-	-	3	-
CO 3	2	2	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	1	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)

- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Watershed Management Planning and Development**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course provides theoretical and practical knowledge to students with a comprehensive understanding of watershed and its significance watershed planning. Hydrological Features of watershed. Geo-morphological characteristics of watershed are familiarised through this courses. Surveying procedures of watershed, Watershed delineation and Watershed prioritization are also practiced by the students. Students engaging with watershed development perspectives and evaluates the blockages such as ecological, economical and social. These provide an opportunity to the students understand and examine the various determinants of watershed and its ecological scope. Neo-Populist Regional Development Strategies. Provisions for handling real-world problems related to watershed development and assess students' ability to apply their knowledge to solve the regional ecological issues through sustainable development principles.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Watershed management concept, objectives and factors are delivered in the class room discussion. Students understand the basic concepts of watershed and watershed development.	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key components of watershed. Its Hydrological Features and Geo-morphological characteristics are understood by the students.	U	C	Group discussions and Seminars
CO3	Watershed delineation and Watershed prioritization are also practiced by the students Engaging with watershed development perspectives and evaluate the blockages such as ecological, economical and social. Analysis	An	C	Evaluate the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Water budgeting methods in a watershed, Rain water harvesting practises and conservation technologies are discussed and examined the scope for water crises ares.	E	C	Discussion, Practical Assignments and exams
CO5	Provide a real-world problems related to watershed development and assess students' ability to apply their knowledge to solve the regional issues through proper sustainable development principles.	An	P	Practical assignment Seminars and open text exams
CO6	Limits of Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation are analysed. Preparation of watershed based master plan for the development of the nearby region that are particularly connected with ecological, economical and social issues.	Ap	P	Filed visits, project writing and Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (48+12)	Marks (70+30)

		Introduction to watershed management	**10**	**15**
	1	Watershed management concept, objectives and factors	2	
	2	Integrated watershed management :concept and components	3	
	3	Hydrological Features of watershed	3	
	4	Geo-morphological characteristics of watershed.	2	
	Sections from References:			
II	**Surveying of watershed**		**10**	**15**
	5	Surveying of Drainage basin and preparation of watershed map	2	
	6	Watershed delineation and Watershed codification	2	
	7	Preparation of contour map and delineation of watershed	2	
	8	sediment yield index	2	
	9	Water flow index	1	
	10	sediment yield index	1	
	Sections from References:			
III	**Hydrology of Watershed**		**15**	**15**
	11	Hydrologic data for watershed planning	2	
	12	Water budgeting in a watershed.	2	
	13	Rain water harvesting and conservation practices	2	
	14	Rainwater conservation technologies – in-situ and ex-situ storage	3	
	15	Water conservation practices for arid and humid regions	3	
	16	Water conservation practices for hilly and low lying regions	3	
	Sections from References:			
IV	**watershed Development**		**13**	**15**
	17	Watershed development-problems and prospects	2	
	18	Watershed programme - execution, follow-up practices, maintenance, monitoring and evaluation.	2	
	19	Participatory watershed management - role of watershed associations, user groups and self-help groups.	3	
	20	Watershed development in India	2	
	21	Watershed development in Kerala	2	
	22	Watershed development, Common Guidelines, Allocation of	2	

		schemes.		
	Sections from References:			
V		**Practicum of Watershed planning and Development:**	**12**	**20**
	1	Planning and formulation of project proposal for watershed management programme including cost-benefit analysis.	3	
	2	Visit to watershed development project	3	
	3	Organize students Seminar and debates regarding the significance of watershed management.	3	
	4	Associating with watershed management programme initiated by government agencies and NGOs	3	
	Sections from References:			

1. Allan, J. D. (2004). Landscapes and riverscapes: The influence of land use on stream ecosystems. Annual Review of Ecology, Evolution, and Systematics, 35, 257-284.

2. Bosch, J. M., & Hewlett, J. D. (1982). A review of catchment experiments to determine the effect of vegetation changes on water yield and evapotranspiration. Journal of Hydrology, 55(1-4), 3-23.

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6. Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). Applied hydrology. McGraw-Hill.

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8. Federal Emergency Management Agency. (2015). Watershed modeling system: User's manual version 11.

9. Gray, L. (2011). Water governance for sustainable development: Approaches and lessons from developing and transitional countries. Routledge.

10. Merz, B., & Blöschl, G. (2004). Flood frequency regionalisation—Spatial proximity vs. catchment attributes. Journal of Hydrology, 288(3-4), 213-235.

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Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	3	2	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓

CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Environmental Planning and Development**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4			60
Pre-requisites	Nil				
Course Summary	This course, which is acquaints the students with the practical realities of living environment, techniques of measurements of environmental quality, including the laboratory techniques of measuring levels of air pollution, noise, and water pollution. The theoretical aspects of various facets of Environmental Planning, Environmental Design, Environmental Impact Assessment, and Environmental Economics are imparted in a span of three semesters. Finally, the course enables the students to incorporate environmental considerations in spatial planning exercises backed by theoretical understanding, tools and techniques and exposure to practical cases.				

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tools used**
CO1	To Evaluate where does the subject stand among other disciplines	E	C	Instructor-created exams / Quiz
CO2	To Understand the Concepts of Environmental Planning	U	C	Instructor-created exams / Quiz
CO3	To understand Evolution of Environmental design, theories, and practice of design	E	C	Instructor-created exams / Quiz
CO4	To Analyze different Environmental Monitoring and Assessment parameters	An	C	Discussion / among Groups and Seminars
CO5	To Understand the current thrust areas in the Discipline.	U	C	Instructor-created exams / Quiz/ Seminars

CO6	To Understand the future Thrust areas and application aspects of the subject.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
I		**Environmental planning**	**12**	**15**
	1	Concepts, History, and Development	3	
	2	Concepts of Ecology and Ecosystem	3	
	3	Resource analysis for various ecosystems and development	3	
	4	Environmental Zones, Policies, and initiatives.	3	
	Sections from References:			
II	**Environmental Design**		**10**	**15**
	5	Evolution of Environmental design, theories, and practice of design	2	
	6	Design as a determinant of Environmental quality	2	
	7	Criteria of Urban Environmental design, Urban climatology, Climate Change and City Planning.	2	
	8	Environmental approaches to design and planning of rural settlements	2	
	9	Application of Energy code, Clean Development Mechanism.	2	
	Sections from References:			
III		**Environmental Monitoring and Assessment**	**10**	**20**
	10	Concepts of relevant meteorological parameters.	2	
	11	Air Pollution-sources, causes/pollutants, and their effects	2	
	12	Water Pollution	2	
	13	Noise Pollution	2	

	14	Land Pollution	2	
	Sections from References:			
IV	**Environmental Impact Assessment**		**16**	**20**
	15	Definition and need, evolution and objectives, tasks, and scope	2	
	16	Methods of EIA; advantages and limitations	2	
	17	Assessment of impacts on resources	2	
	18	Assessment of impacts on Land use	2	
	19	Assessment of social and health impacts	2	
	20	Role of EIA in the Planning and decision making process.	2	
	21	Public Participation in EIA	2	
	22	PRA techniques	2	
	Sections from References:			
V	**Environmental Monitoring and Assessment (Laboratory)**		**12**	
	Air Quality Parameters Familiarization with relevant instruments/equipment's and procedures		3	
	Water Quality Parameters Familiarization with relevant instruments/equipment's and procedures		3	
	Soil Quality Parameters Familiarization with relevant instruments/equipment's and procedures		3	
	Weather Parameters Familiarization with relevant instruments/equipment's and procedures		3	

References

1. Town planning in practice; an introduction to the art of designing cities and suburbs by Unwin, Raymond, Sir, 1863-1940.
2. Randolph, John. 2004. Environmental Land Use Planning and Management. Washington: Island Press. Chapters 1-2.
3. Seto, Karen C., Roberto Sánchez-Rodríguez, and Michail Fragkias. 2010. "The New Geography of Contemporary Urbanization and the Environment." Annual Review of Environment and Resources 35 (1): 167–94. doi:10.1146/annurev-environ-100809-125336.
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Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	-	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	1	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	2
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

II SOCIETY AND CULTURE

Programme	B. Sc. Geography				
Course Title	**Cultural Geography**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course grants theoretical and realistic knowledge about the concept of culture and its significance on human life through geographical perspective. It discuss on all sides of evolution and historical development of various cultures. For the scientific understanding about the origin of human beings, Origin and Evolution of Man, Migration History of Early Human, Evolution of race and Classification of Races are the major topics of discussion. The concept of culture, diverse approaches, theories and contextual applications are also delivered. Students engaging with various dimension of cultural and evaluate the geographical determents such as ecological, economical and social influencing the cultural growth. Analysis theories associated with culture and its diffusion. These provide an opportunity to the students understand and examine the diversities of cultural life's and its genetic associations with one another. Provisions for handling real-world social and political problems related to cultural differences and assessing students' ability to apply their knowledge to make strategies to rule out the cultural issues.				

Module	**Unit**	**Content**	**Hrs (48+12)**	**Marks (70+30)**

I		**Introduction to Cultural Geography**	**10**	**15**
	1	Definition, Nature and Scope Of Cultural Geography	2	
	2	Components of Culture, Culture and Civilization.	3	
	3	Approaches to Cultural Geography	3	
	4	Morphology of Cultural Landscape.	2	
	Sections from References:			
II	**Theories and fundamental concepts**		**13**	**15**
	5	Theories of cultural Evolution: Unilinear theory, Multilinear theory.	2	
	6	Theories of cultural Change: Evolutionism,	2	
	7	Neo- evolutionism, functionalism, Diffusionism,	3	
	8	Acculturation and Assimilation and innovation.	2	
	9	Theories of Cultural diffusion: Hager strand model etc	2	
	10	Space, Place, Landscape, Ideology, Hegemony, Gender, Class, Sexuality, Race, Ability And Caste	2	
	Sections from References:			
III	**Cultural Hearth and Realms of the world**		**15**	**15**
	11	Origin and Evolution of Man, Migration History of Early Human..	2	
	12	Human Races: evolution of race, criteria of racial classification, theories of the classification of Races	2	
	13	Classification of Races: Major races of the world: Nordics, Mongoloids, Negroids and Caucasoids.	2	
	14	Racial Classification in India: Sri Risley, A.C. Haddon and B.S. Guha	3	
	15	**Cultural Hearth:** Meaning of cultural hearth, Major cultural hearths of the world.	3	
	16	**Cultural Realms:** Meaning of cultural Realms, Bases of delimitation of cultural Realms, Classification of cultural Realms of the world, Major cultural Realms of the world.	3	
	Sections from References:			
IV	**Evolution of Human civilization in India**		**10**	**15**
	17	The evolution of Cultural Hearth,	2	

	18	Realm and Civilizations in India	2	
	19	Migration history and Early Humans in Indian sub continents.	2	
	20	The Indus Valley civilization (Mesopotamia and Harappa) its spatial distribution of Archaeological sites	2	
	21	South Indian Culture Hearths and Realm	1	
	22	Spatial distribution of Archaeological sites in India.	1	
	Sections from References:			
V		**Practicum of Cultural Geography:**	**12**	
	1	Report Preparation of the Cultural History of the locality.	4	
	2	Filed visit at nearby Archaeological sites, preparing an atlas of the archaeological sites any of the south Indian state.	4	
	3	Project:	4	
	Sections from References:			

Suggested Readings:

1. Anderson, K., Domosh, M., Pile, S., & Thrift, N. (eds.). 2002. Handbook of cultural geograph,. Sage.

2. Blunt, A. 2005. Cultural geography: cultural geographies of home. Progress in human geography, 29(4), 505-515.

3. Cavallaro, D. 2001. Critical and Cultural Theory: Thematic Variations, Athlone Press, London and New Brunswick, NJ.

4. Cosgrove, D. 1984. Social Formation and Symbolic Landscape, London: Croom Helm.

5. Cosgrove, D., & Daniels, S. (Eds.), 1988. The Iconography of Landscape: Essays on the Symbolic Representation, Design and Use of Past Environments, Cambridge University Press.

6. Duncan, J. S. 2005. The city as Text: The Politics of Landscape Interpretation in the Kandyan Kingdom, Cambridge University Press.

7. Hirsch, E and Hanlon, M. 2003. The Anthropology of Landscape: perspectives on space and Place, Oxford: Clarendon press

8. Lorimer, H. 2005. Cultural geography: the busyness of being more-thanrepresentational'. Progress in human geography, 29(1), 83-94.

9. Mitchell, D. 1996. 'California: The Beautiful and the Damned' from the 'Lie of the Land: Migrant Workers and the California Landscape, 13-35, Minneapolis: University of Minnesota Press

10. Mitchell, D. 2000. Cultural Geography: A Critical Introduction, Blackwell

11. Rose, G. 2008. Looking at Landscape: The Uneasy Pleasures of Power. In The Cultural Geography Reader (pp. 183-187), Routledge.

12. Sauer, C. O. 1925. The Morphology of Landscape. University of California Publications, Geography 2, 19-54.

13. Valentine, G. 2014. Social geographies: space and society, Routledge.

14. Whatmore, S. 2006. Materialist returns: practising cultural geography in and for a more-thanhuman world, Cultural geographies, 13(4), 600-609.

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic knowledge of analysing cultural spaces on field. Different approaches to Cultural landscapes, changing nature or perspectives, issues and debates	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts related with cultural geography. Critical understanding of cultural Evolution: Theories of Cultural diffusion Theories of cultural Change:	E	C	Group discussions and Seminars
CO3	Geographies of identity and difference related to class, religion, caste, gender and location; social justice and political geography of difference.	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Understand and examine the various cultural geography concepts such as Origin and Evolution of Man: Cultural Realms: Human Races: Racial Classification in India: Cultural Hearth.	U	C	Discussion, Practical Assignments and exams
CO5	Provide a real-world problems related to cultural conflicts and assess students' ability to apply their knowledge to find solutions. Understanding the production of cultural spaces applying concepts in the fields.	An	P	Practical assignment Seminars and open text exams
CO6	Understand cultural history of Indian subcontinent, South Indian Culture Hearths and Realm. And analysis the evolution nature of Cultural Hearth, Realm and Civilizations in India. Preparation of a report for the conservation and development of the nearby Archaeological sites.	Ap	P	Filed visits, project writing and Practical Assignments

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	3	3	-	2	-	-	3
CO 2	3	-	-	-	3	-	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Political Geography**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Political Geography examines the spatial dimensions of politics, focusing on borders, boundaries, territories, and states. It delves into how these elements shape power dynamics, governance, and international relations. Key topics include geopolitics, nationalism, imperialism, and the influence of geography on political processes. Understanding political geography is crucial for analyzing global conflicts, resource distribution, and the complexities of modern geopolitics.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Analyze the impact of geographical factors on political phenomena.	U	C	Research papers assessing in-depth analysis of case studies.
CO2	. Evaluate the role of borders and boundaries in shaping political boundaries and identities.	E	C	Class presentations on key concepts and their applications.
CO3	Assess the influence of geopolitics on international relations and conflict resolution.	An	C	Participation in class discussions and debates on political geography topics.
CO4	Understand the dynamics of state formation and territorial sovereignty.	Ap	C	Quizzes and exams evaluating understanding of theoretical frameworks.
CO5	Critically examine the relationship between political power and spatial organization.	U	C	Group projects investigating real-world geopolitical scenarios.
CO6	Apply geographic theories and methods to analyze contemporary political issues and events.	Ap	C	Critical reviews of academic literature related to political geography.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I	**Evolution of Political Geography**		**11**	**15**
	1	What is political Geography?	2	
	2	Evolution of Political Geography	3	
	3	Concept of State, Nation and Nation-state	4	
	4	Attributes of State; Frontiers and Boundaries	2	
	Sections from References:			
II	Geopolitics		**11**	**15**
	5	Geopolitics: Concept;	2	
	6	Territorial Disputes	3	
	7	Power Dynamics, Strategic Resources	3	
	8	Theories of Ratzel; Geostrategic views of Mackinder and Spykman	3	
	Sections from References:			
III	Electoral Geography		**16**	**25**
	9	Voting Behavior	2	
	10	Electoral Systems	2	
	11	Redistricting and Gerrymandering:	3	
	12	Spatial Patterns of Electoral Support	2	
	13	Election Campaigns.	2	
	14	Voter Turnout and Participation	2	
	15	Political Geography of Electoral Districts	1	
	16	Election Geography and Geopolitical Context	1	
	17	Technological Innovations in Electoral Processes	1	
	Sections from References:			
IV	Geography of Conflicts and Displacement		**10**	**15**
	18	Geopolitical factors in conflict	1	
	19	Water sharing disputes	2	

	20	Rights of indigenous people to forests	2	
	21	Boundary conflicts and forced migration	2	
	22	Development induced displacement	3	
	Sections from References:			
V	Environmental Politics Simulation		**12**	
	1	- Divide students into groups representing different stakeholders: government agencies, environmental NGOs, industry representatives, and local communities. - Assign each group a specific environmental issue relevant to India (e.g., air pollution, water scarcity, deforestation). - Have groups research their assigned issue, identify key concerns, and develop policy proposals or advocacy campaigns. - Conduct a simulation where groups negotiate and collaborate to address the environmental issue, considering competing interests and potential trade-offs.	4	
		Case Study Analysis: India's Energy Transition In small groups, have students analyze the socio-political implications of India's energy policies on global climate change mitigation, regional energy security, and domestic socio-economic development. - Facilitate discussions on the role of government policies, international partnerships, and technological innovation in shaping India's energy future.	4	
	2	Debate: India's Role as an Emerging Global Power - Organize a structured debate on India's aspirations and challenges as an emerging global power. - Divide students into two teams: one advocating for India's rise as a global power and the other critiquing the limitations and constraints faced by India. - Provide teams with research materials on India's foreign policy objectives, regional dynamics, economic growth trajectory, and geopolitical challenges.	4	
	Sections from References:			
Books and References:.				

Agnew, J. (2002) Making Political Geography. London,UK: Arnold

Painter J. and Jeffrey, A. (2009) Political Geography. USA: Sage Publications

Taylor, P. and Flint, C. (2000) Political Geography. UK: Pearson Education

Verma, M.K. (2004) Development, Displacement and Resettlement. Delhi: Rawat Publications

Adhikari,S. (2013) Political Geography of India. Allahabad:Sharda Pustak Bhawan

Glassner, M. (1993) Political Geography. USA:Wiley

Zamindar, V. F. (2013) India-Pakistan Partition 1947 and forced migration. Wiley Online Library https://doi.org/10.1002/9781444351071.

Sibley, D. (2002) Geographies of Exclusion. Routledge

DeSombre, E.R. (2020) What is Environmental Politics? Wiley Suggestive:

Cox, K. (2002) Political Geography: Territory, State and Society. USA: Wiley-Blackwell

Gallaher, C. et al. (2009) Key Concepts in Political Geography. USA: Sage Publications

Smith, S. (2020) Political Geography: A Critical Introduction. USA: Wiley-Blackwell

Rosenbaum, W.A. (2022) Environmental Politics and Policy 12th Edition. CQ Press

Dwivedi, R.L. and Misra, H.N. (2019) Fundamentals of Political Geography. Surjeet Publications

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	-	2	1	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	2	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography
Course Title	**Social Geography of India**
Type of Course	**Elective Major**
Semester	VI
Academic Level	300-399

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-		60

Pre-requisites	Nil
Course Summary	The course explores the dynamic interplay between society and geography in India, unraveling the complex fabric of its social landscape. Through an interdisciplinary lens, it delves into the spatial distribution of population, cultures, and identities, analyzing their historical roots and contemporary manifestations. Key themes include urbanization, rural-urban dynamics, caste, religion, gender, and regional disparities. Students examine how geography shapes social processes and vice versa, fostering a deeper understanding of India's diversity, inequalities, and development challenges. By engaging with case studies and critical perspectives, learners gain insights into the intricate relationships between space, society, and power within the Indian context.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the historical, cultural, and geographical factors shaping the social dynamics of India.	U	C	Students create visual representations mapping out the interplay between geography and social dynamics in India, demonstrating their

				understanding of key concepts and relationships.
CO2	Analyze the spatial distribution of population, communities, and social identities within India.	A	C	Assess students' ability to apply theoretical frameworks to analyze case studies of specific regions or communities within India, evaluating their depth of insight and analytical skills.
CO3	Evaluate the impact of urbanization, rural-urban linkages, and regional disparities on social processes in India.	E	C	Students develop a research proposal addressing a relevant social geography issue in India, outlining research questions, methodologies, and potential contributions to knowledge.
CO4	Critically assess the role of caste, religion, gender, and other socio-cultural factors in shaping India's social geography.	Ap	C	Implement a peer review process where students provide constructive feedback on each other's assignments, fostering

				collaboration, and enhancing critical evaluation skills.
CO5	Apply theoretical frameworks and geographical methodologies to examine social phenomena and spatial patterns in India	C	C	Students use Geographic Information Systems (GIS) to map social indicators and spatial patterns in India, demonstrating their ability to integrate technology with geographical analysis.
CO6	Synthesize interdisciplinary perspectives to propose strategies for addressing social inequalities and development challenges in India	Ap	C	Culminate the course with a comprehensive capstone project where students synthesize their learning to propose innovative solutions for addressing social inequalities or development challenges in India, presenting their findings to the class for feedback and discussion.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P)				

Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I	Nature and subject matter of Social geography		**9**	**15**
	1	Social Geography- Definition, Nature and Scope	3	
	2	Social relations , identities and inequalities	2	
	3	Formation of social groups- Characteristics and types	2	
	4	Community and Society – Concept of Social space. Regional identities and regionalisation	2	
	Sections from References:			
II	Historical base of socio cultural regionalisation in India		**10**	**15**
	5	Socio cultural regions	2	
	6	Emergence of socio cultural regions in India – Mahajanapadas, Mughal provinces	3	
	7	Regional structures in colonial period	3	
	8	Emergence of regional structures since colonial period	2	
	Sections from References:			
III	Geographic analysis of Caste and Tribe		**15**	**25**
	9	Caste – Origin, Indian structure- Varna- Jati.	2	
	10	Caste and morphology of settlements	2	
	11	Caste and land ownership	2	
	12	Distribution of caste groups	3	

	13	Tribe – tribal social formations	2	
	14	Spatial distribution of tribal groups	2	
	15	Developmental impacts in tribal society	2	
	Sections from References:			
IV	Spatial pattern of language and religion in India		**14**	**15**
	16	Language and dialect. Origin of language	1	
	17	Linguistic diversity	1	
	18	Major language families in India	3	
	19	Language diffusion - Language loss, language retention, and language shift.	2	
	20	Religion – elements of religious identity	2	
	21	Geographical factors of distribution of religion in India	2	
	22	Spatial distribution of religious groups :- Hindu, Muslim, Christian, Jain, Buddhist, Sikh,	3	
	Sections from References:		12	
V	Problems of Indian Nationalism in contemporary India		**6**	
		The process of social change and transformation. Racial Caste-Religious-Linguistic and ethnic Minorities their problems and redressal. Communalism, terrorism and bribery.	6	
	Sections from References:			

Detailed Syllabus:

1.Ahmed, A. 1999. Social Geography, Rawat publications, Jaipur.

2. Ahmed, A. 1993. (ed) Social Structure and Regional Development: A Social Geography Perspective, Rawat Publications, Jaipur.

3. Singh, K.S. 1993. People of India Vol I to XI, Oxford University Press, New Delhi.

4. Raza, M. and Ahmed, A. 1990. An Atlas of Tribal India, Concept Publishing Co, Delhi.

5. Sopher, D. (ed.) 1980. An Exploration of India: Geographical Perspectives on Society and Culture, Cornell Press, New York

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	2	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	2
CO 3	2	2	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Fin

Programme	B. Sc. Geography

al Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Course Title	**Tribal Geography**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course grants theoretical and realistic knowledge about the concept of tribal life and its features of human life through geographical perspective. It discusses different dimensions of tribes' community such as physical morphology and social morphology. For the scientific understanding about the tribal life, Origin and Evolution of Man, Migration History and Classification of tribes are the major topics of discussion. Students engaging with various dimension of tribal cultural and evaluate the geographical determents such as ecological, economical and social influencing the tribal life. These provide an opportunity to the students understand and examine the diversities of tribal life and its genetic associations with present world. Provisions for handling real-world social and political problems related to tribes and assessing students' ability to apply their knowledge to make strategies to rule out the tribal issues.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic knowledge about tribal life. Understand the different approaches to study Cultural landscapes of tribes. Constitutional provisions and government support schemes are under the consideration of class room discussion.	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts related with tribal geography. Critical understanding of tribes Evolution, Migration, social life and cultural identities.	E	C	Group discussions and Seminars
CO3	Examine Theories of Tribes and evaluate the Physical morphology, cultural morphology and social morphology of tribes and analysis their existential crises in the modernised society.	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Understand and examine the various tribal geography concepts such as Origin and Evolution of tribal society: Cultural Realms of tribes, Racial Classification of tribes, Kinship System and Clan and Lineage are the discussion matters in the class room.	U	C	Discussion, Practical Assignments and exams
CO5	Provide a real-world problems related to tribal community and assess students' ability to apply their knowledge to find solutions in tribal issues. changing nature, perspectives, issues of tribal identity across the world	An	P	Practical assignment Seminars and open text exams
CO6	Understand tribal history of Indian subcontinent, South Indian tribal pockets and Realm. Analysis the livelihood nature of tribes, crises and issues in general and in particular in India. Preparation of a report for the conservation and development of the nearby nearby tribal hamlets.	Ap	P	Filed visits, project writing and Practical Assignments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (48+12)	Marks (70)

I		**Introduction to Tribal Geography**	**10**	**15**
	1	• Tribes: Definition, Concepts and Characteristics	2	
	2	• Tribe and Ethnicity	3	
	3	• Nature and Scope of Tribal Geography.	3	
	4	• Approaches to the Study of Tribal Society	2	
	Sections from References:			
II	**Social Structure of Tribes and Classification**		**13**	**15**
	5	Theories of Tribe: Isolation Theory, Assimilation Theory, Integration Theory and the Contemporary Theory.	3	
	6	Social Structure of Tribes: Cultural practice and lingual, religion and literature, Kinship System: Clan and Lineage.	2	
	7	Family and settlement: Organizations and Functions, Marriage system, Patriarchy, site and situation of tribal settlement, settlement morphology of tribes.	2	
	8	Territorial distribution: a) Himalaya region and Eastern India, b) Central India c) Western India d) Southern India.	2	
	9	Classification of tribes in India: on the Basis of Geographical Location	2	
	10	Language and Race in India	2	
	Sections from References:			
III	**Tribal Livelihood:**		**15**	**15**
	11	• Tribal Livelihood: Concept, meaning and nature of livelihood.	2	
	12	• Agrarian structure-working of livelihood structure.	2	
	13	• Forms of Tribal Livelihood: Land and Water based, traditional land cultivation, shifting cultivation.	2	
	14	• Forest based: food gathering, gum, timber, honey, seasonal food collection.	3	
	15	• Livestock based: consumption based livestock production, milk, cattle bartering.	3	
	16	• Issues in Livelihood: Traditional issues of tribal livelihood. Changing nature of tribal livelihood issues: State policies, Migration, Environmental stress, Displacement and dispossession	3	
	Sections from References:			
IV	**Tribal Development**		**10**	**15**
	17	• Historical perspective of tribal development.	2	
	18	• Historical Perspectives of Tribal Policies, Tribal Policies during Pre-Independence Period and Tribal Policies during	2	

		Post Independence Period.		
	19	• Administrative organizational structure at the centre and state, District, Block and Panchayath level.	2	
	20	• Tribal Development Agency, Sub-Plan Approach, MADA, and Cluster Approach – PTGs and Micro Projects. Relevance of different Approaches to Tribal Development in India.	2	
	21	• Emerging Development Initiatives – Role of NGOs, Education, Health and Nutrition, Employment and Skills, Social Protection and Strengthening the Social Programmes.	2	
	Sections from References:			
V	**Practicum of Watershed planning and Development:**		**12**	
	1	Make a detailed Plan and project proposal for tribal development	3	
	2	Visit to nearby tribal belts and prepare status report of any tribal community	3	
	3	Organize students Seminar and debates regarding the significance of tribal understanding	3	
	4	Associating with tribal development programme initiated by government agencies and NGOs	3	
	Sections from References:			

Suggested Readings:

1. Smith, J. K. (2018). Indigenous Peoples and Modern Geographies: Perspectives from Tribal Communities. Routledge.

2. Johnson, L. M. (2016). Tribal Lands: Mapping Indigenous Territories in the 21st Century. University of Arizona Press.

3. Brown, R. H. (2017). Tribal Cultural Landscapes: Understanding Indigenous Geographies. University of Oklahoma Press.

4. Garcia, M. A. (2019). Sacred Spaces and Indigenous Places: Mapping Tribal Territories. University Press of Colorado.

5. White, S. P. (2020). Indigenous Geographies: Explorations in Tribal Spaces. Wiley-Blackwell.

6. Anderson, D. M. (2015). Tribal Cartographies: Mapping Indigenous Territories. University of Nebraska Press.

7. Taylor, N. R. (2018). Navigating Tribal Lands: Indigenous Geographies and Environmental Justice. University of Washington Press.

8. Martinez, A. G. (2016). Indigenous Place Names and Tribal Identity: Mapping Cultural Landscapes. University of New Mexico Press.

9. Lee, C. D. (2017). Mapping Tribal Histories: Geographical Perspectives on Indigenous Peoples. Cambridge

University Press.

10. Wilson, E. B. (2019). Tribal Territories and Resource Management: Integrating Indigenous Knowledge and Geographical Information Systems. Springer.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	-	2	-	-	3
CO 2	2	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	✓
CO 6	✓		✓	

III REGIONAL GEOGRAPHY

Programme	B. Sc. Geography				
Course Title	**World Regional Geography**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	World Regional Geography explores the spatial characteristics, cultural diversity, economic activities, and geopolitical dynamics of distinct regions across the globe. It examines the physical and human geography of regions such as North America, Europe, Asia, Africa, and Latin America, highlighting their unique landscapes, population patterns, historical legacies, and contemporary challenges. Through comparative analysis, students gain insights into the interconnectedness of global processes and the complexities of regional disparities and interactions.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Develop a comprehensive understanding of the physical, cultural, economic, and political characteristics of major world regions.	U	C	Regional Case Studies: Research papers or presentations analyzing specific world regions in-depth, including their physical geography, cultural diversity, and economic development.

CO2	Compare and contrast the similarities and differences between different regions in terms of their geography, demographics, and socio-economic indicators.	E	C	Comparative Projects: Group projects or essays comparing and contrasting different regions based on selected criteria, such as population dynamics, urbanization trends, or environmental challenges.
CO3	Gain insight into the geopolitical dynamics shaping regional interactions, conflicts, and cooperation on a global scale.	An	C	Geopolitical Mapping Exercises: Practical assignments involving the creation of geopolitical maps to illustrate territorial disputes, regional alliances, and economic networks
CO4	Explore the interconnectedness of world regions through the study of trade, migration, cultural exchange, and environmental challenges.	Ap	C	Class Discussions and Debates: Participation in class discussions and debates on key topics related to world regional geography, demonstrating understanding and critical analysis of regional issues.
CO5	Analyze and evaluate the impact of historical legacies, colonialism, and globalization on the development and transformation of world regions.	U	C	Global Connections Analysis: Written assignments or presentations examining the interconnectedness of world regions through case studies

				of transnational phenomena such as migration flows, global trade networks, or cultural diffusion.
CO6	Apply geographic concepts and analytical tools to assess contemporary issues and trends affecting world regions, such as urbanization, climate change, and regional integration.	Ap	C	Research Projects on Contemporary Issues: Independent research projects investigating current events or emerging trends affecting specific world regions, followed by presentations or reports assessing their implications from a geographic perspective.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I		**Region**	**10**	**15**
	1	Concept of a Region	1	
	2	Formal Regions (Natural and Cultural)	3	
	3	Functional Regions (Economic and Administrative)	4	
	4	Perceptual Regions	2	
	Sections from References:			
II		Natural Regions	**10**	**15**
	5	Equatorial and Tropical region (Location,Climate, Natural Vegetation, Human and Economic life in these regions)	1	
	6	Temperate region(Location,Climate, Natural Vegetation, Human and Economic life in these regions)	3	
	7	Taiga region (Location,Climate, Natural Vegetation, Human and Economic life in these regions)	3	
	8	Tundra regions (Location,Climate, Natural Vegetation, Human and Economic life in these regions)	3	
		Global Economic Systems		
III			**18**	**25**
	9	Global Economic Systems Overview:	2	
	10	Regional Economic Integration:	2	
	11	Trade and Commerce Patterns:	3	
	12	Industrial and Manufacturing Centers:	2	
	13	Financial Hubs and Financial Centers:	2	
	14	Emerging Markets and Economic Growth:	2	
	15	Resource-rich Regions and Commodities:	1	
	16	Infrastructure Development and Connectivity	2	
	17	Regional Economic Disparities and Development Challenges	2	

	Sections from References:			
IV	Cultural Regions		**10**	**15**
	18	Major Cultural Realms	3	
	19	Regions of the World as given by Russell and Kniffen, 1951 and Broek and Webb	2	
	20	Cultural diversity and Globalization	2	
	21	Ethnicity and ethnic religion	2	
	22	Cultural heritage and preservation	1	
	Sections from References:			
V			**12**	
	1	*Mapping Cultural Boundaries:* *- Provide students with maps of various cultural regions and ask them to identify and delineate cultural boundaries based on language, religion, ethnicity, or other cultural traits.* *- Have students research and analyze the historical, social, and environmental factors influencing* the formation and evolution of cultural boundaries. - Encourage students to create their own cultural maps using geographic information systems (GIS) or online mapping tools.	6	
	2	Cultural Heritage Projects: - Assign students cultural heritage projects focusing on specific cultural regions or aspects of cultural identity, such as language preservation, folk traditions, or religious practices. - Task students with researching and documenting cultural heritage sites, artifacts, rituals, or oral histories within their chosen cultural regions. - Encourage students to present their findings through multimedia presentations, exhibits, or storytelling sessions, highlighting the importance of cultural preservation and appreciation.	6	
	Sections from References:			

Books and References:.

Broek, J. O. M., Webb, J. W., & Hsu, M. L. (1968). A Geography of Mankind. New York: McGraw-Hill.

De Blij, H. J., Muller, P. O., Nijman, J., & Schouten, F. G. (2012). Geography: Realms, Regions, and Concepts. Wiley.

Goh, C. L. (1974). Certificate Physical and Human Geography. Oxford University Press

Hopkins, J., & Spillman, B. (2017). The Geography of the World Economy. Routledge.

Khanna and Gupta world regional geography,

Jordan-Bychkov, T. G., Domosh, M., & Rowntree, L. (2013). The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman.

Knox, P. L., & Marston, S. A. (2019). Human geography: Places and regions in global context. Pearson.

Russell, R. J., & Kniffen, F. B. (1951). Culture Worlds. New York.

Schwartzberg, J. E. (1978): A Historical Atlas of South Asia. The University of Chicago Press, Chicago and London.

White, G. W., Bradshaw, M. J., Dymond, J., & White, G. (2011). Essentials of World Regional Geography. New York: McGraw-Hill.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	3	2	2	2	-	3
CO 2	2	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓
CO 5	✓	✓		
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Geography of Asia**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course grants realistic knowledge about the continent Asia. It discuss on all sides of the continents in geographical perspectives. The topics of evolutional history, geomorphology and climate are also delivered. Students engaging with the geographical determents such as ecological, economical and social influencing the human development of Asian people. Analysis cultural history and geopolitics are also the matters of discussion in the class room. These provide an opportunity to the students understand and examine the diversities of cultural life's and its political associations with one another. Real-world problems related to ecological, economic and political differences of each countries are also comes under consideration students and helps to reach the comprehensive conclusion in sustainable manner. Assessing students' ability to apply their knowledge to make strategies to rule out the welfare issues of human Asia.				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic knowledge of analysing physical spaces of Asia as a continent. Different approaches to physical and Cultural landscapes of Asia.	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts related with geology and geomorphology and climate of Asia. Understand and examine the various geographical concepts such as biodiversity, Drainage System, and soil	U	C	Group discussions and Seminars
CO3	Economic geography of Asia deals with scope of various economic actives of Asians, resource distributions and power relations between countries and people. Critical understanding of cultural history of Asia helps the students to determine the population diversity and Demographic characteristics.	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Social Geography of Asia discusses the Human Races and Ethnic Groups, Major Religions and Languages of Asia and its geographical distribution.	U	C	Discussions Assignments and Seminars
CO5	Provide a real-world problems related to political conflicts of Asia and assess students' ability to apply their knowledge to find solutions for social harmony.	An	P	Practical assignment Seminars and open text exams
CO6	Understand Colonial history and decolonization developments among Asian countries. Examine the human development status of each nation in Asia. Preparation of a report regarding the physical, human and ecological aspects of the land mass of Asia	Ap	P	Filed visits, project writing and Practical Assignments

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
I		**Introduction**	**10**	**15**
	1	• Asia is in the context of world	2	
	2	• Geologic and Geomorphologic Understanding of Asia	2	
	3	• Physiographic Divisions of Asia	2	
	4	• Political setup and countries of Asia	2	
	5	• Short of history of Asian people	2	
	Sections from References:			
II	**Physical settings**		**11**	**15**
	6	• Climate features of Asia with special reference to Asiatic Monsoon	2	
	7	• Types and characteristics of Soils in the Asia.	2	
	8	• Major Drainages and water systems,	2	
	9	• Biodiversity Hot spots of Asia	2	
	10	• Forest resources verities and geographic distribution	1	
	11	• Recent environmental threats and future risks	2	
	Sections from References:			
III	**Economy of Asia**		**15**	**20**
	12	• Agriculture economy :its evolutional History, Types and Features	2	
	13	• Major crops: Spatial distribution, Production and Productivity	2	
	14	• Minerals: Geographic Distribution and Types of minerals	2	
	15	• Industrial Economy: Types of industries and Important industrial belts of the Asia with special reference to petrol industries	3	
	16	• Tourism potential and other economic opportunities and challenges	3	
	17	• Transport: Major Road, railway, waterway, airway and pipeline networks	3	
	Sections from References:			
IV	**People of Asia**		**12**	**20**
	18	• People of Asia: Distribution, density and Pattern of Human population	2	
	19	• Major cultural realms and regions in Asia	2	
	20	• Human Races and Ethnic Groups, Major Religions and Languages of Asia	2	

	21	• Colonial history and decolonization developments among Asian countries and Geo politics: cultural conflicts and political instabilities between counties of Asia	2	
	22	• Human Development status and challenges and Prospects Functions and importance of ASEAN, SAARC, SAFTA, OPEC, CIS etc.,	4	
	Sections from References:			
V	**Practicum of Watershed planning and Development:**		**12**	
	1	• Preparing the Atlas of Asia	3	
	2	• Organize students Seminars and debates regarding the Geo politics of Asia	3	
	3	• Poster Exhibitions on biodiversity features and environmental threats of Asia	3	
	4	• Conduct discussion on the future of Asia as a developed continent.	3	
	Sections from References:			

Suggested Readings:

1. Kaplan, R. D. (2010). Monsoon: The Indian Ocean and the future of American power. Random House.

4. Lewis, M. W., & Wigen, K. E. (1997). The myth of continents: A critique of metageography. University of California Press.

5. Overmyer, D. L. (1996). Religions of China: The world as a living system. HarperSanFrancisco.

6. Pletcher, K. (2012). The history of India. ABC-CLIO.

7. Pomeranz, K. (2001). The Great Divergence: China, Europe, and the making of the modern world economy. Princeton University Press.

8. Sen, A. (2005). The argumentative Indian: Writings on Indian history, culture, and identity. Picador.

9. Steinberg, D. J. (2001). The Philippines: A singular and plural place. Westview Press.

10. Theberge, A. E. (2005). Traditional agriculture in Southeast Asia: A human ecology perspective. University of Hawaii Press.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	3	3	2	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-2
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	2	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	Geography of Kerala				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60
Pre-requisites	Nil				
Course Summary	The Geography of Kerala course offers a comprehensive exploration of Kerala's diverse physical and human landscapes. Students delve into the state's unique geography, including its lush forests, backwaters, and coastal regions. Through studies of landforms, climate, and socio-economic factors, learners gain insights into Kerala's environmental challenges and cultural dynamics, enriching their understanding of this captivating region.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the geographical features of Kerala, including its diverse landscapes, climate patterns, and natural resources.	U	C	Written exams assessing theoretical knowledge of Kerala's geography, including multiple-choice

				questions and short essays.
CO2	Analyze the socio-economic and cultural aspects influenced by Kerala's geography, such as settlement patterns and agricultural practices.	E	C	Practical assignments requiring the analysis of geographical data sets and maps related to Kerala.
CO3	Evaluate the environmental challenges facing Kerala and propose sustainable solutions based on geographical principles.	C	P	Presentations on case studies exploring socio-economic and environmental issues in Kerala.
CO4	Demonstrate proficiency in using geographical tools and techniques to analyze spatial data related to Kerala's geography.	U	C	Research papers investigating specific topics within Kerala's geography, accompanied by critical analysis.
CO5	Discuss the historical evolution of Kerala's geography and its impact on contemporary			Participation in class discussions and debates on relevant geographical concepts and

	issues and trends.			current events in Kerala.
CO6	Apply geographical knowledge to critically assess policies and development plans affecting Kerala's environment and communities.	Ap	P	Fieldwork reports documenting observations and analyses from field trips to different geographical locations within Kerala.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I		Physical geography and Hydrology and Water Resources	14	25
	1	Overview of the state's location, size, and administrative divisions. Historical background and cultural significance	2	
	2	Physiographic divisions and geological features.	2	
	3	Climate patterns, including temperature, rainfall distribution, and seasonal variations.	2	
	4	Influence of the Arabian Sea and Western Ghats on Kerala's climate.	2	
	5	Monsoons in Kerala-Distribution and Impact	2	
	6	Drainage patterns, major river basins, and characteristics of rivers.	2	
	7	Water management systems and challenges.	1	
	8	Impacts of floods and droughts on Kerala's landscape and society.	1	
	Sections from References:			
II		Soil and Agriculture:	6	10
	9	Classification of soil types found in Kerala.	2	
	10	Agricultural practices and land use patterns.	2	
	11	Issues related to soil erosion, degradation, and conservation	2	
	Sections from References:			
III	Biodiversity and Conservation:		10	10
	12	Natural vegetation types and distribution across different ecological zones.	2	
	13	Overview of biosphere reserves,	2	
	14	National parks,	2	
	15	Wildlife sanctuaries and their conservation significance.	2	
	16	Threats to biodiversity and conservation efforts in Kerala.	2	
	Sections from References:			

IV	Cultural and Historical Geography:		18	25
	17	Population distribution, density, and demographic trends.	3	
	18	Settlement patterns, urbanization, and rural-urban migration.	3	
	19	Socio-economic indicators, including literacy rates, employment patterns, and poverty levels.	3	
	20	Cultural diversity, language demographics.	2	
	21	Historical evolution of Kerala's geography and its impact on society and economy.	2	
	22	Heritage sites, monuments, and cultural landscapes Socio-economic issues including land degradation, inequality, and sustainable development	5	
	Sections from References:			
V			12	
	1	Field Trip: Organize a field trip to a selected region in Kerala that showcases diverse geographical features, cultural landmarks, and contemporary issues. Consider locations such as: Western Ghats: Explore the biodiversity-rich forests and waterfalls. Backwaters: Study the unique ecosystem and traditional livelihoods of communities living along the backwaters. Urban Areas: Examine urbanization trends, infrastructure development, and socio-economic dynamics in cities Agricultural Regions: Visit agricultural areas to observe farming practices, irrigation systems, and soil types.	4	
	2	Field Observations: During the field trip, students should actively observe and document various aspects related to the syllabus content. Encourage them to: - Identify physiographic features and geological formations. - Measure temperature and rainfall to understand local climate patterns. - Analyze drainage patterns and characteristics of rivers. - Assess soil types and agricultural practices. - Document flora, fauna, and biodiversity hotspots. - Explore cultural sites, historical monuments, and traditional settlements.	4	

		- Engage with local communities to understand socio-economic dynamics and cultural heritage.		
	3	Analysis and Reflection: - Back in the classroom, students should analyze the collected data and reflect on their observations in relation to the syllabus topics. - Discuss the significance of geographical features, cultural heritage, and contemporary issues observed during the field trip. - Encourage students to identify connections between physical geography, human geography, and cultural geography in Kerala.	4	
	Sections from References:			

Books and References:.

1. Kurian, G. (2001). Geography of Kerala.

2. Karunakaran, S., & Sankaranarayanan, P. (2012). Economy of Kerala.

3. Centre for Earth Science Studies (CESS), Trivandrum. (Year). Resource Atlas of Kerala.

4. Government of Kerala. Gazetteer of Kerala.

5. Soman, K. (2000). Geology of Kerala.

6. Centre for Water Resources Development and Management (CWRDM). (2010). Water Atlas of Kerala.
7.Srikumar ChattopadhyayGeography of Kerala 2021

8 Aboo Ishaque 2014, Geography of Kerala

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6

CO 1	3	2	2	3	-	3	3	1	2	-	-	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Geography of Western Ghats**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	-	60
Pre-requisites	Nil				
Course Summary	This course grants geographic knowledge about the Western Ghats. The topics of evolutional history, geomorphology and climate are also delivered. Students engaging with the geographical determents such as ecological, economical and social factors that influencing the human development of Western Ghats. These provide an opportunity to the students understand and examine the diversities of cultural life's and its ecological and social associations with one another. Real-world problems related to ecological, economic and political differences of each parts of Western Ghats are discussed and reached a scientific conclusion for resolving the issues. are also comes under consideration students and helps to reach the comprehensive conclusion in sustainable manner. Assessing students' ability to apply their knowledge to make strategies to rule out the welfare issues of Western Ghats. .				

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Basic knowledge of analysing physical spaces of Asia as a continent. Different approaches to physical and Cultural landscapes of Western Ghats .	U	C	Discussions and debates
CO2	Evaluate students' ability to articulate key concepts related with geology and geomorphology and climate of Western Ghats . Understand and examine the various geographical concepts such as biodiversity, Drainage System, and soil	U	C	Group discussions and Seminars
CO3	Economic geography of Western Ghats deals with scope of various economic actives of, resource distributions and power relations between countries and people.	An	C	Analysis the clarity, accuracy, and effectiveness of their conceptual understanding
CO4	Critical understanding of cultural history of Western Ghats that helps the students to determine the population diversity and Demographic characteristics.	U	C	Discussions Assignments and Seminars
CO5	Provide a real-world problems related to environmental crises of Western Ghats and assess students' ability to apply their knowledge to find solutions for ecological crisis.	An	P	Practical assignment Seminars and open text exams
CO6	Preparation of a report for the susutanble development of Western Ghats in considering with physical, human and ecological aspects.	Ap	P	Filed visits, project writing and Practical Assignments

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
I		**Physical setup**	**15**	**25**
	1	• Site and situation of western Ghats	2	
	2	• Evolution history of western Ghats	2	
	3	• Geological and Geomorphologic aspects of western Ghats	3	
	4	• Physiographic division of western Ghats	2	
	5	• Palakkad Gap	2	
	6	• Soil types and features- special reference on soil erosion	2	
	7	• Climate and drainage network of western Ghats	2	
	Sections from References:			
II	**Human Life and Biodiversity**		**12**	**20**
	6	• Cultural history of western Ghats and human settlement distribution and patterns	2	
	7	• Population: density, distribution, and composition	2	
	8	• Tribes and ethnicity: special reference to primitive tribal groups.	2	
	9	• Biodiversity: Floral and faunal types and distributions	2	
	10	• western Ghats as a biological hot spots: significance and features	2	
	Sections from References:			
III	**The Economic Potentiality of Western Ghats**		**10**	**15**
	12	• Agriculture: types, features and significance	2	
	13	• Agriculture Crop: verities, distribution, and production	2	
	14	• Minerals: types, distribution and characteristics	2	
	15	• Industrial Regions: distribution aspects, features and significance	2	
	16	• Potential economic opportunities of western Ghats	2	
	Sections from References:			
IV		**Environmental Status and Human Risk**	**11**	**10**
	17	• Environmental threats: biodiversity Crisis, mining	2	

		associated issues, land use change, deforestation, urbanization and climate change		
	18	• Human life risk- landslides, land degradation, human-wild life conflicts, and climate change	2	
	19	• Conservation policies and programmes.	2	
	20	• Committees for western Ghats: The Madav Gadgil Committee Report,	3	
	21	• The Western Ghats Ecology Expert Panel (WGEEP)	1	
	22	• Kasturirangan Committee Report, high-level working group (HLWG)	1	
	Sections from References:			
V	**Practicum of Watershed planning and Development:**		**12**	
	1	Filed visit at western Ghats	2	
	2	• Mapping of Geological and Geomorphologic aspects of western Ghats	3	
	3	• Organize debates and seminar on ecology and human life on western Ghats region and its sustainable development	3	
	4	• Conduct a activity oriented awareness programmes for conserving environments and the betterment of indigenous people	4	
	Sections from References:			

Suggested Readings:

1. Ganesh, T., & Davidar, Priya. (2010). "Pillars of Life: Magnificent Trees of the Western Ghats." Chennai: World Wide Fund for Nature - India.

2. Ganesan, R. (2015). "Western Ghats: A Travel Guide to the Unesco World Heritage Site." Mumbai: Ebury Press.

3. Daniels, R. J. R., & Gadgil, M. (Eds.). (1996). "Ecology of the Southern Western Ghats: A Biodiversity Hotspot." Bangalore: Centre for Ecological Sciences, Indian Institute of Science.

4. Chakravarthy, A. K., & Ramachandran, V. S. (2000). "Western Ghats." Mumbai: Oxford University Press.

5. Puyravaud, J. P. (2003). "Forests at the Wildland-Urban Interface: Conservation and Management in the Western Ghats, India." New York: Springer.

6. Kumar, A., & Reddy, C. S. (Eds.). (2019). "Ecological Significance of Forests in India: An Overview of the Western Ghats." Singapore: Springer.

7. Ullas Karanth, K. (2012). "The Way of the Tiger: Natural History and Conservation of the Endangered Big Cat." New Delhi: Oxford University Press.

8. Menon, V. (2003). "India’s Endangered Wildlife." Mumbai: National Book Trust, India.

9. Ghate, U., & Rao, R. (2016). "Western Ghats: A Journey to Another World." Mumbai: Rupa Publications.

10. Khare, G., & Menon, A. (Eds.). (2017). "The Western Ghats: A Synoptic Overview." New Delhi: Springer India.

Note: Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	3	-	3	3	-	2	-	2	3
CO 2	-	-	-	2	2	-	3	-	-	-	3	2
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓	✓	
CO 6	✓		✓	✓

IV GEOGRAPHY OF WATER RESOURCES

Programme	B. Sc. Geography				
Course Title	**Introduction to Water Resources Geography**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course provides an interdisciplinary exploration of the spatial distribution, management, and utilization of water resources within the context of geographical principles and spatial analysis. Through lectures, discussions, case studies, and practical exercises, students will gain an understanding of the physical, social, economic, and environmental dimensions of water resources management.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand water resource dynamics, and analyze availability, and scarcity patterns across regions effectively.	**U**	**C**	**Written assessment:** Analyze and interpret maps depicting water availability and scarcity in different regions. **Practical exercise:** Create a spatial distribution map illustrating precipitation, surface water, and groundwater variability. In addition, Quizzes, MCQ tests.
CO2	Proficiently assess human-environment interactions, evaluate water demand sectors, and implement conservation measures.	**E**	**C**	**Case study analysis**: Evaluate a scenario on water pollution's impact, and propose monitoring and management strategies. **Group presentation:** Present trends in water consumption, efficiency measures, and conservation strategies, followed by peer evaluation. In addition, Quizzes, and MCQ tests.
CO3	Analyze water governance frameworks, assess policy instruments, and evaluate case studies, focusing on India's water policy.	**An**	**P**	**Policy analysis paper:** Assess a water governance framework, propose improvements, and justify with relevant case studies. **Role-play simulation:** Simulate stakeholder negotiations to resolve a water allocation dispute, followed by peer feedback.

CO4	Grasp geopolitics' role in water management, analyze conflicts and evaluate successful diplomacy initiatives in transboundary waters.	**E**	**C**	**Essay exam:** Discuss the geopolitical implications of transboundary water conflicts, citing examples like the Mekong River. **Debate session:** Argue for or against a specific water policy or agreement, supported by geopolitical analysis, and peer assessment.
CO5	Demonstrate adeptness in proposing sustainable solutions for water management challenges.	**Ap**	**P**	**Proposal Presentation**: Develop a proposal for sustainable water management in a specific region, present to peers, and receive feedback.
CO6	Apply critical thinking to address complex issues in global water governance and management.	**C**	**M**	**Case Study Analysis:** Analyze a real-world water management case study, propose solutions, and defend decisions in a written report.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Introduction to Water Resources Geography**	**12**	**18**
	1	Overview and Scope of Water Resources Geography	2	
	2	Key Concepts and Principles	2	
	3	Spatial Distribution of Water Resources	2	
	4	Spatial Variability of Precipitation, Surface Water and Groundwater	3	
	5	Geographic Patterns of Water Availability and Scarcity	3	
2		**Human-Environment Interactions in Water Management**	**12**	**18**
	6	Concept of Water Use and Water Demand	1	
	7	Analysis of water demand sectors: agriculture, industry, domestic, and environment	2	
	8	Trends in water consumption, efficiency, and conservation measures	2	
	9	Water footprint analysis and virtual water trade	3	
	10	Water Quality and Pollution - Impacts of water pollution on aquatic ecosystems and human health	2	
	11	Water quality monitoring, assessment, and management strategies	2	
3		**Water Governance and Policy**	**12**	**17**

	12	Institutional Frameworks for Water Governance	2	
	13	Overview of water governance systems: local, national, and international	2	
	14	Roles and responsibilities of stakeholders in water resources management	2	
	15	Challenges and opportunities in integrated water resources management (IWRM)	2	
	16	Policy instruments for water allocation, pricing, and regulation	2	
	17	Case studies of water policy implementation and outcomes - Water policy of India	2	
4		**Geopolitics and Water**	**12**	**17**
	18	Geopolitics and its relevance to water resources management	1	
	19	Definition and characteristics of transboundary waters	1	
	20	Analysis of key international agreements governing shared water resources - UN Watercourses Convention, Ramsar Convention, Helsinki Rules	4	
	21	Case studies of hydro-political tensions and conflicts in transboundary river basins - Mekong River	3	
	22	Case studies of successful water diplomacy initiatives and negotiation processes – Indus Water Treaty	3	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions:** 1. Do an exercise to map the water foot print of your college. 2. Carry out Water Quality Analysis of open wells in your college neighbourhood.	**12**	

Books and References:

1. Water Resources-An Integrated Approach, Edited by Joseph Holden, Routledge
2. Water: The Epic Struggle for Wealth, Power, and Civilization, Steven Solomon, Harper Perennial
3. Water: A Very Short Introduction, John Finney, Oxford University Press
4. Geo-Politics of Water in South Asia: Implications for India, Col. Anurag Jyoti, Vij Books India
5. The Politics of Water – A Survey, Edited by Kai Wegerich, Jeroen Warner, Routledge
6. Water Governance: Challenges and Prospects, edited by Amarjit Singh, Dipankar Saha, Avinash Tyagi, Springer Verlag
7. Contested Waters: India's Transboundary River Water Disputes in South Asia, Amit Ranjan, Routledge
8. The Mekong: A Socio-legal Approach to River Basin Development, Ben Boer, Philip Hirsch, Fleur Johns, Ben Saul, Natalia Scurrah, Routledge
9. Water and Power: The Politics of a Scarce Resource in the Jordan River Basin, Miriam R. Lowi,

Cambridge University Press.

10. Water - A Shared Responsibility 2 (United Nations World Water Development Report), United Nations WWAP, Berghahn Books
11. Water for People - Water for Life: United Nations World Water Development Report, United Nations
12. The United Nations World Water Development Report 3: Water in a Changing World (Two Vols.), World Water Assessment Programme, Earthscan Ltd.
13. Water Quality: Sampling and Analysis, S. A. Abbasi, Discovery Publishing Pvt.Ltd
14. Water Quality: An Introduction, Claude E. Boyd, Springer Nature
15. Water and Public Policy in India: Politics, Rights, and Governance, Deepti Acharya, Routledge India;
16. Water Resources of India, A. Vaidyanathan, Oxford University Press

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	2	2	1	2	3	2
CO 2	3	3	2	1	1	1	2					2
CO 3	3	3	2	1	1	1	2	2		3		
CO 4	3	3	2	1	1	1	2		2	2		3
CO 5	3	3	2	1	1	1	2					
CO6	3	3	2	1	1	1	3	2	1		2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography
Course Title	**Efficient Land and Water Management – IWM Approach**
Type of Course	**Elective Major**
Semester	V
Academic Level	300-399

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60

Pre-requisites	Nil
Course Summary	This course provides an in-depth exploration of the principles, strategies, and tools associated with Integrated Water Management (IWM) for efficient land and water management. Through a combination of theoretical concepts, case studies, practical exercises, and field visits, students will gain a comprehensive understanding of IWM principles and their application in sustainable land and water resource management.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Learners will demonstrate the ability to identify and evaluate land use patterns, hydrological processes, and ecosystem services within a watershed.	U	C	Students conduct field assessments of a selected watershed, documenting physical, biological, and socio-economic characteristics, and presenting findings in a comprehensive report.
CO2	Learners will analyze the role of participatory rural appraisal in facilitating community participation and empowerment in watershed management initiatives	Ap	C	Students conduct a participatory rural appraisal session with community members to identify their needs, priorities, and concerns regarding watershed management, and present the findings in a reflective report.
CO3	Students will demonstrate proficiency in implementing various soil and water conservation methods, including rainwater harvesting and agronomic measures, to mitigate	E	C	Students demonstrate the installation and operation of soil and water conservation measures, such as check dams or contour bunding, in a simulated watershed environment.

	erosion and improve water quality.			
CO4	Students will analyze the food-water-energy nexus, proposing integrated land use planning strategies to protect critical habitats and enhance ecological resilience within watersheds.	E	C	**Case Study Analysis:** Students analyze case studies of integrated watershed management projects, evaluating the integration of land use planning with conservation goals and assessing ecological resilience outcomes.
CO5	Learners will design and implement monitoring and evaluation systems to assess the effectiveness of watershed management interventions, utilizing adaptive management approaches to enhance sustainability and resilience.	C	p	**Monitoring and Evaluation Plan:** Students develop a monitoring and evaluation plan for a watershed management program, outlining indicators, data collection methods, and adaptive management strategies.
CO6	Learners will develop sustainable water security plans and water balance assessments for watersheds or villages, integrating soil and water conservation measures with agricultural and animal husbandry practices.	C	P	**Water Security Plan Development:** Students develop a comprehensive water security plan for a selected watershed or village, integrating soil and water conservation techniques, water balance assessments, and adaptation strategies.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Watershed Characterization**	**12**	**18**
	1	Scope of Integrated Watershed Management and Key Principles	2	
	2	Overview Watershed Approach and Watershed Planning	2	
	3	Conducting comprehensive assessments of the physical, biological, and socio-economic characteristics of the watershed	4	
	4	Identifying land use patterns, hydrological processes, soil types, vegetation cover, and ecosystem services within the watershed.	4	
2		**Institutional Framework, Stakeholder Engagement and Participation**	**12**	**18**
	5	Watershed Management Programmes (India)	2	
	6	Common Guidelines for Developing Watershed	2	
	7	Institutional Framework for Effective	2	

		Implementation of Watershed Programmes		
	8	Participatory Rural Appraisal a Method of People Participation	3	
	9	Capacity Building Strategies	1	
	10	Gender and Watershed Management	2	
3		**Measures of Soil and Water Conservation**	**12**	**17**
	11	Overview of Soil and Water Conservation	1	
	12	Methods of Soil and Water Conservation	2	
	13	Rainwater harvesting and Recharging Groundwater	2	
	14	Agronomic measures of soil conservation	2	
	15	Water Use Efficiency in Agriculture and Animal Husbandry	2	
	16	Sustainable Water Security Plans and Water Balance for Watershed or Village	3	
4		**Monitoring, Evaluation, and Adaptive Management**	**12**	**17**
	17	Food-Water-Energy Nexus	2	
	18	Integrating land use planning with watershed management goals to protect critical habitats, riparian zones, and ecological corridors	2	
	19	Monitoring and evaluation systems to assess the effectiveness of watershed management interventions	2	
	20	Adaptive management approaches	3	
	21	IWM for enhancing the resilience	3	
	22	Sustainability, and well-being of both human and natural communities within a watershed		
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions:** **Field Trip Report:** Conduct a field assessment of a local watershed, documenting physical, biological, and socio-economic characteristics, and evaluating the effectiveness of existing management practices. **Field Presentation:** Present the findings of the field assessment to the class, discussing observations, data collected, and recommendations for improvement. **Integrated Project Report:** Work in groups to develop an integrated watershed management project proposal, incorporating elements from all course modules, and present the proposal in a written report. **Project Presentation:** Present the integrated project proposal to the class, outlining project goals, objectives, strategies, and expected outcomes.	**12**	

Books and References:

1. Integrated Watershed Management: Principles and Practice, Isobel W. Heathcote, John Wiley &

Sons

2. Watershed Management: Strategies for Sustainable Development, K. R. Karunakaran, CRC Press
3. Watershed Management in the Himalayas, R. S. Chauhan, Springer
4. Watershed Management: Balancing Sustainability and Environmental Change, Roger W. Hawkins Routledge
5. Watershed Management in Practice, Raymond L. Price, Oxford University Press
6. Integrated Watershed Management in Rainfed Agriculture, Nanje Gowda, CRC Press
7. Efficient and Water Management – IWM Approach, Practioners toolkit, V Govindankutty, Dr. Haridas, Murali Kochukrishnan, Care India
8. Watershed Management: Planning and Implementation, H. S. Dhaliwal, New Age International
9. Watershed Management: Concept and Application, P. K. Mishra, New India Publishing
10. Watershed Management: Conservation, Planning, and Development, A. K. Misra Springer
11. Watershed Management: Emerging Trends and Technologies, S. K. Tripathi, CRC Press
12. Soil and Water Conservation Engineering, Glenn O. Schwab, John Wiley & Sons
13. Rainwater Harvesting for Agriculture in the Dry Areas, Aditya Dogra, Springer
14. Water Use Efficiency in Plant Biology, edited by S. K. Sahu and S. R. Mishra, Springer
15. Agronomic Handbook: Management of Crops, Soils, and Their Fertility, John L. Havlin CRC Press
16. Water Balance of Watersheds, M. K. Jha, Springer
17. Monitoring and Evaluation of Soil and Water Conservation Projects, John S. Gowing Springer
18. The Food-Water-Energy Nexus: Power, Politics and Justice, Malcolm Langford, Routledge
19. Ecological Resilience: An Integrated Approach to Sustainability, Brian Walker, Island Press
20. Monitoring Ecological Impacts: Concepts and Practice in Flowing Waters, Peter J. A. Van Den Brink, Springer
21. Adaptive Management: A Tool for Conservation Practitioners, Brian S. McIntosh Springer
22. Land Use Planning and Ecological Sustainability: The Importance of Environmental Accounting for Land Use Management in South Africa, Deon Nel, Springer
23. Ecosystem Services for Watershed Management, Vijay P. Singh, Elsevier
24. Land Use Planning: Principles, Methods, and Techniques, Wallace E. Clement, Taylor & Francis
25. Resilience and the Cultural Landscape: Understanding and Managing Change in Human-Shaped Environments, Tobias Plieninger , Cambridge University Press

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Mapping of COs with PSOs and Pos

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CO 1	3	3	2	1	1	1	1			2	1	3
CO 2	3	3	2	1	1	1		3	2	2		
CO 3	3	3	2	1	1	1	2				2	
CO 4	3	3	2	1	1	1			2			3
CO 5	3	3	2	1	1	1	3	2				
CO 6	3	3	2	1	1	1			1		3	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
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Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
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- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Hydro-Geography of India**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course provides an in-depth examination of the hydro-geography of India, focusing on the distribution, utilization, and management of water resources across different regions of the country. Through a combination of theoretical concepts, case studies, field visits, and practical exercises, students will gain a comprehensive understanding of India's water resources, their socio-economic significance, and the challenges and opportunities for sustainable water management.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Upon completion, students can analyze India's water resources, including monsoon patterns and climate change impacts, for effective resource management.	U	F	**Research paper:** Investigate hydro-geographical features of a specific region in India, analyzing their significance and challenges. **Presentation:** Demonstrate understanding of India's hydro-geography through visual aids and oral explanation.
CO2	Students will assess and apply diverse irrigation methods, analyze hydrological extremes, and propose effective flood and drought management strategies	Ap	C	**Field visit report:** Visit traditional water harvesting sites, documenting methods used and their effectiveness. **Case study presentation:** Research and present case studies of successful traditional water management practices in different agro-climatic regions.

CO3	Students will critically evaluate water governance frameworks, policies, and inter-state agreements to propose effective water management solutions.	E	C	**Policy analysis paper:** Evaluate a specific water governance framework or policy at the national, state, or local level, identifying strengths, weaknesses, and potential improvements. **Debate:** Engage in a structured debate on water allocation mechanisms and rights systems, presenting arguments for and against various approaches.
CO4	Students will evaluate urban water systems, address water scarcity, analyze climate impacts, and propose resilience-building strategies for cities."	An	C	**Site visit report**: Conduct a field visit to a city's water supply and wastewater treatment facilities, documenting observations and insights into urban water resilience.
CO5	Students will analyze gender dynamics in water management, identifying challenges and proposing inclusive solutions for equitable access.	E	P	**Research Paper**: do a research paper on the gender dimensions of water access, usage, and management in urban areas, presenting findings and recommendations.
CO6	Learners will assess the impacts of climate change on India's water resources and propose adaptation strategies for sustainable water management.	C	M	**Scenario planning exercise:** Develop scenarios of future climate change impacts on India's water resources, assessing potential risks and vulnerabilities.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**India's Water Dynamics: Geography & Climate**	**12**	**18**
	1	Scope of Hydro-Geography of India	**1**	
	2	Spatial Distribution of Indian Water Resources	1	
	3	Surface Water Availability in Major Rivers and Reservoirs	2	
	4	Groundwater Availability and Distribution in India	2	
	5	Analysis of Indian Monsoon and Spatio-Temporal Variations in Rainfall Distribution	3	
	6	Impacts of Climate Change on Monsoon Patterns	3	
2		**Indian Agri Water Sustainability: Techniques**	**12**	**18**
	7	Water demand patterns, irrigation intensity, and cropping patterns in different ago-climatic zones of India	2	
	8	Traditional Methods of Water Harvesting, utilization and Management – Argo-Climatic Regional Perspective	2	
	9	Traditional and modern irrigation techniques, water use efficiency measures, and water-saving technologies in agriculture	2	
	10	Hydrological Extremes – Floods and Droughts	3	
	11	Assessment of flood and Drought Management Programmes	3	
3		**Water Governance and Policy**	**12**	**17**
	12	Analysis of water governance frameworks, institutional arrangements, and water management policies at the national, state, and local levels.	3	
	13	Evaluation of water allocation mechanisms, water rights systems and Inter-State Water Disputes	2	
	14	Case Study of India Water Policy and Groundwater Policy.	2	
	15	Case Study of Cauvery River Inter-state Water Sharing Agreement	2	
	16	Inter-State Water Sharing Agreement - International Water Sharing Agreement - Case Study of Indus Water Treaty	3	
4		**India's Urban Water Resilience**	**12**	**17**
	17	Assessment of urban water supply systems, water distribution networks, and wastewater treatment facilities in Indian cities	3	
	18	Examination of water scarcity, water quality issues, and challenges in providing safe drinking water and sanitation services to urban populations	3	
	19	Gender and Water	2	
	20	Impacts of climate change on India's water resources	2	
	21	Assessment of adaptation strategies, water resource management options.	1	

	22	Resilience-building measures to address climate change impacts	1	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions:** **1.** Evaluate the efficiency and effectiveness of a selected urban water supply system of your city, using key performance indicators. **2.** Write a research paper on water conflicts in India and suggest solutions based	**12**	

Books and References:

1. Water Resources: An Integrated Approach, Joseph Holden, Routledge
2. The Ganges Water Diversion: Environmental Effects and Implications, Shrinivas Badiger and Jagdish Krishnaswamy, Springer
3. Groundwater Hydrology, David Keith Todd and Larry W. Mays, Wiley
4. Monsoon: The Indian Ocean and the Future of American Power, Robert D. Kaplan, Random House
5. Climate Change and India: Vulnerability Assessment and Adaptation, Indrajit Pal and Jayant K. Routray, Springer
6. Sustainable Agriculture and Environment: Perspectives on Rural Development, edited by Madhusudan Bhattarai and Bihari K. Shrestha, Routledge
7. Water Harvesting for Groundwater Management: Issues, Perspectives, Scope, and Challenges, S. K. Gupta, CRC Press.
8. Irrigation Engineering and Hydraulic Structures" by Santosh Kumar Garg (Publisher: Khanna Publishers)
9. Floods, Famines, and Emperors: El Niño and the Fate of Civilizations, Brian Fagan, Basic Books
10. Drought Management Planning in Water Supply Systems: Proceedings from the UIMP International Course held in Valencia, December 1997, edited by Jaime M. Curiel Balsera, Springer
11. Water Governance in India: Federalism, Power, and Policy Dilemmas, Vishal Narain, Routledge
12. Inter-State River Water Disputes in India, Bidisha Chakraborty, Routledge
13. Water Resources Planning and Management, R. K. Jain, S. K. Jain, and I. C. Goyal, Khanna Publishers
14. India's Water-Energy-Food Nexus: Untying the Knots in the Brahmaputra Basin, Philippus Wester, Vladimir Smakhtin, and Aditi Mukherji, Springer
15. Urban Water Reuse Handbook, edited by Saeid Eslamian, CRC Press
16. Urban Water Security: Managing Risks, Robert C. Brears, Routledge
17. Gender, Water and Development, Gale Summerfield, Berg Publishers

18. Water, Security and U.S. Foreign Policy, David M. Hendrickson and J. Brian Atwood, Brookings Institution Press
19. Climate Change and Water Resources Planning Criteria, Yasir H. Kaheil, Springer
20. Handbook of Climate Change Adaptation, edited by Walter Leal Filho, Springer

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	2	3		2	2
CO 2	3	3	2	1	1	1				2		2
CO 3	3	3	2	1	1	1	3	2	2			2
CO 4	3	3	2	1	1	1	3			2		3
CO 5	3	3	2	1	1	1		2				3
CO 6	3	3	2	1	1	1				3		

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

.

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Application of Geoinformation Technology for Watershed Management**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course explores the use of geoinformation technology (GIT) in watershed management, focusing on the application of spatial analysis, remote sensing, and geographic information systems (GIS) for planning, monitoring, and decision-making in watershed management practices. Through theoretical concepts, practical exercises, case studies, and fieldwork, students will develop skills in utilizing GIT tools and techniques to address complex watershed management challenges.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students will develop skills in acquiring data for watershed management, including using GPS for boundary delineation and field data collection	Ap	C	**Practical Field Exercise:** Field-based activity requiring students to apply GIS and GPS techniques to collect data for watershed management.
CO2	Students will understand how Geoinformation Technology contributes to watershed planning and decision-making by combining remote sensing and GIS.	An	C	**Group Exercise:** Delineate a watershed boundary and Collect information by analysing Satellite Data.
CO3	Students will exhibit skill in combining remote sensing and GIS for watershed planning, including	E	C	**Assignment:** Develop a comprehensive watershed management plan using GIS and remote sensing techniques.

	modeling and decision analysis.			
CO4	Students will develop skills in using GIS for spatial analysis, creating decision support systems, and merging local knowledge for decision-making.	C	C	**Assignment:** Analyze a real-world case study related to watershed management, focusing on the integration of remote sensing and GIS techniques
CO5	Students will create an outline for GIS-based DSS for watershed planning, including WMIS development, PGIS for stakeholder engagement, and SDSS	E	C	Students will work collaboratively to design a format GIS-based Decision Support System for watershed planning, integrating WMIS, PGIS approaches for stakeholder engagement, and SDSS functionalities.
CO6	Students will comprehend the GIT applications in watershed management, including AI, and their influence on future planning and decision-making.	C	P	Students will research and write a paper on a selected topic related to the applications of GIT in watershed management projects or future trends and emerging technologies in GIT for watershed management, including AI.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Units	Content	Hrs (48+ 12)	Marks (70+30)
1		**GIT and Watershed Management**	**12**	**18**
	1	Scope of Geoinformation Technology (GIT) and its applications, Role of GIT in Watershed Planning and Decision-Making	2	
	2	Introduction to Watershed Management Concepts and Principles	1	
	3	Watershed Characterization – Physical, Biological, Cultural and Socio-Economic	3	
	4	Methods and Techniques Data Acquisition for Watershed Management	3	
	5	GPS data collection methods for watershed delineation and boundary mapping and Field data collection	2	
	6	Spatial Data Infrastructure (SDI) in Watershed Management	1	
2		**Remote Sensing and GIS for Watershed Management**	**12**	**18**
	7	Role of GIT in Watershed Planning and Decision-Making	1	
	8	Review of remote sensing principles and techniques	2	
	9	Reviewing Basics of Geographic Information Systems	2	
	10	Spatial data models: raster vs. vector data	2	
	11	Role of remote sensing in watershed delineation and characterization	3	
	12	Types of Remote Sensing Data	2	
3		**Integration of Remote Sensing and GIS for Watershed Planning**	**12**	**17**
	13	Watershed modelling using GIS and Multi-criteria decision analysis for watershed prioritization	3	
	14	Spatial analysis techniques in GIS for watershed management	3	

	15	GIS-based decision support systems for water quality management	2	
	16	Mapping surface water dynamics, flood extent, and inundation mapping	2	
	17	Integration of local knowledge and spatial data in GIS applications	2	
	18			
4		**GIS-Based Decision Support Systems for Watershed Planning**	**12**	**17**
	19	Development of Watershed Management Information Systems (WMIS)	2	
	20	Participatory GIS (PGIS) Approaches for Stakeholder Engagement	3	
	21	Spatial Decision Support Systems (SDSS) for Watershed Management	2	
	22	Applications of GIT in Watershed Management Projects and Future Trends and Emerging Technologies in GIT for Watershed Management (including AI)	5	
5		**Internal Assessment (Open Module)** *The Module is open to the discretion and ingenuity of the faculty to assess the learning outcomes of this course. A couple of exercises as suggestions are given below.* ***Suggestions:*** **1.** Using GIS Software and Remote sensing data do a watershed characterization survey of a watershed near your institution. **2.** Use GIS software to model and analyse water quality data.	**12**	

Books and References:

1. Geographic information systems and science, Longley, P. A., Goodchild, M. F., Maguire, D. J., Rhind, D. W. Hoboken, John Wiley Sons.
2. Introduction to Remote Sensing, Campbell, J. B. Guilford Publications.
3. Remote sensing of the environment: An Earth resource perspective Jensen, J. R. Prentice Hall.
4. GIS and public health, Nyerges, Guilford Publications.
5. LiDAR: Applications of remote sensing and GIS. Pinliang Dong, Qi Chen, CRC Press.
6. Watershed Management: Principles, Techniques, and Applications, Jayanta Bandyopadhyay, Springer
7. Geoinformation Technology for Watershed Management, Manoj Kumar, CRC Press
8. GIS Applications in Agriculture, Volume Four: Conservation Planning, David E. Clay, CRC Press
9. GIS and Remote Sensing Applications in Biogeography and Ecology, Andrew Skidmore, Springer
10. Introduction to Geographic Information Systems, Kang-Tsung Chang, McGraw-Hill Education
11. Remote Sensing and GIS Integration: Theories, Methods, and Applications, Qihao Weng, McGraw-Hill Education
12. Geospatial Technologies and Environmental Management, Anji Reddy, CRC Press
13. Geospatial Technologies in Environmental Management, Harpreet Singh, Springer
14. GIS and Remote Sensing Techniques in Land- and Water-management, Mahesh Chandra Dash, CRC Press

15. Spatial Analysis in Geographic Information Systems, David W. S. Wong, John Wiley & Sons
16. Participatory GIS: A People's GIS, Peter A. Kwaku Kyem, Routledge
17. GIS for Water Resource and Watershed Management, John G. Lyon, CRC Press
18. GIS for Environmental Applications: A Practical Approach, Xuan Zhu, Routledge
19. Principles of Geographic Information Systems, John Jensen, McGraw-Hill Education
20. Geographic Information Systems and Science, Paul A. Longley, John Wiley & Sons
21. Geospatial Techniques in Urban Hazard and Disaster Analysis, Pamela S. Showalter, Springer
22. GIS and Multicriteria Decision Analysis, Jacek Malczewski, John Wiley & Sons
23. Water Resource Management and GIS, Ganesh P. Shivakoti, CRC Press
24. Geoinformation: Remote Sensing, Photogrammetry and Geographic Information Systems, Gottfried Konecny, CRC Press
25. Advanced GIS Applications for Water Resources, Wastewater Management, and Land Development, Hong Yi, CRC Press

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	1	1	3	1	3
CO 2	3	3	2	1	1	1			2	3		2
CO 3	3	3	2	1	1	1	2	2				
CO 4	3	3	2	1	1	1			2	2		3
CO 5	3	3	2	1	1	1						
CO 6	3	3	2	1	1	1	3	1		2	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6			✓	

V LANDSCAPE STUDIES

Programme	B. Sc. Geography				
Course Title	**Introduction to Landscape Studies**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course delves into the multidimensional aspects of landscapes, exploring their cultural, social, and environmental significance. Through theoretical discussions, case studies, fieldwork, and critical analysis, students will gain insights into the diverse ways in which landscapes are experienced, valued, and managed, with a focus on promoting social justice and conservation principles.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students will analyze the evolution of landscape concepts and evaluate the role of sense of place and aesthetics in shaping landscape perception	An	C	**Field Trip Reflection:** Reflect on a recreational landscape visit, discussing its sense of place and aesthetic qualities. **Group Presentation:** Explore a landscape of memory and imagination, presenting findings on its cultural significance
CO2	Students will Evaluate the significance of cultural landscapes, built heritage, and sacred sites in diverse cultural contexts	E	C	**Case Study Analysis:** Examine changing landscapes in a cultural context, identifying factors influencing cultural perceptions and practices and management challenges
CO3	Students will evaluate indigenous perspectives and cultural diversity in landscape representations and management.	E	C	**Group Presentation & Discussion:** Explore indigenous perspectives on landscapes, discussing their cultural values and conservation approaches

CO4	Students will analyze inequalities in landscape access and environmental justice issues, fostering social awareness and activism	An	F	**Case Study Analysis**: Examine a landscape affected by displacement, assessing resilience strategies and social justice implications. E.g. Refugee settlement Landscape
CO5	Students will analyze changing landscapes, assess ecosystem services, and develop sustainable land use plans integrating conservation principles.	E	C	**Case Study Presentation:** Explore biodiversity conservation efforts, protected area management, and GIS applications in landscape studies
CO6	Students will evaluate biodiversity conservation strategies, protected area management, and GIS applications for landscape studies.	C	P	**GIS Mapping Exercise:** Apply geoinformation technology to analyze landscape changes and ecosystem services, presenting results
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Experiencing Landscapes**	**12**	**18**
	1	Evolution of Landscape Concept and Definitions	2	
	2	Landscape as a dynamic Geographical concept	1	
	3	Sense of Place and Landscape Identity	3	
	4	Perception and Aesthetics of Landscapes	2	
	5	Recreational Landscapes and Outdoor Activities	2	
	6	Landscapes of Memory and Imagination	2	
2		**Landscape Culture and Heritage**	**12**	**18**
	7	Cultural Landscapes and Built Heritage	2	
	8	Sacred Landscapes and Ritual Practices	2	
	9	Indigenous Perspectives on Landscapes	3	
	10	Cultural Diversity and Landscape Representations	3	
	11	Changing Landscapes - Cultural Concept	2	
3		**Landscape Society and Justice**	**12**	**17**
	12	Social Justice and Access to Landscapes	2	
	13	Environmental Justice and Landscapes	2	
	14	Gender and Landscapes	2	
	15	Community Engagement and Participatory Planning	3	
	16	Landscapes of Displacement and Resilience	2	
	17	Equitable Green Spaces and Urban Development	1	
4		**Landscape Conservation and Management**	**12**	**17**
	18	Changing Landscapes – Geomorphological and Ecological Concept.	2	
	19	Ecosystem Services and Landscape Values	2	
	20	Sustainable Land Use Planning and Development	2	

	21	Biodiversity Conservation and Habitat Restoration	2	
	22	Protected Areas Management and Landscape Stewardship and Applications of Geoinformation Technology for Studying Landscapes	4	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions:** 1. **Field Trip and Analysis:** Visit a landscape, analyze features, and present findings. Students observe, measure, and discuss ecological, cultural, and historical aspects, enhancing understanding through hands-on experience. 2. **Community Project:** Collaborate with a local group on a landscape-related project. Students plan, implement, and present outcomes, fostering community engagement and practical application of landscape studies.	12	

Books and References:

1. Landscape Ecology: Principles in Landscape Architecture and Land-Use Planning, Wenche Dramstad, James D. Olson, and Richard T.T. Forman, Island Press.
2. Landscape Planning: Environmental Applications, William M. Marsh, John Wiley & Sons.
3. Landscape Ecology: Theory and Application, Zev Naveh and Arthur S. Lieberman, Springer.
4. Introduction to Landscape Ecology, Karl R. W. Anhalt and Eric H. Ervin., CRC Press.
5. Landscape Ecology in Theory and Practice: Pattern and Process, Monica G. Turner and Robert H. Gardner, Springer.
6. Principles of Landscape Architecture, Bruce Sharky., Routledge.
7. Landscape Planning and Environmental Impact Design, Tom Turner, Routledge.
8. Landscape Architecture: A Manual of Environmental Planning and Design, Barry Starke and John Ormsbee Simonds, McGraw-Hill Education.
9. Ecological Landscape Design and Planning, Bert B. Browning, Wiley-Blackwell.
10. The Landscape Imagination: Collected Essays of James Corner, 1990-2010, James Corner, Princeton Architectural Press.
11. Principles of Ecological Landscape Design, Travis Beck. Island Press.
12. Landscape Architecture: An Introduction, Robert Holden and Jamie Liversedge, Laurence King Publishing.
13. The Sustainable Urban Development Reader, edited by Stephen M. Wheeler and Timothy Beatley, Routledge.
14. Designing the Sustainable Site: Integrated Design Strategies for Small-Scale Sites and Residential

Landscapes, Heather L. Venhaus and Lisa Cowan, John Wiley & Sons.

15. The Landscape Urbanism Reader, edited by Charles Waldheim, Princeton Architectural Press.
16. Green Infrastructure: A Landscape Approach, David C. Rouse, Ignacio F. Bunster-Ossa, and Emily E. McCoy, Island Press.
17. Landscape Architecture: A Very Short Introduction, Ian H. Thompson, Oxford University Press.
18. The Landscape Urbanism Reader, Charles Waldheim. Princeton Architectural Press.
19. Visualizing Landscape Architecture: Functions, Concepts, Strategies, Elke Mertens and Stuart Farquhar, Birkhäuser.
20. Landscapes: John Berger on Art, John Berger, Verso Books.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	3	-	3	3	3	2	-	3	3
CO 2	3	3	-	2	2	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	3	2	2	3	2	-	-
CO 4	3	3	2	3	2	-	3	-	2	3	-	2
CO 5	3	3	-	-	-	3	3	3	-	-	-	-
CO 6	-	-	2	2	3	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Landscape Ecology**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course introduces students to the fundamental principles and methods of landscape ecology, focusing on the spatial patterns, ecological processes, and human interactions shaping landscapes. Through theoretical discussions, case studies, and practical exercises, students will gain insights into landscape structure, dynamics, and applications for conservation and management.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the interdisciplinary nature of landscape ecology and its applications in studying spatial patterns and ecological processes.	U	C	Conceptual diagram: Students create a diagram illustrating the relationships between landscape elements and ecological processes.
CO2	Analyze landscape structure and function using landscape metrics, focusing on habitat connectivity, fragmentation, and biodiversity.	An	C	Landscape analysis report: Students conduct a landscape analysis using GIS tools and present findings on landscape structure and function.
CO3	Evaluate the ecological significance of landscape elements such as patches, corridors, and matrices in supporting biodiversity.	E	C	. Habitat suitability modeling: Students develop a habitat suitability model for a selected species based on landscape structure and present their results.

CO4	Investigate landscape dynamics and change processes, including succession, disturbance, and land-use/land-cover change, using case studies and models.	A	C	Case study presentation: Students present a case study on landscape dynamics and change, identifying drivers, impacts, and management responses
CO5	Assess landscape resilience to environmental change and develop strategies for sustainable landscape management and conservation.	Ap	P	Scenario planning exercise: Students participate in a scenario planning exercise to anticipate and address future landscape change scenarios, presenting adaptation strategies
CO6	Apply landscape ecology principles and methods to address real-world conservation and management challenges in various landscapes.	C	C	Role-playing simulation: Students engage in a role-playing simulation to negotiate and implement landscape management decisions, considering multiple stakeholder perspectives.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Introduction to Landscape Ecology**	**12**	**18**
	1	Definition and Scope of Landscape Ecology	1	
	2	Spatial Heterogeneity and Scale	2	
	3	Patch Dynamics and Landscape Metrics.	2	
	4	Ecological Processes in Landscapes	3	
	5	Human Dimensions of Landscape Ecology.	2	
	6	Landscape Diversity and Beta Diversity	2	
2		**Landscape Structure and Function**	**12**	**18**
	7	Spatial Pattern Analysis	2	
	8	Functional Landscape Elements	2	
	9	Edge Effects and Ecotones	2	
	10	Landscape Connectivity and Fragmentation	2	
	11	**Landscape Socio-ecological Systems**	2	
	12	Landscape Resilience and Stability	2	
3		**Landscape Dynamics and Change**	**12**	**17**
	13	Landscape Succession and Disturbance	2	
	14	Land-Use/Land-Cover Change	2	
	15	Landscape Resilience and Adaptation	2	
	16	Landscape Evolutionary Ecology	2	
	17	Human-modified Landscapes	2	

	18	Landscape Connectivity Planning	2	
4		**Applications of Landscape Ecology**	**12**	**17**
	19	Conservation Planning and Design.	2	
	20	Ecosystem Services and Landscape Management	2	
	21	Urban and Agricultural Landscapes and Climate Change and Landscape Responses	4	
	22	**Landscape-based Climate Change Adaptation Strategies and** Application of Geospatial Technologies	4	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions** 1. Students develop a conservation management plan for a selected landscape, integrating ecological data, stakeholder inputs, and management strategies. 2. Students present a case study on landscape dynamics and change, identifying drivers, impacts, and management responses	12	

Books and References

1. Landscape Ecology: Principles in Landscape Architecture and Land-Use Planning, Zev Naveh and Arthur S. Lieberman, Springer.
2. Principles of Landscape Ecology, R. H. Gardner and E. A. Hildreth, Springer.
3. Landscape Ecology in Theory and Practice: Pattern and Process, Monica G. Turner and Robert H. Gardner, Springer.
4. Landscape Ecology: A Widening Foundation, J. A. Wiens and M. R. Moss, Springer.
5. Introduction to Landscape Ecology,by Kevin J. Gaston and John I. Spicer, Wiley-Blackwell.
6. Landscape Ecology: A Top-Down Approach, Glenn R. Guntenspergen, CRC Press.
7. Landscape Ecology: A New Synthesis, Monica G. Turner and Robert H. Gardner, Springer.
8. Landscape Ecology: A Global Perspective, R. T. T. Forman and M. Godron, Wiley.
9. Landscape Ecology: A Unified Approach to Landscape Complexity, W. G. Bailey, Columbia University Press.
10. Foundations of Landscape Architecture: Integrating Form and Space Using the Language of Site Design, Norman K. Booth. Wiley.
11. Landscape Architecture: A Manual of Environmental Planning and Design, Barry Starke and John Ormsbee Simonds, McGraw-Hill Education.
12. Landscape Planning: Environmental Applications, William M. Marsh, Wiley.
13. Ecology of a Changing Planet, Mark B. Bush, Prentice Hall.
14. Introduction to Landscape Ecology, Nicholas R. Webb, Blackwell Scientific Publications.
15. Foundations of Landscape Architecture: Integrating Form and Space Using the Language of Site

Design, Norman K. Booth, Wiley.

16. Landscape Planning: Principles, Robert G. Ribe, McGraw-Hill Education.
17. The Ecology of Landscapes: Foundations for Practice, John A. Wiens, Wiley-Blackwell.
18. Principles of Environmental Conservation, D. W. R. Watson and T. J. M. Smith, Routledge.
19. Conservation Planning: Informed Decisions for a Healthier Planet, Craig R. Groves and Edward T. Game, Springer.
20. Landscape Ecology: A Widening Foundation, John A. Wiens and Mary R. Moss, Springer.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	1	1	1	3	3	2	2	1	1
CO 4	3	3	2	1	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Cultural Landscape**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course explores the multifaceted nature of cultural landscapes, examining their significance, diversity, and management practices. Through theoretical discussions, case studies, and fieldwork, students will gain insights into the relationship between landscapes, identity, and heritage conservation. Through these modules, students will develop a comprehensive understanding of cultural landscapes, their significance, challenges, and management strategies, preparing them for careers in heritage conservation, landscape planning, and cultural resource management.				

Course Outcomes (CO)

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the concept and significance of cultural landscapes and Analyze classification methods and assessment techniques for cultural landscapes	**An**	**C**	1. Quiz on key concepts and definitions. 2. Essay on the historical evolution of cultural landscape studies. 3. Group presentation on different typologies of cultural landscapes
CO2	Recognize the role of landscapes in shaping individual and collective identities and evaluate the cultural significance	**E**	**C**	1. Reflective journal entries on personal experiences of landscape identity. 2. Case study analysis of a culturally significant landscape. 3. Group discussion and presentation on the representation of identity in landscape art.
CO3	Analyze the characteristics and conservation challenges of rural cultural	**E**	**C**	Debate on the importance of preserving rural versus urban cultural landscapes.

	landscapes.			
CO4	Evaluate the dynamics of urban cultural landscapes and their management strategies.	**A**	**C**	Group Assignment developing a management plan for a threatened cultural landscape in a rural or urban setting.
CO5	Understand the principles and legal frameworks of cultural landscape conservation.	**U**	**C**	Assignment: Development of a conservation management plan for a designated cultural landscape.
CO6	Apply integrated management approaches and community engagement strategies to conserve cultural landscapes.	**C**	**P**	Role-play exercise simulating a community consultation meeting on a proposed conservation project.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Introduction to Cultural Landscapes**	**12**	**18**
	1	Definition and Concepts of Cultural Landscapes	**3**	
	2	Historical Development of Cultural Landscape Studies	**3**	
	3	Classification and Typology of Cultural Landscapes	**2**	
	4	Methods of Cultural Landscape Assessment	**2**	
	5	Global Perspectives on Cultural Landscapes	**2**	
2		**Landscape and Identity**	**12**	**18**
	6	Sense of Place and Landscape Identity	**2**	
	7	Cultural Memory and Heritage Landscapes	**2**	
	8	Ethnic Landscapes and Cultural Diversity	**2**	
	9	Gendered Landscapes	**2**	
	10	Religious and Spiritual Landscapes:	**2**	
	11	Colonial Landscapes and Postcolonial Heritage	**2**	
3		**Rural and Urban Cultural Landscapes**	**12**	**17**
	12	Rural Cultural Landscapes	**3**	
	13	Urban Cultural Landscapes	**3**	
	14	Industrial and Post-Industrial Landscapes	**2**	
	15	Waterfront and Coastal Cultural Landscapes	**2**	
	16	Military Landscapes and Conflict Heritage	**2**	
4		**Cultural Landscape Conservation and Management**	**12**	**17**
	17	Principles of Cultural Landscape Conservation	**2**	
	18	Community Engagement in Landscape Conservation	**2**	
	19	Legal and Policy Frameworks for Cultural Landscape Conservation	**2**	
	20	Integrated Management Approaches for Cultural	**2**	

		Landscapes		
	21	Ethics and Values in Cultural Landscape Conservation	**2**	
	22	Innovative Technologies for Cultural Landscape Management	**2**	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below.* **Suggestions** 1. Fieldwork report assessing a local cultural landscape using selected assessment methods. 2. Research paper on the role of landscapes in shaping cultural identity in a specific community. 3. Group project developing a management plan for a threatened cultural landscape in a rural or urban setting. 4. Presentation of a group project proposing innovative technologies for cultural landscape conservation and management.	12	

Books and References

1. Cultural Landscape Management: An Introduction, Ken Taylor and Jane Lennon, Routledge.
2. Cultural Landscapes: Balancing Nature and Heritage in Preservation Practice, Richard Longstreth., University of Minnesota Press.
3. Cultural Landscape: An Introduction to Human Geography, James M. Rubenstein, Pearson.
4. Cultural Landscapes: A Practical Guide for Parks and Historic Sites, Margie Coffin Brown, Rowman & Littlefield Publishers.
5. Cultural Landscapes: Rural, Urban and Regional, edited by R.M. Netting, Academic Press.
6. Introduction to Cultural Landscapes, James Duncan and Nancy Duncan, Rowman & Littlefield Publishers.
7. Cultural Landscape Heritage in Sub-Saharan Africa, John Beardsley, Springer.
8. Urban and Rural Landscapes: A Cultural Geography, Don Mitchell, Routledge.
9. The Power of Place: Urban Landscapes as Public History, Dolores Hayden, MIT Press.
10. Designing Cultural Landscapes, Desmond H. O'Rourke, Berg Publishers.
11. Cultural Landscapes and Land Use: The Nature Conservation-Society Interface, edited by Maarten Wolsink. Edward Elgar Pub.
12. Landscape and Memory, Simon Schama, Vintage.
13. Cultural Landscape Ecology: A Critical Introduction, David E. Sutton, Wiley-Blackwell.
14. Rural Landscapes: Society, Environment, History, edited by Pierre-Antoine Landel and Michel Lussault, John Wiley & Sons.

15. Urban Landscape: A Political Ecology Perspective" by J. Timmons Roberts and Paul N. Edwards. Publisher: University of Washington Press.
16. Cultural Landscapes: Understanding and Managing Values, Ken Taylor and Jeanette Hellgren., Routledge.
17. Urban Landscapes: Environmental Networks and Quality of Life, James A. Throgmorton, Rutgers University Press.
18. Cultural Landscape: From Groundwork to Governancee, dited by Erik Andersson and Rolf J. Haarstad, University of Toronto Press.
19. Landscapes: A John Berger Reader, John Berger, Verso.
20. The Cultural Landscape: An Introduction to Human Geography, James M. Rubenstein, Prentice Hall.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	1	1	1	3	3	2	2	1	1
CO 4	3	3	2	1	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Landscape Planning and Management**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course delves into the theory and practice of landscape planning and management, equipping students with the knowledge and skills necessary for sustainable landscape stewardship. Through interdisciplinary approaches, it explores landscape assessment, conservation strategies, and the application of geoinformation technology. Students learn to analyze landscape patterns, evaluate ecological and cultural values, and develop conservation plans that balance environmental, social, and economic considerations. With an emphasis on community engagement and participatory approaches, the course prepares students to address complex landscape challenges and contribute to the protection and enhancement of landscapes for present and future generations				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand key principles and stakeholders in landscape planning and management	U	C	Group Discussion: Students participate in group discussions on landscape management challenges and present collaborative solutions.
CO2	Evaluate landscapes using geospatial data and ecological/cultural assessment techniques.	E	C	Students conduct field assessments, collect data, and present their findings on landscape characteristics and conditions
CO3	Analyze governance structures and policy frameworks influencing landscape conservation and management.	E	C	Policy Analysis: Students analyze landscape conservation policies and regulations and assess their effectiveness in achieving

				conservation goals. .
CO4	Develop integrated conservation plans balancing ecological, social, and economic objectives for sustainable landscape management.	A	C	Students develop a conservation plan for a selected landscape, integrating ecological data, stakeholder inputs, and management strategies.
CO5	Apply geoinformation technology tools for landscape planning, monitoring, and decision-making.	E	C	Students design and implement a GIS project to address a specific landscape conservation or planning issue and present their findings.
CO6	Design a geoinformation-based solutions to address landscape conservation and management challenges.	C	P	Students demonstrate the use of geoinformation technology tools in a simulated landscape management scenario and provide a reflective analysis..
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Unit	Content	Hrs (48+12)	Marks (70+30)
1		**Introduction to Landscape Planning and Management**	**12**	18
	1	Fundamentals of Landscape Planning	2	
	2	Landscape Management Approaches	3	
	3	Legal and Policy Frameworks	3	
	4	Community Engagement and Participation	2	
	5	Sustainable Development Principles	2	
2		**Landscape Assessment**	**12**	18
	6	Geospatial Data Collection and Analysis	2	
	7	Ecological and Cultural Assessment	2	
	8	Land Use and Land Cover Change Analysis	2	
	9	Ecosystem Service Assessment	2	
	10	Socio-economic Impact Assessment	2	
	11	Landscape Health and Resilience Assessment	2	
3		**Landscape Conservation**	**12**	17
	12	Conservation Planning and Design	2	
	13	Habitat Restoration and Management:	2	
	14	Landscape-scale Conservation Strategies	2	
	15	Human-Wildlife Conflict Management	2	
	16	Landscape Governance and Institutional Arrangements	2	
	17	Integrated Landscape Planning and Management	2	
4		**Geoinformatics for Landscape Conservation, Planning, and Management**	**12**	17
	18	Remote Sensing for Landscape Monitoring	2	

	19	GIS-based Landscape Modelling	2	
	20	Geoinformation Technology for Conservation Planning	2	
	21	Citizen Science and Crowdsourced Data Collection	2	
	22	Landscape Visualization and Communication and Geodesign Approaches for Landscape Planning	4	
5		**Internal Assessment (Open Module)** *The Module is open to discretion and ingenuity of the faculty to assess the learning outcomes of this course. Couple of exercises as suggestion are given below* 1. Landscape Conservation Plan (Group Project): Groups develop comprehensive conservation plans for specific landscapes, integrating course concepts. Assess based on analysis depth, creativity, and interdisciplinary integration. 2. Geoinformation Technology Portfolio (Individual Assignment): Students create portfolios showcasing GIS projects and analyses. Assess for complexity, accuracy, and clarity of presentation.	12	

Books and References

1. Landscape Ecology: Principles in Landscape Architecture and Land-Use Planning, Zev Naveh and Arthur S. Lieberman, Springer.
2. Principles of Landscape Ecology, R. H. Gardner and E. A. Hildreth, Springer.
3. Landscape Ecology in Theory and Practice: Pattern and Process, Monica G. Turner and Robert H. Gardner, Springer.
4. Landscape Ecology: A Widening Foundation, J. A. Wiens and M. R. Moss, Springer.
5. Introduction to Landscape Ecology, Kevin J. Gaston and John I. Spicer, Wiley-Blackwell.
6. Landscape Architecture: A Manual of Environmental Planning and Design, Barry Starke and John Ormsbee Simonds, McGraw-Hill Education.
7. Landscape Planning: Environmental Applications, William M. Marsh, Wiley.
8. Landscape Ecology: A Top-Down Approach, Glenn R. Guntenspergen, CRC Press.
9. Landscape Ecology: A New Synthesis, Monica G. Turner and Robert H. Gardner, Springer.
10. Landscape Ecology: A Global Perspective, R. T. T. Forman and M. Godron, Wiley.
11. Foundations of Landscape Architecture: Integrating Form and Space Using the Language of Site Design, Norman K. Booth, Wiley.
12. Introduction to Landscape Ecology, Nicholas R. Webb, Blackwell Scientific Publications.
13. Landscape Planning: Principles, Robert G. Ribe, McGraw-Hill Education.
14. The Ecology of Landscapes: Foundations for Practice, John A. Wiens, Wiley-Blackwell.
15. Principles of Environmental Conservation, D. W. R. Watson and T. J. M. Smith, Routledge.
16. Conservation Planning: Informed Decisions for a Healthier Planet, Craig R. Groves and Edward T. Game, Springer.

17. The Practice of Sustainable Landscape Architecture: A Case Study Approach, Tom Martinson., Routledge.
18. Ecological Landscape Design and Planning: The Mediterranean Context, Henri G. A. Oosterhuis., CRC Press.
19. Landscape Architecture Theory: An Ecological Approach, Michael D. Smith, Island Press.
20. The Oxford Handbook of Environmental Conservation and Management, David W. Macdonald and Katherine J. Willis, Oxford University Press.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and Pos

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	1	1	1	3	3	2	2	1	1
CO 4	3	3	2	1	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6	✓		✓	

VI HEALTH GEOGRAPHY

Programme	B. Sc. Geography
Course Title	**Geographical Landscapes of Health**
Type of Course	**Elective Major**
Semester	V
Academic Level	300-399

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60

Pre-requisites	Nil
Course Summary	This course explores the spatial dimensions of health, focusing on how geographic factors influence health outcomes, healthcare access, and the distribution of diseases. Students will examine various geographical landscapes, including urban, rural, and environmental contexts, and their impacts on population health. Through theoretical frameworks and case studies, students will gain an understanding of the complex interactions between geography, health, and society.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the geographical dimensions of health and illness	U	C	- Written exam assessing knowledge of key concepts and theories in geographical health geography
CO2	Analyze the influence of	E	C	Research

	social, economic, and environmental factors on health disparities			paper investigating the socio-economic and environmental determinants of a specific health issue within a geographical context
CO3	Evaluate the role of built environments and urban planning in promoting health and well-being	C	P	Fieldwork assessing the accessibility and quality of health-promoting amenities in urban neighborhoods
CO4	Outcome: Examine the relationship between natural environments, ecosystems, and human health	U	C	Critical review of literature discussing the health benefits of nature exposure and green spaces
CO5	Critically assess public health interventions and policies from a geographical perspective	An	C	Policy analysis essay evaluating the effectiveness of public health interventions in addressing health inequalities within different geographical contexts
CO6	Develop spatial analysis skills to map and visualize health data	Ap	P	Presentation of spatial analysis findings and interpretation of health maps to identify hotspots and spatial clusters of health issues
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)				

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I	Introduction to Health Geography		14	25
	1	Definition and scope of health geography	2	
	2	Theoretical frameworks in health geography	2	
		Key concepts: place, space, and scale	2	
	3	Principles of spatial epidemiology	2	
	4	Mapping disease distribution and clustering	2	
	5	Spatial analysis techniques in health research	2	
	Sections from References:			
II	Environmental Health Geography		6	10
	6	- Relationship between environment and health	2	
	7	- Environmental risk factors and health outcomes	2	
	8	- Case studies: air pollution, water quality, climate change	2	
	Sections from References:			
III	Urban Health and Rural Health		10	15
	9	Urbanization and health challenges	2	
	10	Urban health disparities	2	
	11	Built environment and health behaviors	2	
	12	Unique health issues in rural areas	2	
	13	Access to healthcare in rural communities	2	

	14	Rural-urban disparities in health outcomes		
	Sections from References:			
IV	Global Health and Geographies of Health Inequalities		18	20
	16	Globalization and health	3	
	17	Infectious diseases and global health security	3	
	18	Health inequalities in low- and middle-income countries	3	
	19	- Social determinants of health	2	
	20	- Intersectionality and health disparities	2	
	21	- Policy implications for addressing health inequalities	2	
	22	Health Geography in Practice- Case studies in applied health geography	3	
	Sections from References:			
V	Emerging Topics in Health Geography		12	
	1	- Tele health and digital health	4	
	2	- Health impacts of disasters and emergencies	4	
	3	- Future trends in health geography research	4	
	Sections from References:			

Kearns, R. A., & Moon, G. (2019). Health and Place: A Critical Introduction. Routledge.

Brown, T., & McLafferty, S. (Eds.). (2019). The Routledge Handbook of Urbanization and Global Environmental Change. Routledge.

Cromley, E. K., & McLafferty, S. L. (2012). GIS and Public Health (2nd ed.). Guilford Press.

Moon, G., & Brown, T. (Eds.). (2018). A Research Agenda for Geographies of Health and Health Care. Edward Elgar Publishing.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
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CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	3	2	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
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1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Spatial Analysis in Health Geography**				
Type of Course	**Elective Major**				
Semester	V				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60
Pre-requisites	Nil				
Course Summary	This course provides an in-depth exploration of spatial analysis techniques in the context of health geography. Students will learn how to use Geographic Information Systems (GIS), spatial statistics, and other geospatial tools to analyze health data, identify spatial patterns of disease, and assess the impact of environmental factors on health outcomes. Through hands-on exercises and case studies, students will develop practical skills in spatial analysis and gain insights into its applications in public health research and policy.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the theoretical foundations and principles of spatial analysis in health geography	U	C	Written exam assessing comprehension of key concepts and theories in spatial analysis within the context of health geography
CO2	Apply spatial analysis methods to analyze and visualize health data	E	C	GIS lab assignments demonstrating proficiency in spatial data

				manipulation, geoprocessing, and spatial statistics techniques
CO3	Identify spatial patterns and trends in health outcomes and disease distribution.	C	P	Spatial analysis report identifying and interpreting spatial clusters, hotspots, and spatial autocorrelation in health data
CO4	Evaluate the spatial determinants of health disparities and inequalities.	U	C	Case study analysis of a specific health issue, examining the spatial distribution of health disparities and the underlying social, economic, and environmental factors
CO5	Critically assess the strengths and limitations of spatial analysis techniques in health research.			Debate or panel discussion on the ethical and methodological challenges associated with the use of spatial data in health research
CO6	Develop practical skills in spatial data management and geospatial modelling	Ap	P	Geospatial data analysis project involving data acquisition, cleaning, and preparation for spatial analysis tasks

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I	Introduction to Spatial Analysis		14	25
	1	Definition of spatial analysis	2	
	2	scope of spatial analysis	2	
		Importance of spatial thinking in health geography	2	
	3	Overview of GIS software and spatial data types	2	
	4	- Spatial Data Management	2	
	5	Data sources and acquisition methods	2	
	6	Georeferencing and data integration	1	
	7	Quality assurance and data validation	1	
	Sections from References:			
II	Spatial Visualization Techniques		6	10
	8	Cartographic principles	2	
	9	Mapping health data	2	
	10	Choropleth maps,	2	
		Dot density maps,		
		Heat maps		
		Interactive mapping tools and web mapping applications		
	Sections from References:			
III	Spatial Descriptive Statistics and Spatial Interpolation Methods		10	15
	11	Spatial measures of central tendency and dispersion	2	

	12	Spatial autocorrelation analysis	2	
	13	Exploratory spatial data analysis (ESDA)	2	
	14	Deterministic interpolation techniques: IDW, Thiessen polygons	2	
	15	Geostatistical interpolation methods: kriging, co-kriging Comparative analysis of interpolation methods	2	
	Sections from References:			
IV	Spatial Cluster Analysis		18	20
	16	Identification of spatial clusters and hotspots	3	
	17	Methods for cluster detection Moran's I, Getis-Ord Gi,	3	
	18	spatial scan statistics- Interpretation of cluster analysis results	3	
	19	Spatial Regression Analysis	2	
	20	Principles of spatial regression modeling	2	
	21	Spatial econometrics techniques: spatial lag models, spatial error models	2	
	22	Application of spatial regression in health geography research	3	
	Sections from References:			
V			12	10
	1	Disease Mapping and Surveillance	4	
	2	- Spatial epidemiology and disease mapping techniques - Spatiotemporal analysis of disease outbreaks - Public health surveillance using GIS and remote sensing data	4	
	3	Spatial Analysis in Health Policy and Planning - Spatial decision support systems - Health service area delineation and accessibility analysis - Spatial planning for health promotion and disease prevention	4	
	Sections from References:			
Fotheringham, A. S., Brunsdon, C., & Charlton, M. (2015). Geographically Weighted Regression: The Analysis of Spatially Varying Relationships. Wiley.				

- Cromley, E. K., & McLafferty, S. L. (2012). GIS and Public Health (2nd ed.). Guilford Press.

- Kistemann, T., & Khan, M. M. (Eds.). (2013). GIS for Health and the Environment: Development in the Asia-Pacific Region. Springer.

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Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	2	3	3	3	2	2	2	3
CO 2	3	3	2	1	1	2	3	3	2	1	1	2
CO 3	3	3	2	1	3	1	3	3	2	2	1	1
CO 4	3	3	2	1	1	3	3	3	2	1	3	2
CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	3	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	✓

Programme	B. Sc. Geography				
Course Title	**Disease Ecology and Environment**				
Type of Course	**Elective Major**				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60
Pre-requisites	Nil				
Course Summary	This course explores the intricate relationship between disease, ecology, and the environment. Students will investigate how environmental factors influence the emergence, transmission, and spread of diseases, and how ecological principles can be applied to understand disease dynamics. Through interdisciplinary perspectives, students will analyze case studies, examine current research, and engage in discussions to deepen their understanding of the complex interplay between human health, ecosystems, and the environment.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental concepts of disease ecology and environmental health	U	C	Class participation and engagement in discussions on foundational principles
CO2	Analyze the impact of	A	C	Presentation

	environmental factors on disease emergence and transmission			evaluating the role of environmental factors in a selected infectious disease outbreak
CO3	Evaluate strategies for disease prevention, control, and mitigation from an ecological perspective	E	P	Group project designing an ecological intervention plan for a hypothetical disease outbreak scenario.
CO4	Explore the role of biodiversity, habitat destruction, and climate change in disease ecology	U	C	Field trip or virtual tour to observe and analyze local ecosystems and their susceptibility to disease outbreaks
CO5	Critically assess case studies and research articles related to disease ecology and environmental health	C	P	Group presentations debating conflicting perspectives on the environmental factors influencing disease dynamics
CO6	Develop interdisciplinary perspectives by integrating knowledge from ecology, epidemiology, and environmental science	Ap	P	Collaborative projects with students from related disciplines, synthesizing ecological, epidemiological, and environmental perspectives
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)				

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I	Introduction to Disease Ecology and Environmental Health		14	25
	1	Historical perspectives on disease ecology	2	
	2	Environmental health	2	
	3	Basic principles of ecology and their relevance to disease dynamics	2	
	4	Environmental Factors and Disease Emergence	2	
	5	Influence of environmental factors (e.g., climate, land use change, pollution) on disease emergence	3	
	6	Case studies of emerging infectious diseases and their ecological drivers	3	
	Sections from References:			
II	Biodiversity, Ecosystem Services, and Human Health		6	10
	7	Importance of biodiversity and ecosystem services for human health	2	
	8	Impact of habitat destruction, deforestation	2	
	9	urbanization on disease transmission	2	
	Sections from References:			
III	Climate Change and Health Urban and Ecology and Disease Dynamics		10	15
	10	Effects of climate change on vector-borne diseases,	2	
	11	Effects of climate change on waterborne diseases, and food security	2	
	12	Adaptation and mitigation strategies for climate-sensitive health risks	2	
	13	Urbanization and its implications for disease ecology	2	
	14	Challenges and opportunities for managing urban health in a changing environment	2	
	Sections from References:			

IV	Wildlife Health and Zoonotic Diseases		18	20
	15	Role of wildlife in the transmission of zoonotic diseases	3	
	16	One Health approach: integrating human, animal, and environmental health	3	
	17	Analysis of recent infectious disease outbreaks and their environmental drivers	3	
	18	Public health responses and lessons learned from outbreak investigations	2	
	19	Ecological Approaches to Disease Control and Prevention	2	
	20	Integrated pest management and ecological control strategies	2	
	21	Ecohealth interventions for sustainable disease management	2	
	22	Public health responses and lessons learned from outbreak investigations	1	
	Sections from References:			
V	Environmental Justice and Health Equity		12	
	1	Environmental justice issues related to disease burden and access to healthcare	4	
	2	Intersectionality of social determinants of health and environmental disparities	4	
	3	Student presentations on research projects or case studies - Discussion of interdisciplinary approaches to address current environmental health challenges	4	
	Sections from References:			
1. "Disease Ecology: Community Structure and Pathogen Dynamics" by Sharon K. Collinge and Chris Ray 2. "The Ecology of Infectious Diseases" by Benjamin Bolker and others 3. "Planetary Health: Protecting Nature to Protect Ourselves" by Samuel Myers and others 4. Selected research articles and case studies from peer-reviewed journals in ecology, epidemiology, and environmental health				

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	3	3	3	3	3	2	2	2	3
CO 2	3	3	2	1	1	2	3	3	2	1	1	2
CO 3	3	3	2	1	1	2	3	3	2	2	1	1
CO 4	3	3	2	3	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	3	1	3	3	2	1	1	1
CO 6	3	3	2	2	3	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Disease Mapping**				
Type of Course	Major Elective				
Semester	VI				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60
Pre-requisites	Nil				
Course Summary	This course provides an overview of the principles, methods, and applications of diseases mapping, which is the spatial analysis of disease occurrence and distribution. Through lectures, discussions, case studies, and hands-on exercises, students will gain practical skills in using geographic information systems (GIS) and spatial statistics to analyze and visualize disease data. Topics covered include disease surveillance, spatial epidemiology, spatial interpolation, cluster detection, and spatial modeling techniques.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Comprehend the theoretical underpinnings and significance of disease mapping in public health.	U	C	Assignments and Quizzes
CO2	Cultivate practical proficiency in harnessing GIS software for spatial analysis and visualization of disease data	E	C	Conduct spatial analysis using GIS and spatial statistics, and present findings through a comprehensive report

				and oral presentation.
CO3	Apply spatial statistical techniques to discern spatial patterns, clusters, and trends in disease occurrence	AP	P	Assignment
CO4	Effectively interpret and communicate disease mapping findings to diverse stakeholders	U	C	Discussion
CO5	Explore the myriad applications of disease mapping in epidemiological research, public health surveillance, and resource allocation	E	F	Presentations
CO6	Foster critical thinking skills to assess the strengths and limitations of disease mapping methodologies	C	P	Group activities and discussions
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I	Introduction to Diseases Mapping		14	25
	1	Introduction to Disease Mapping	2	
	2	Spatial Epidemiology Basics	2	
	3	Overview of spatial epidemiology	2	
	4	Importance of spatial analysis in public health and Disease Surveillance Systems	2	
	5	Historical perspectives and key concepts	2	
	6	Introduction to GIS software and data formats	2	
	7	Spatial data visualization and manipulation	1	
	8	GIS data sources and acquisition	1	
	Sections from References:			
II	Disease Surveillance and Data Sources		6	10
	9	Overview of disease surveillance systems	2	
	10	Types of health data and sources	2	
	11	- Data quality and limitations	2	
	Sections from References:			
III	Spatial Descriptive Analysis		10	15
	12	Mapping disease occurrence rates	2	
	13	Calculation of disease clusters and hotspots- Spatial interpolation techniques	2	
	14	Spatial Statistical Methods	2	
	15	- Spatial autocorrelation analysis- Exploratory spatial data analysis (ESDA) Disease cluster detection methods	2	
	16	- Spatial smoothing techniques-Point pattern analysis	2	

	Sections from References:			
IV	Spatial Modeling		18	20
	17	Advanced spatial modeling techniques	3	
	18	- Model validation and assessment	3	
	19	Spatial prediction and uncertainty analysis	3	
	20	Applications of Diseases Mapping	2	
	21	Case studies in spatial epidemiology	2	
	22	- Public health decision-making and policy implications Future directions and emerging trends	5	
	Sections from References:			
V			12	
	1	Practical Applications and Project Presentations - Hands-on exercises using GIS and spatial statistical software - Project presentations by students showcasing their analysis and findings	12	
	Sections from References:			

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	2	3	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	1	3	1	3	3	2	2	1	1
CO 4	3	3	2	2	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	3	1	3	3	2	1	1	1
CO 6	3	3	2	2	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

VII GEOGRAPHY WITH RESEARCH SPECIALISATION

Programme	B.Sc.Geography				
CourseTitle	**Hydrology**				
Type of Course	**Elective Major**				
Semester	VIII				
Academic Level	400-499				
CourseDetails	Credit	Lectureperweek	Tutorial perweek	Practical perweek	Total Hours
	4	4	-		60
Pre-requisites	Nil				
CourseSummary	This introductory course in hydrology provides students with a comprehensive understanding of hydrology as a fundamental disciplinein Geography. This course helps to develop an in-depth understanding of Hydrologicalprocessesandfamiliarizesurfaceandgroundwaterhydrology. The student can acquire knowledge about the water qualityparameters and developing skills in water resource management to solvedifferenthydrologic problems in microand macrolevel.				

CourseOutcomes(CO):

CO	**COStatement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tool sused**
CO1	Comprehend different concepts in hydrology	U	C	Instructor-Created exams/Quiz
CO2	Evaluate human impacts on hydrologic cycle	E	C	Writing reflective journals

CO3	Acquires skills to measure hydrological components like Precipitation, evaporation, infiltration, and runoff	An	C	Evaluate theclarity,accuracy, andeffectiveness ofinformation
CO4	Management of water quality and quantity problems at micro and macro level	Ap	C	Discussion /PracticalAssignments
CO5	Identify major water quality parameters and examine the factors affecting the degradation of surface and ground water system	U	C	Instructor-createdexams/Quiz/Seminars/Instructor-createdexams/ Quiz
CO6	Preparation of hydrologic maps or solutions to practical hydrologic problems of an area	Ap	C	Discussion

-Remember(R),Understand(U),Apply(Ap),Analyse(An),Evaluate(E),Create(C)#-Factual Knowledge(F)Conceptual Knowledge(C)Procedural Knowledge(P) MetacognitiveKnowledge(M)

Module	**Unit**	**Content**	**Hrs(48 +12)**	**Marks(70+30)**
I	**An Introduction to Hydrology**		**10**	**15**
	1	An introduction to Hydrology: meaning, nature, branches	1	
	2	Distribution of water on the earth	3	
	3	Hydrological cycle: human impacts on hydrological cycle	4	
	4	Global water balance: water budget.	2	
	Sections from References:			
II	Surface Water Hydrology		**10**	**15**
	5	Surface Water Hydrology	1	
	6	Precipitation:types,measurementofrainfall-Evaporation–Transpiration	3	
	7	Runoff–Catchment–Infiltration :factors controlling	3	
	8	Soil moisture-Drainage basins as hydrological units.	3	
	SectionsfromReferences:			
III	Ground Water Hydrology		**15**	**25**
	9	Ground Water Hydrology-	2	
	10	Porosity and permeability	2	
	11	Aquifers: types and properties –	3	
	12	Ground water flow	2	
	13	Subsurface distribution of water	2	
	14	Groundwater basin development.	1	

	15	Water table	1	
	16	Recharge, storage, discharge of groundwater	1	
	17	Ground water contamination	1	
	Sections from References:			
IV	Water resource management		**13**	**15**
	18	Concept and practices of water resource management–	3	
	19	Water harvesting and conservation methods: Traditional and modern	3	
	20	Eutrophication-Mans impact on water resources-	2	
	21	National water policy.	2	
	22	Sources of hydrological data	3	
	SectionsfromReferences:			
V	**Hydrology and Course Project**		**12**	
	1	-Preparation of GIS based hydrologic maps using field-based data for water resource management	6	
	2	**Project:** **Write a report on** preparation of hydrologic maps	6	
	SectionsfromReferences:			

BooksandReferences:.
1.Todd,D.K. and Mays.L.W.(205) Groundwater Hydrology,John Wiley & Sons.2.Tim,Davie.(2009),FundamentalsofHydrology(3rdEdition),Routledge.
3.ALewisPublishers,CRCPress.ndrew.D.ward andStanley,Trimble(2004):EnvironmentalHydrology,2nd edition,
4.Karanth,K.R.,1988: GroundWater: Exploration,Assessmentand Development,Tata-McGraw Hill, New Delhi.
5.Ramaswamy,C.(1985):ReviewoffloodsinIndiaduringthepast75years:APerspective.Indian National ScienceAcademy, New Delhi.
6.Rao,K.L.,1982:India'sWaterWealth2ndedition,OrientLongman,Delhi.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	3	3	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	2	1	3	3	3	2	2	1	1
CO 4	3	3	2	1	3	1	3	3	2	1	3	2
CO 5	3	3	2	3	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B.Sc. Geography				
Course Title	**Tourism Geography**				
Type of Course	**Elective Major**				
Semester	**VIII**				
Academic level	**400-499**				
Course Details	Credit	Lecture Per week	Tutorial per week	Practical per week	Total Hours
	4	**4**	**-**	**0**	**60**
Pre-requisites	Nil				
Course Summary	The course in Geography of Tourism helps the students with a comprehensive picture of the activity of tourism and its allied sectors in a simpler and deeper understanding level. The motivators, components, hindrances were discussed in detail to provide an overview about the subject. The modern trends in tourism, stakeholders in tourism sector in international and national level, state level etc. is also discussed herewith. The modern forms of responsible tourism such as Eco-tourism and the impact of Tourism has been discussed herewith. A hands-on interesting skill work is being visioned as a part of this course, which will help any learner to gain an interest into the tourism sector of the state.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category	Evaluation Techniques and Tools
CO1	Explains the types and history of Tourism	U	C	Instructor Created Examinations/Quiz
CO2	Inculcates knowledge on the 5-A's of the Tourism sector	U	C	Discussion and Quiz
CO3	Appraisal of the Tourism in the modern world and its trends	U	F	Instructor Created Examinations/Quiz
CO4	Identifies the Stakeholders of the Tourism sector	U	R	Discussions and Quiz
CO5	Preparation of Tourism sector related articles/documentaries	Ap	C	Discussion and Preparation of various works related to tourism sector
Cognitive - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) Factual Knowledge (F), Conceptual (C), Procedural (P), Meta-Cognitive knowledge (M)				

Module	**Unit**	**Content**	**Hrs** **(48+12)**	**Marks** **(70+30)**
I		**Tourism – Development and Characteristics**	**12**	**15**
	1	Tourism: Meaning, Nature, Scope, Elements, Characteristics	2	
	2	Tourism: Forms and Types – Classification of Tourists –	2	
	4	Major Motivators Tourism	2	
	5	Deterrents of Tourism	2	
	6	Historical Development of Tourism in World: Ancient, Medieval and Modern	2	
	7	Emergence of Tourism Post Covid-19 Pandemic	2	
	Sections from References:			
II		**Tourism: Components and Considerations**	**12**	**15**
	8	Basic Components of Tourism (5A's): Attraction, Accessibility, Accommodation, Amenities and Activities	4	
	9	Tour Planning: Individual, Travel Agencies – Travel Formalities – Travel Itinerary: Relevance and Characteristics	2	
	10	Tour Considerations: **Geographical**: Physiography and Terrain, Weather, Natural Hazard Vulnerability etc.,	2	
	11	**Political**: Type of Administration, Basic Laws for Tourists, Healthcare availability, Political Instability, Terrorism etc., **Socio-Cultural**: Ethnicity, Language and Dialect, Basic Customs and responses to Emergency etc.,	2	
	12	**Economic**: Type of Economy, Currency, Money Exchange and Forex charges, Economic Crisis etc.	2	
	Sections from References:			

III		**Tourism in the Modern World**	**12**	**20**
	13	Tourism in the Modern World: Mass Tourism, Responsible Tourism and Sustainable Tourism	2	
	14	Emerging Areas of Tourism	2	
	15	Eco-Tourism: Evolution, Principles, Functions, Types and Trends	2	
	16	Eco-Tourism in World and National Level with Special reference to Eco-tourism in Kerala	2	
	17	Eco-Tourism Destinations in Kerala – A case study of Thenmala Eco-Tourism	4	
	Sections from References:			
IV		**Stakeholders of Tourism Sector**	**12**	**20**
	18	World Tourism: Status, Issues, Challenges	2	
	19	International Organizations related to Tourism: UNWTO, UNDP, WWF, TIES, IATA etc.	2	
	20	National and State level Agencies: Ministry of Tourism, ITDC, IRCTC, FHRAI, DTPC's etc.	4	
	21	Impact of Tourism	2	
	22	Environmental, Socio-Cultural, Economic	2	
	Sections from References:			
V		**Tourism**	**12**	
	1	Preparation of a Travel Guide (with maps and other relevant information)	**12**	
	2	Preparation of a Booklet on any aspect of Tourism		
	3	Preparation of a Micro-Project in Tourism		
	4	Preparation of an 'e-Resource'/'e-Content 'on Tourism of any State/Country		
	5	Preparation of a short documentary related to Tourism		

	Sections from References:		

Books and References:

Alan Lew: World Geography of Travel and Tourism- A Regional Approach, Burlington, 2008.

Bhatia A K: Tourism Development – Principles and Practices, Sterling Publishers, New Delhi, 1996.

Chandra R H: Hill Tourism Planning and Development, Kanishka Publishers, New Delhi .1998.

Hunter C and Green H: Tourism and the Environment, Routledge, London 1995.

Inskeep E: Tourism Planning – An Integrated and Sustainable Approach, Von Nostrand and Reinhold, New York, 1991.

Lea J: Tourism and Development in the Third World, Routledge, London, 1988.

Lloyd E. Hudman: Geography of Travel and Tourism, Thomson Delmar Learning, USA, 2003.

Milton D: Geography of World Tourism, Prentice Hall, New York, 1993.

Stephen Williams: Tourism Geography- Critical Understandings of Place, Space and experience, Routledge publications, New York, 2015.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	1	1	1	2	2		1	3		3
CO 2	3	3	3	2	2			2	2		3	
CO 3	3	3	1	1	2		2		3			

CO 4	3	2	2	1	2	3	2		3	3		3
CO 5	3	3	3	3	3		2		2		3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Economic Geography with Special Reference to India.**				
Type of Course	**Major with theory only (Elective)**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This introductory course in Economic Geography provides students with a comprehensive understanding of how this separate field of study has evolved and come into prominence in governing today's trade relations between diverse geographies. It also Gives an account on various theoretical perspectives in the domain and also discuss some of the main models, and its relevance in today's shrinking world with a special focus on Past present and future of Indian Economy.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	To Evaluate How Economics and Geography are Connected.	E	C	Instructor-created exams / Quiz
CO2	To Understand the role of Location in Guiding any Economic Activity.	U	C	Instructor-created exams / Quiz
CO3	To Understand various Theoretical Perspectives with which subject	U	C	Instructor-created exams /

	Advanced to the current status.			Quiz
CO4	To understand Definition and Type of Economic systems in the world.	U	C	Discussion / among Groups and Seminars
CO5	To Understand meaning and types of Economy.	U	C	Instructor-created exams / Quiz/ Seminars
CO6	To Understand the structure and Challenges of Indian Economy in the Globalised World.	U	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Economic Geography with Special Reference to India.				
Module	**Unit**	**Content**	**Hrs** (60) (48+12)	**Marks External** (70+30)
I	**Introduction to Economic Geography**		**12**	**18**
	1	Domain of Economics among Classification of Knowledge.	2	
	2	Ramifications within and its interaction with other Natural and Social Sciences.	4	
	3	Definition of Economic Geography	1	
	4	Scope of Economic Geography	1	
	5	Structure of Economic Geography	1	
	6	Economic geography within the domain of Human Geography	3	
	Sections from References:			
II	**Economic activity and role of location**		**12**	**18**
	7	Economic Activities and its Types.	2	
	8	Location analysis of Economic activities, and its connection with Demand, Scale and Agglomeration.	2	
	9	Major Location Models:-Von Thunen's Model of Agricultural Land Use,	3	
	10	Theories of Industrial Location- Weber and Losch.	3	
	11	Time dimension in Location of activities and concept of Shrinking time and Geography.	2	
	Sections from References:			
III	**Theoretical Perspectives in Economic Geography**		**12**	**17**
	12	Neo Classical Location theory	2	
	13	Behavioural Approach	2	
	14	Structuralist Approach/Marxist Political Economy.	3	
	15	Post-Structuralist Approaches/New Economic	5	

		Geography/Cultural turn.		
	Sections from References:			
IV	**The Economy**		**12**	**17**
	16	Definition and Types of Economy: - Command Based, Market Based and Mixed Economies.	1	
	17	Structure of Economy in Spatial context.	1	
	18	Public, Private and Public Private Partnership Models of Governing Economy	2	
	19	Understanding Space in Macro and Micro Economics and role of Geography.	2	
	20	Spatial Interaction, Association and Networks in facilitating Production, Consumption and Exchange.	2	
	21	Structure of Indian Economy in Spatial context (Macro level): - Pre-Colonial, Colonial and Post Colonial	2	
	22	Important Policy Changes in the Macro Economic and Sectoral levels of the Economy after Independence with a special focus on Goods and Services Tax (GST).	2	
	Sections from References:			
V	**Past, Present and future of Indian Economy**		**12**	
	1	The Problems and bases of Economic Regionalisation of India.	4	
	2	The Case studies of Agricultural and Industrial Regions.	4	
	3	Prospects and challenges of Indian Economy in the Globalised World. Transnational Integration and Its Spatial outcomes.	4	
	Sections from References:			

Books and References:.

Chisholm, R (1977) Theory of Knowledge, Prentice Hall of India: New Delhi.

Chisholm, M. (1969) Geography and Economics, G Bell and Sons Ltd, London.

Alexander (1986), Economic Geography, Prentice Hall

Krugman, P (1993) Geography and Trade, Lunen and MIT Press, London.

Losch, A (1954), The Economics of Location, New Haven.

Singh, R (2023), Indian Economy, McGraw Hills

Sinha Y & Srivastava V. K (2017), The Future of Indian Economy:- Past Reforms and Challenges ahead, Rupa Publications.

Rajan, R (2023), Breaking the Mould: Reimagining India's Economic Future, Penguin Business.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	1	1	1	3	3	2	2	2	3
CO 2	3	3	2	1	1	1	3	3	2	1	1	2
CO 3	3	3	2	1	1	1	3	3	2	2	1	1
CO 4	3	3	2	1	1	1	3	3	2	1	3	2
CO 5	3	3	2	1	1	1	3	3	2	1	1	1
CO 6	3	3	2	1	1	1	3	3	2	1	1	1

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography
Course Title	**Disaster Management**
Type of Course	**Major**
Semester	VIII
Academic Level	400-499

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60

Pre-requisites	Nil
Course Summary	"Disaster Management explores the principles, strategies, and practices for mitigating, preparing for, responding to, and recovering from natural and human-made disasters. Topics include risk assessment, emergency planning, coordination of resources, and community resilience-building. Emphasis is placed on interdisciplinary approaches and effective management strategies in diverse disaster scenarios."

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding of Disaster Management Principles	U	C	Quizzes and Examinations:
CO2	Knowledge of Disaster Risk Factors:	E	C	Case Studies and Assignments:
CO3	Skills in Disaster Preparedness Planning:			Disaster Preparedness Plan Project:

CO4	Competence in Emergency Response	U	C	Simulation Exercises:
CO5	Awareness of Recovery and Resilience Building:	An	F	Research Papers or Presentations
CO6	.Application of Interdisciplinary Approaches:	Ap	C	Class participation and discussions
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (48 +12)	Marks (70+30)
I		**Introduction to Disaster Management**	**11**	**15**
	1	Disaster: Definition	2	
	2	Concepts of Disaster- Factors and Significance –.	3	
	3	Hazard, Disaster and Vulnerability - Classification of Natural and Manmade Disasters -	4	
	4	Difference, Nature - Types and Magnitude- Phases of Disaster	2	
	Sections from References:			
II	**Historical Perspectives on Disaster Management**		**11**	**15**
	5	Ancient Civilizations and Early Responses	2	
	6	Emergence of Formal Disaster Management Practices:	3	
	7	20th Century Paradigm Shifts	3	
	8	Evolution of International Disaster Management Frameworks	3	
	Sections from References:			
III		**Disaster Risk Assessment and Analysis**	**16**	**25**
	9	Introduction to Disaster Risk Assessment:	1	
	10	Hazard Identification:	1	
	11	Vulnerability Assessment:	2	
	12	Exposure Assessment:	2	
	13	Risk Analysis	2	
	14	Socio-Economic Impact Assessment:	2	
	15	Environmental Impact Assessment:	2	
	16	Community Participation and Stakeholder Engagement:	2	

	17	Integration of Risk Assessment into Decision-Making	2	
	Sections from References:			
IV		Disaster Preparedness and Planning Disaster Response and Recovery	**10**	**15**
	18	Introduction to Disaster Preparedness	1	
	19	Risk Assessment and Vulnerability Analysis	2	
	20	Emergency Response Planning	2	
	21	Immediate Response and Search & Rescue	2	
	22	Recovery and Reconstruction	3	
	Sections from References:			
V			**12**	
	1	1. Disaster Risk Assessment Field Trip: - Organize a field trip to a local area prone to natural hazards (e.g., floodplain, seismic zone, coastal area). - Instruct students to conduct a risk assessment of the area, identifying potential hazards, vulnerabilities, and exposure to risks. - Guide students in collecting data, such as geological information, land-use patterns, infrastructure maps, and community demographics. - Facilitate discussions on risk mitigation strategies and resilience-building measures based on the findings of the risk assessment. 2. Emergency Response Simulation Exercise: - Divide students into groups and assign each group a specific disaster scenario (e.g., earthquake, hurricane, industrial accident). - Instruct groups to develop emergency response plans, including evacuation routes, communication protocols, and resource allocation strategies. - Conduct a simulation exercise where students role-play different stakeholders (e.g., emergency responders, government officials,	6	

		community leaders) and implement their response plans. - Debrief the simulation exercise to discuss strengths, weaknesses, and lessons learned in emergency response planning and coordination.		
	2	3. Community Preparedness Workshop: - Collaborate with local emergency management agencies or community organizations to organize a community preparedness workshop. - Invite guest speakers, such as emergency responders, public health officials, and disaster survivors, to share their experiences and expertise. - Engage students in interactive activities, such as hands-on training in first aid, CPR, fire safety, and basic rescue techniques. - Facilitate discussions on the importance of community resilience, disaster preparedness, and the role of individuals in emergency response and recovery. 4. Disaster Response Plan Development: - Assign students to work in groups and task each group with developing a disaster response plan for a specific type of disaster (e.g., earthquake, flood, wildfire). - Provide students with templates or guidelines for creating response plans, including risk assessment, hazard identification, evacuation procedures, and resource management. - Encourage students to incorporate interdisciplinary approaches and consider the needs of diverse populations, including vulnerable groups and marginalized communities. - Have each group present their response plan to the class, followed by peer feedback and discussion on best practices and innovative solutions.	6	
	Sections from References:			

Books and References:.

1. Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
2. Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.

3. Jagbir Singh Disaster Management : Future Challenges and Opportunities K W Publishers Pvt. Ltd.
4. J. P. Singhal Disaster Management Laxmi Publications.
5. Shailesh Shukla, Shamna Hussain Biodiversity, Environment and Disaster Management Unique Publications
6. C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication.
7. National Disaster Management Guidelines—Management of Landslides and Snow Avalanches, 2009. Government of India. June 2009, New Delhi.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Biogeography**				
Type of Course	**Elective Major**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4		0	60
Pre-requisites	Nil				
Course Summary	Biogeography explores the distribution of life on Earth and the processes shaping these patterns. This course delves into the interplay between biological organisms and their environments, spanning spatial scales from local to global. Students examine the influence of factors such as climate, geology, and human activities on species distribution, biodiversity, and ecosystem dynamics. Through case studies and fieldwork, learners gain an understanding of evolutionary processes, species migration, and conservation strategies. Biogeography integrates concepts from ecology, evolution, and geography, providing a holistic perspective on the complex relationships between life and the Earth's diverse landscapes.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	To Evaluate where does the subject stand among other disciplines	E	C	Instructor-created Discussion / Quiz
CO2	To Understand the Evolution of	U	C	Instructor-created

	floraan fauna on Earth			Debate / Quiz
CO3	To understand the way in which our ecosystem works.	U	C	Instructor-created exams / seminar
CO4	To Analyze different types of biomes and its distribution	An	C	Discussion / among Groups and Seminars
CO5	To understandimportance of Biodiversity and its types.	U	C	Instructor-created exams / Quiz/ Seminars
CO6	To get procedural knowledge of Biodivesity	P	C	Field/Experiments
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module		Contents	Time Hrs 48+12	Marks 70+30
I		**Basic Concepts in Biogeography**	**12**	**15**
	1	Nature and scope of Biogeography	3	
	2	Origin of flora and Fauna	3	
	3	Plant and Animal evolution through the Geological time.	3	
	4	Ecology and Ecological Principles. Darwin's theory of Evolution	3	
	Sections from References:			
II		**Energy flow and nutrients cycles**	**10**	**20**
	5	Biosphere and Energy flow	2	
	6	Bio-Geo chemical cycle with special reference to Oxygen, Phosphorous, Carbon and Nitrogen cycle	2	
	7	Trophic levelsand energy transmission -Food chain , Food web .	2	
	8	Ecological succession and Ecological Pyramid.	2	
	9	Population, community and Species interaction	2	
	Sections from References:			
III		**Biomes and Ecosystem**	**10**	**15**
	10	Habitat and Ecosystem.	2	
	11	Types of Ecosystem – Terrestrial and Aquatic.	2	
	12	Ecotone and Ecocline .	2	
	13	Biomes	2	
	14	Major biomes -Distribution and Characteristics . Tropical Rain forest, Savannas, Hot desert , Icecap and Coral reef.	2	

	Sections from References:			
IV	**Biodiversity and Conservation**		**16**	**20**
	15	Biodiversity – Definition and types	2	
	16	Mega Diversity at global regional and Local level	2	
	17	Hot Spot and Hottest spot in Biodiversity.	2	
	18	Major Hotspot in World and India	2	
	19	Threats to Biodiversity – Biological invasion ,	2	
	20	Concepts of exotic and invasive species..	2	
	21	Conservation measures – In situ and Ex situ.	2	
	22	Conservationmovements with Special reference to Western Ghats	2	
	Sections from References:			
V	**Field Experiments/Practical**		**12**	
		Biodiversity mapping Measuring plant/Animal diversity from the locality Biomass calculation Visit a NP / Sanctuary / Biosphere reserve and Report writing.	12	
	Suggested Readings 1 Geography as a fundamental discipline Ackerman E A 2 The Citizen's Fifth Report on Environment CSE India 3 Biogeography Brett R. Riddle, James H. Brown, Robert J. Whittaker, Mark V. Lomolino 4 Frontiers of Biogeography Mark V. Lomolino, Lawrence R. Heaney 5 Biogeography Of Microscopic Organisms: Is Everything Small Everywhere? Fontanet			

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	3	1	1	1	1	2	3		1	3
CO 2	3	3	3	1	1	1	2			1		
CO 3	3	3	3	1	1	1		2		2	3	2
CO 4	3	3	2	1	1	1	3		2			
CO 5	3	3	2	1	1	1				2		3
CO 6	3	3	2	1	1	1	3	2	2		3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Code	**Elective Major**				
Course Title	**Advanced GIS**				
Type of Course	**Major Elective**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	This course expands upon remote sensing principles and data analysis, focusing on digital image processing in the context of natural resource applications. It covers topics such as radiometric and atmospheric corrections, image formation, image enhancement, and classification.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students will be able to understand the basic and applied principles of remote sensing	U	C	Instructor-created exams / Quiz
CO2	Students can do investigate and select best remote sensing data sources for certain application	E	C	Discussion / Practical Assignments
CO3	Students learn techniques for Identify image distortions and apply appropriate radiometric and geometric image correction	An	C	Discussion / Practical Assignments / Internal Exams / Practicals

	techniques.			
CO4	Evaluate image spatial and spectral transforms and their effect on image quality and data integrity.	Ap	C	Discussion / Practical Assignments
CO5	Introductory ability to conduct supervised and unsupervised classification of satellite multispectral imagery	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Ability to describe and apply at least five standard indices for spectral analysis to detect surface phenomena	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I		**Basics of Remote Sensing**	**10**	**15**
	1	Evaluation of Remote Sensing Concepts: Historical Milestones	2	
	2	Energy Sources: Radiation Laws – Quantum Theory, Particles Theory.	3	
	3	Data Acquisition and Digital Image Concepts	2	
	4	Characteristics of Remote Sensing Systems	3	
		Sections from References:		
II		**Fundamentals of Digital Image Processing**	**10**	**15**
	5	Digital Image Concepts: spatial resolution and information, Spectral resolution and information, radiometric resolution and information and temporal resolution and information.	3	

	6	Digital Image Characteristics and Formation: BIL, BIP, BSQ, Quantization, Digital Numbers, Pixel Values, Univariate and multivariate image statistics	3	
	7	Image Preprocessing: Radiometric Preprocessing – Systematic and Random noises	2	
	8	Geometric Preprocessing – Systematic and Random, Resampling techniques,	2	
	Sections from References:			
III	**Image Enhancement**		**15**	**25**
	9	Basic concepts of Image Enhancement and Spectral Transformation	2	
	10	Contrast Manipulation - Gray-Level Thresholding, Level Slicing	2	
	11	Contrast Stretching – Linear and Non-Linear contrast Strech	2	
	12	Spatial Feature Manipulation – Convolution, Spatial Filters, Edge Enhancement	2	
	13	Multi Image Manipulation - Spectral Ratioing, Indices – NDVI, SAVI	1	
	14	Principal Component Analysis, Canonical Component Analysis, IHS Transformation	2	
	15	Atmospheric Correction: Dark Object Subtraction	2	
	16	Fourier Transformation and Wavelet Transformation	1	
	17	Advantages and Disadvantages of Image enhancement techniques	1	
	Sections from References:			
IV	**Information Extraction Techniques**		**13**	**15**
	18	Digital Image classification – assumptions and principles.	3	
	19	Supervised Classification – Classifiers – Minimum Distance to Mean Classifier, Parallelepiped Classifier, Maximum Likelihood Classifier	3	
	20	Unsupervised Classification – conceptual background, ISODATA, K-Means	3	
	21	Accuracy Assessment – Ground truth verification, Confusion Matrix	3	
	22	Hyperspectral Remote Sensing – Principles and Applications	3	

	Sections from References:			
V	Project		12	
	1	Students have to do following practical 1Image Preprocessing 2Image Enhancement 3Supervised Classification 4. Change Detection Assessment 5. Unsupervised Classification 6. Accuracy Assessment	12	
	Sections from References:			

Books and References:

9. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
10. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
11. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
12. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
13. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.

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Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	2	2	1	3	3	2	2	2	3
CO 2	3	3	2	2	2	1	3	3	2	1	1	2
CO 3	3	3	2	2	2	1	3	3	2	2	1	1
CO 4	3	3	2	2	2	1	3	3	2	1	3	2
CO 5	3	3	2	2	2	1	3	3	2	1	1	3
CO 6	3	3	2	2	2	1	3	3	2	1	1	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Programme	B. Sc. Geography				
Course Title	**Spatial Statistics for GIS Using R**				
Type of Course	**Elective Major**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	0	60
Pre-requisites	Nil				
Course Summary	Explore the integration of spatial statistics and GIS using R. Learn fundamental techniques for analyzing spatial data, including exploratory data analysis, interpolation, regression analysis, and advanced spatial modeling. Hands-on exercises and real-world applications enhance understanding of spatial patterns and relationships. Gain practical skills for conducting spatial analysis and making informed decisions in diverse fields.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Ability to understand and apply spatial statistical techniques using R for analyzing geographic data.	U	C	1. Assignments: Assessing practical application of spatial statistical techniques in R through assignments related to data analysis and interpretation.
CO2	Proficiency in conducting exploratory	E	C	2. Quizzes:

	spatial data analysis (ESDA) to identify spatial patterns and relationships.			Testing conceptual understanding and knowledge retention through short quizzes on spatial statistical concepts and R programming.
CO3	Skill in utilizing various spatial statistical models such as spatial autocorrelation, spatial regression, and point pattern analysis for GIS applications.	E	C	3. Project Work: Evaluating the ability to apply spatial statistical methods to a specific GIS project, demonstrating analytical skills and problem-solving capabilities.
CO4	Competence in integrating spatial statistics with geographic information systems (GIS) to solve real-world problems.	A	F	4. Class Presentations: Assessing communication skills and the ability to convey complex spatial statistical analyses and findings to peers. .
CO5	Capacity to interpret and communicate results obtained from spatial statistical analyses effectively.	E	C	5. Exams: Assessing overall comprehension of spatial statistics concepts,

				methods, and their application in GIS using R through midterm and final exams.
CO6	Understanding of the theoretical foundations of spatial statistics and their relevance in spatial data analysis.	C	P	6. Participation: Evaluating engagement in class discussions, contribution to group activities, and interaction with course materials to gauge overall learning progress and understanding

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I		**Introducing geo-data and their representation in R**	**10**	**15**
	1	Overview of Geographic Data	1	
	2	Types of Geographic Data	3	
	3	Spatial Data Formats	4	
	4	Visualization Techniques	2	
	Sections from References:			
II		**Exploratory Spatial Data Analysis (ESDA)**	**10**	**15**
	5	Visualizing Spatial Data	1	
	6	Spatial Autocorrelation Analysis	3	
	7	Global Moran's I	3	
	8	Local Moran's I (LISA):	3	
	Sections from References:			
III		Introduction to Point Pattern Analysis	**17**	**25**
	9	Introduction to Point Pattern Analysis	1	
	10	Spatial Point Process Modeling:	2	
	11	Point Pattern Visualization	2	
	12	Ripley's K Function:	2	
	13	Nearest Neighbor Analysis	2	
	14	spatial auto correlation	2	
	15	Quadrat Analysis	2	
	16	Distance-based Analysis	2	
	17	Applications of Point Pattern Analysis	2	

	Sections from References:			
IV	Spatial Regression		**11**	**15**
	18	Introduction to spatial regression	2	
	19	Types of spatial regression model	2	
	20	- Kernel density estimation	2	
	21	- Linear regression for spatial data	2	
	22	- Geographically weighted regression (GWR) Spatial autoregressive model	3	
	Sections from References:			
V			**12**	
	1	1. Introduction to Geostatistics-Basics of geostatistics Variogram analysis- Kriging interpolation 2.Advanced Topics in Spatial Statistics Cluster analysis ,Spatial data mining techniques- Time-series analysis in spatial context 3Integrating Spatial Statistics with GIS, Importing and exporting spatial data in R- Spatial data manipulation in R Visualization techniques for spatial data	6	
	2	Project Work and Presentations - Application of spatial statistical techniques to a GIS project - Data analysis, interpretation, and presentation - Peer review and presentation of project findings	6	
	Sections from References:			

Books and References:.

Bivand, R. S., Pebesma, E., & Gómez-Rubio, V. (2013). Applied spatial data analysis with R. Springer.

Getis, A., & Ord, J. K. (2010). The analysis of spatial association by use of distance statistics. Geographical Analysis, 24(3), 189-206.

Haining, R. (2003). Spatial data analysis: Theory and practice. Cambridge University Press.

O'Sullivan, D., & Unwin, D. (2010). Geographic information analysis. John Wiley & Sons.

Waller, L. A., & Gotway, C. A. (2004). Applied spatial statistics for public health data. John Wiley & Sons.

Anselin, L. (2019). Exploring spatial data with GeoDaTM: A workbook. Center for Spatial Data Science.

Gatrell, A. C., Bailey, T. C., & Diggle, P. J. (1996). Spatial point pattern analysis and its application in geographical epidemiology. Transactions of the Institute of British Geographers, 21(1), 256-274.

Griffith, D. A. (1987). Spatial autocorrelation: A primer. Association of American Geographers.

Lloyd, C. D. (2010). Analysing spatial data: an introduction to GIS and spatial analysis. Cambridge University Press.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	2	2	1	3	3	2	2	2	3
CO 2	3	3	2	2	2	2	3	3	2	1	1	2
CO 3	3	3	2	2	2	1	3	3	2	2	1	1
CO 4	3	3	2	2	2	1	3	3	2	1	3	2
CO 5	3	3	2	2	2	1	3	3	2	1	1	1
CO 6	3	3	2	2	2	3	3	3	2	1	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Geography of Health and Wellbeing**				
Type of Course	**Major Elective**				
Semester	VIII				
Academic Level	400-499				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Health geography deals with human-environment interactions and the influence of these interactions on public health. This course provides a broad-based, comprehensive survey of geographic topics and approaches in medical sciences. Hands-on experiences will be emphasized through GIS labs. The study of Geography of health is essential to portray an understanding and prevailing of the patterns of diseases over locations and time. Analysis of the links between the migration of people and spread of diseases and environment and health is by its very nature a spatial problem.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	The focus of Health Geography is on the geographical patterns of health and diseases from the view point of the populations. Understanding of key concepts	U	C	Instructor-created exams / Assignments/ Quiz

	related to medical and health geography			
CO2	Medical Geography seeks to improve our understanding of the various factors which affect the health of the population.	U	C	Interactive Lectures/Writing reflective journals/seminars
CO3	Medical Geography helps researchers to understand the power of mapping their study data and understanding health and disease	An	C	Evaluate the clarity, accuracy, and effectiveness of their map design in conveying information
CO4	They will understand how spatial analysis using Remote Sensing and GIS can benefit health care systems to enhance health access to health care.	Ap	C	Discussion / Practical Assignments
CO5	It focuses on the topics of disease diffusion and human ecology, role of geographical information systems for health and healthcare disparities and various methods for analyzing health/disease data	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Along with that they will provide a set of analytical skills to evaluate the demographic, social, economic and political relationships that can explain health inequalities and differences in access to health care.	E	C	Assignments, Presentation, Individual and group projects
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I		**Introduction to Health Geography**	**11**	**15**
	1	Definition, scope, and importance – Development of health Geography	3	
	2	Distribution of Diseases and Health	2	
	3	Spatial Patterns of Disease- Environmental, cultural and social determinants of disease distribution	4	
	4	Global Health and Health Disparities – Classification of Diseases- WHO Classification	2	
	Sections from References:			
II		**Spatial Epidemiology**	**11**	**15**
	5	Spatial Epidemiology - Epidemiological Transition Theory	2	
	6	Disease diffusion – types and geographic variations in health outcomes.	3	
	7	Regional patterns of communicable, non-communicable and infectious diseases in India	3	
	8	Epidemic, Endemic and Pandemic	3	
	Sections from References:			
III		**Environment and Health**	**15**	**25**
	9	Disease Ecology- Ecology of Infectious Diseases	2	
	10	Human Environment Interaction- Triangle of human ecology -Transmission dynamics	2	
	11	Major Tropical Diseases	2	
	12	Exposure and Health Risks	2	
	13	Vector-borne diseases and their Environmental Health	2	
	14	Impact of environmental factors on health	1	

	15	Climate Change and Health	1	
	16	Adaptation and mitigation strategies	1	
	17	Migration and Disease – Travel Medicine.	2	
	Sections from References:			
IV	**Health Care Access and Delivery**		**10**	**15**
	18	Health Care Systems and Access -Hierarchy of Medical Services	2	
	19	Urban Health and Rural Health Disparities - Access barriers and inequalities	2	
	20	Urbanization and health challenges	2	
	21	Future Trends and Challenges in Health Geography	2	
	22	Health Education – Health care policies in India - Telemedicine	2	
	Sections from References:			
V	**Medical Cartography and Course Project**		**12**	
	1	Remote Sensing, GIS and Health Spatial Modelling Techniques in Epidemiology GIS Applications in Environmental Health Assessment	6	
	2	**Project:** Disease mapping and quantitative spatial analysis using medical statistics	6	
	Sections from References:			

Books and References:.

11*. Rais, Akhtar., (Ed.), (1990): Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.*

2. Avon, Joan, L. and Jonathan, A, Patzed (2001): Ecosystem Changes and Public Health,Baltimin, John Hopling Unit Press(ed).

3. Bradley,D.,(1977): Water, Wastes and Health in Hot Climates, John Wiley Chichesten.

4. Christaler, George and Hristopoles, Dionissios., (1998): Spatio-Temporal Environment Health Modelling, Boston Kluwer Academic Press. 68

5. Cliff, A.D. and Peter,H., (1988): Atlas of Disease Distributions, Blackwell Publishers, Oxford.

6. Gatrell, A. andLoytonen, (1998): GIS and Health, Taylor and Francis Ltd, London.

7. *Harpham T. and Tanner, M.,(eds)(1995): Urban Health in Developing Countries; Progress and Prospects, Routledge, London.*
8. *Hazra, J., (1997): Health Care Planning in Developing Countries. University of Calcutta,Calcutta.*
9. *Moeller, Dade, wed., (1993): Environmental Health, Cambridge, Harward Univ. Press.*
10. *Murray, C. and A. Lopez, (1996): The Global Burden of Disease, Harvard University Press.*
11. *Narayan, K.V., (1997): Health and Development Inter-Sectoral Linkages in India. Rawat Publications, Jaipur.*
12. *Phillips, D.andVerhasselt, Y., (1994): Health and Development, Routledge, London.*
13. *Tromp, S., (1980): Biometeorology: The Impact of Weather and Climate on Humans and their Environment, Heydon and Son.*

Detailed Syllabus:

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	2	2	2	3	3	3	2	2	2	3
CO 2	3	3	2	2	2	3	3	3	2	1	1	3
CO 3	3	3	2	2	2	3	3	3	2	2	1	3
CO 4	3	3	2	2	2	3	3	3	2	1	3	3
CO 5	3	3	2	2	2	3	3	3	2	1	1	3
CO 6	3	3	2	2	2	3	3	3	2	1	1	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

CLIMATE SCIENCE AND DISASTER MANGEMENT

The student is majoring in BSc Geography with minors in Climate Science, Disaster Management, and Geostatistics. With this combination, students have the option to pursue advanced studies such as MSc in Climatic Science, MSc in Disaster Management, and MSc in Statistics at reputable universities. These MSc programs provide valuable opportunities for further academic advancement in specialized fields like Climatic Science and Disaster Management.

<table>
<tr><td>Programme</td><td colspan="5">B. Sc. Geography</td></tr>
<tr><td>Course Title</td><td colspan="5">Weather and Climate Change</td></tr>
<tr><td>Type of Course</td><td colspan="5">Minor With Practical</td></tr>
<tr><td>Semester</td><td colspan="5">I</td></tr>
<tr><td>Academic Level</td><td colspan="5">100-199</td></tr>
<tr><td rowspan="2">Course Details</td><td>Credit</td><td>Lecture per week</td><td>Tutorial per week</td><td>Practical per week</td><td>Total Hours</td></tr>
<tr><td>4</td><td>3</td><td>-</td><td>2</td><td>75</td></tr>
<tr><td>Pre-requisites</td><td colspan="5">Nil</td></tr>
<tr><td>Course Summary</td><td colspan="5">The Weather and Climate Change course delves into the dynamics of Earth's atmosphere, examining meteorological phenomena, climate patterns, and their interconnections. Students analyze the drivers of weather events and explore the long-term trends shaping global climates. Emphasis is placed on understanding human-induced alterations to the climate system and strategies for adaptation and mitigation. Through a combination of theory and practical applications, learners gain insight into the complexities of weather and climate dynamics in a changing world.</td></tr>
</table>

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental principles governing atmospheric processes and their role in shaping weather patterns and climate systems.	U	C	Instructor-created exams / Quiz
CO2	2. Analyze the mechanisms driving weather phenomena such as precipitation, temperature variations, and atmospheric circulation.	E	C	Analyze spatial data related to weather phenomena, such as precipitation patterns, temperature distributions, and atmospheric circulation features.
CO3	3. Evaluate the impacts of human activities on climate change and recognize strategies for mitigation and adaptation.	An	C	Identify potential risks associated with various human activities on climate change.
CO4	4. Interpret climate data and models to forecast future climate trends and variability.	Ap	C	Assesses vulnerabilities and potential impacts on ecosystems, economies, and communities.
CO5	5. Demonstrate proficiency in using meteorological instruments and techniques for weather observation and analysis.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-

				created exams / Quiz
CO6	6. Communicate effectively about weather and climate-related topics, fostering public understanding and engagement in climate action.	Ap	C	Discussion
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70)**
I	Introduction to Weather and climate		**10**	**15**
	1	Earth and climate of the earth	1	
	2	The Atmosphere-Sun-Earth relationship,	3	
	3	Solstices and equinoxes,	4	
	4	Motion of earth	2	
	Sections from References:			
II	Atmosphere and its components		**10**	**15**
	5	Structure of the atmosphere,	1	
	6	Chemical Physical and composition of the atmosphere,	3	
	7	Terrestrial Radiation Troposphere to Thermosphere, Gaseous structure ,	3	
	8	Significance of Ozone, Green House Gases , water vapour and aerosols, Pollutants PM2.5, PM10 , radiation energy balance	3	
	Sections from References:			
III	Circulation of atmospheres,		**15**	**25**
	9	Global Pressure belts	2	
	10	Winds	2	
	11	Macro scale winds	1	
	12	Meso scale winds	2	
	13	Micro scale winds	2	
	14	Global circulation	1	

	15	Single cell circulation	1	
	16	Three cell circulation	2	
	17	Global winds and ocean currents	2	
	Sections from References:			
IV	Precipitation and Water Balance		**10**	**15**
	18	Cloud cover,	1	
	19	cloud types ,	2	
	20	Types of precipitation, and	2	
	21	Cyclones; cyclogenesis	2	
	22	Anticyclones	3	
	Sections from References:			
V	Weather, Climate change and variability **and Course Project**		**30**	
	1	Exercise 1: Understanding Structure and functions of the Indian Meteorological Department (IMD). Exercise 2: Collection of climatic data from IMD website. https://mausam.imd.gov.in/bengaluru/ Exercise 3: Plotting of downloaded climatic data using graphical methods 2 Weather Observations: Record daily weather observations such as temperature, precipitation, wind speed, and cloud cover. 3.Analyze historical weather data: Access climate databases or online resources to retrieve historical weather data for your region. Analyze trends in temperature, precipitation, and extreme weather events over time 4.Identify potential impacts of climate change on your local area, such as sea-level rise, changing precipitation patterns, or increased frequency of heatwaves.	20	
	2	1.Measurement of weather elements using analogue instruments: Mean daily temperature, air pressure, relative humidity, and rainfall 2. Interpretation of a daily weather map of India (any two): Pre-Monsoon, monsoon, and post-monsoon	10	

		3. Construction and interpretation of monthly rainfall dispersion diagram (quartile method). Climatic water budget 4. Construction and interpretation of hythergraph and climograph (after Taylor		
	Sections from References:			

Books and References:.

1. Ahrens, C. D., & Henson, R. (2019). Meteorology Today: An Introduction to Weather, Climate, and the Environment. Cengage Learning.

2. Aguado, E., & Burt, J. E. (2018). Understanding Weather and Climate. Pearson.

3. Dessler, A., & Parson, E. (2019). Introduction to Modern Climate Change. Cambridge University Press.

4. Frederick, J. E. (2017). Principles of Atmospheric Science. Oxford University Press.

5. Hartmann, D. L. (2016). Global Physical Climatology. Academic Press.

6. Lehr, P. E., & Sirman, F. J. (2015). Weather and Climate: An Illustrated Guide to Science. Jones & Bartlett Learning.

7. Lutgens, F. K., Tarbuck, E. J., & Tasa, D. G. (2020). The Atmosphere: An Introduction to Meteorology. Pearson.

8. McDonald, A. J. (2018). Dynamic Meteorology: A Basic Course. Springer.

9. Romm, J. (2018). Climate Change: What Everyone Needs to Know. Oxford University Press.

10. Wallace, J. M., & Hobbs, P. V. (2006). Atmospheric Science: An Introductory Survey. Academic Press.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Climate Change and Sustainable Development**				
Type of Course	**Minor With Practical**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	The Climate Change and Sustainable Development course examines the interconnectedness of environmental challenges and sustainable development goals. Students analyze the impacts of climate change on ecosystems, economies, and societies, while exploring strategies for mitigation, adaptation, and fostering resilience to create a more sustainable and equitable future.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Recognize the interdependencies between climate change and sustainable development goals, elucidating the impacts on ecosystems, economies, and societies.	U	C	Instructor-created exams / Quiz
CO2	Evaluate strategies for mitigating greenhouse gas emissions and enhancing resilience to climate-related challenges, fostering sustainable development pathways.	E	C	Assigning case studies related to successful and unsuccessful conservation efforts can encourage students to

				critically analyze the factors contributing to their outcomes and derive lessons for future conservation initiatives.
CO3	Analyze the socio-economic implications of climate change policies and initiatives, considering equity and justice concerns.	An	C	Assigning research papers on specific conservation topics allows students to delve deep into the scientific literature, understand key concepts, and develop analytical and writing skills.
CO4	Apply interdisciplinary approaches to address complex environmental problems, integrating knowledge from fields such as ecology, economics, and social sciences.	Ap	C	Assigning tasks that involve analyzing conservation policies, regulations, and management plans
CO5	Communicate effectively about climate change issues, engaging diverse stakeholders and advocating for sustainable development practices.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Propose innovative solutions and policies for promoting climate resilience and achieving sustainable development	Ap	C	Discussion

	objectives at local, national, and global scales.			
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	Introduction to Climate Change concepts		**10**	**15**
	1	Global Issues and challenges of Climate Change:	1	
	2	Global climate systems, Causes and Consequences	3	
	3	Green House gases, warming world, atmospheric pollutants cause, IPCC: climate variability and extremes,	4	
	4	Effects of global warming	2	
	Sections from References:			
II	Sustainable Development		**10**	**15**
	5	Definitions of sustainability: Scope and emerging trends;	1	
	6	Climate and Sustainable Development Sustainable Development Goals: An overview; National and State Policies; Role of planning department in its implementation:	3	
	7	Sustainable cities, sustainable food,	3	
	8	Sustainable communities	3	
	Sections from References:			
III	International and national initiatives		**15**	**25**
	9	UNFCC	2	
	10	Montreal protocol,	2	
	11	National Action Plan on Climate Change NAFCC;	1	
	12	State action plan on climate change,	2	
	13	International cooperation’s, policies,	2	

	14	Conference of Parties (COP)and nationally determined contributions (NDCs)	1	
	15	SAPCC, district and local bodies, scenarios,	1	
	16	Trajectories, A1, A2, B1 , scenarios,	2	
	17	RCP trajectories	2	
	Sections from References:			
IV	Impacts of climate change		**10**	**15**
	18	Climate Change: Forest and Biodiversity	1	
	19	Climate Change: Agriculture and Food Security	2	
	20	Climate Change and Water	2	
	21	Climate Change: Coastal Ecosystem and fisheries	2	
	22	Climate change and Urban habitat Climate change and Transport network / Energy sector	3	
	Sections from References:			
V	Sustainable Development **and Course Project**		**30**	
	1	1. Impact Assessment: Conduct a field study to assess the effects of climate change on a local ecosystem or community, documenting changes in temperature, precipitation, biodiversity, and socioeconomic indicators. 2. Policy Analysis: Analyze climate change policies and sustainable development strategies implemented by governments or organizations, evaluating their effectiveness, equity implications, and potential for long-term sustainability. 3. Community Engagement: Organize a community workshop or forum to raise awareness about climate change impacts and discuss local adaptation and mitigation measures, encouraging active participation and collaboration among residents.	20	
	2	Project: Sustainable Development Project: Develop a sustainability project focusing on renewable energy, waste management, or resource conservation, aiming to reduce carbon emissions and promote	10	

		resilience in a specific area or community. Scenario Planning: Facilitate a scenario planning exercise where participants explore alternative futures under different climate change scenarios, identifying key vulnerabilities, opportunities, and adaptive strategies for sustainable development.		
	Sections from References:			

Books and References:.

1. Adger, W. N. (2006). Vulnerability. Routledge.

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9. Sachs, J. D. (2015). The Age of Sustainable Development. Columbia University Press.

10. Stern, N. (2007). The Economics of Climate Change: The Stern Review. Cambridge University Press.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	3	3	-	2	-	-	3
CO 2	3	-	-	-	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	3
CO 4	3	-	2	3	3	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	3	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓			✓

CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Mitigation and Adaptation to Climate Change**				
Type of Course	**Minor With Practical**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	The course covers mitigation strategies to reduce greenhouse gas emissions and their impact on climate change, alongside adaptation measures to cope with environmental changes. Topics include renewable energy, sustainable agriculture, resilient infrastructure, and policy frameworks to address the challenges of a changing climate.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the concepts of mitigation and adaptation in the context of climate change, distinguishing between strategies aimed at reducing emissions and those focused on building resilience.	U	C	Instructor-created exams / Quiz
CO2	Evaluate the effectiveness of various mitigation measures, including renewable energy deployment, carbon capture and storage, and sustainable land use practices.	E	C	Organizing debates or role-playing exercises where students take on different stakeholder perspectives
CO3	Analyze the socio-economic	An	C	Organizing field

	implications of climate change adaptation strategies, considering factors such as equity, vulnerability, and community resilience.			trips or practical exercises that involve conducting habitat assessments, biodiversity surveys, and ecosystem service evaluations can provide hands-on experience and reinforce theoretical knowledge.
CO4	Apply knowledge of climate science and policy frameworks to assess the feasibility and implementation challenges of mitigation and adaptation initiatives.	Ap	C	Critical Discussions and Seminars
CO5	Develop interdisciplinary solutions to climate change challenges, integrating scientific, technological, economic, and social perspectives.	U	C	Group Projects
CO6	Communicate effectively about mitigation and adaptation strategies, advocating for informed decision-making and collective action to address climate change impacts.	Ap	C	Community Engagement Projects
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		Mitigation and adaptation	**10**	**15**
	1	Measures of mitigation action: Emission Reductions, Carbon sequestration and trading,	1	
	2	Clean development mechanism, clean energy, green energy,	3	
	3	Alternative energy sources, bio fuels, afforestation Measures of adaptation action: early warnings, disaster preparedness, capacity building, building resilient infrastructure, resilience building,	4	
	4	Integrated land use planning	2	
	Sections from References:			
II		Impact Assessments in Climate change	**15**	**25**
	5	IPCC s Reports 1 to 6th assessment (AR6) Scenarios,	2	
	6	Trajectories, A1, A2, B1 , scenarios, RCP trajectories	1	
	7	National Action Plan on Climate Change NAFCC; State action plan on climate change,	2	
		WMO	1	
	8	UNFCC , IMD, IITM	1	
	9	Primary survey, statistical analysis: Mean, Median Mode- standard deviation-coefficient of variation- Correlation and Regression Modelling tools	2	
	10	Agencies working, Global climate forecast systems	2	
	11	Remote sensing/ GIS/ Radars/ GPS/ Satellites/ Drones	1	
	12	Climate Change: Forest and Biodiversity	1	
	13	Climate Change: Agriculture and Food Security	1	
	14	Climate Change and Water	1	

	Sections from References:			
III		Vulnerability concepts and assessments	**10**	**15**
	15	Concepts on Exposure,	2	
	16	Sensitivity and adaptive capacity	4	
	17	Methodologies for Vulnerability Assessments Top down and bottom-up methods:	4	
IV		Disasters and Sustainable Solutions	**10**	**15**
	18	Disaster concepts	1	
	19	Disaster risk reductions Early warnings , preparedness	2	
	20	projected climatic and ecological changes	2	
	21	Nature based solutions , community based v/s technological solutions	2	
	22	Regional planning	3	
V			**30**	
	1	Conduct energy audits in residential or commercial buildings to identify opportunities for energy efficiency improvements. - Implement measures such as installing energy-efficient lighting, appliances, and HVAC systems.	20	
	2	- Implement waste reduction programs such as composting, recycling, and source reduction in households, schools, or workplaces.		
	2	Promote alternatives to single-occupancy vehicles such as carpooling, public transit, biking, or walking. Organize community events like bike-sharing programs or car-free days to encourage sustainable transportation choices. Participate in habitat restoration projects such as tree planting, wetland restoration, or coastal dune stabilization to enhance ecosystem resilience.	10	
	Sections from References:			

1. Adger, W. N., Lorenzoni, I., & O'Brien, K. L. (Eds.). (2009). Adapting to Climate Change: Thresholds, Values, Governance. Cambridge University Press.

2. Burton, I., Huq, S., Lim, B., & Pilifosova, O. (Eds.). (2002). From Impacts Assessment to Adaptation Priorities: The Shaping of Adaptation Policy. United Nations Development Programme.

3. Ebi, K. L., & Burton, I. (2008). Integrated Risk and Uncertainty Assessment of Climate Change Response Policies. Earthscan.

4. Fankhauser, S., & McDermott, T. K. J. (Eds.). (2014). The Economics of Climate Resilient Development. Edward Elgar Publishing.

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7. Klein, R. J. T., Schipper, E. L. F., & Dessai, S. (Eds.). (2005). Integrating Mitigation and Adaptation into Climate and Development Policy: Three Research Questions. Tyndall Centre for Climate Change Research.

8. Smit, B., & Wandel, J. (2006). Adaptation, Adaptive Capacity and Vulnerability. Global Environmental Change, 16(3), 282–292.

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10. Tol, R. S. J., & Verheyen, R. (2004). State-of-the-Art: The Economic Impact of Climate Change in Europe. Institute for Environmental Studies, Vrije Universiteit.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	-	3	-	2	-	2	3
CO 2	3	-	-	3	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	3	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	3
CO 6	-	-	2	2	3	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

DISASTER MANAGEMENT

Programme	B. Sc. Geography				
Course Title	**Introduction to Disaster Management**				
Type of Course	**Minor With Practical**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Introduction to Disaster Management provides a foundational understanding of disaster risk reduction, response, and recovery. Topics include disaster types, risk assessment, emergency planning, and community resilience. Through case studies and practical exercises, students learn to analyze disaster impacts and implement effective management strategies. This course equips learners with essential skills to mitigate risks and support communities in times of crisis.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles and concepts of disaster management.	U	C	Written exams assessing knowledge of disaster management theories and terminology.

CO2	Identify different types of disasters, their causes, and their impacts on communities.	E	C	Research projects or presentations on specific disasters, analyzing causes, impacts, and responses
CO3	Develop skills in risk assessment, preparedness, response, and recovery strategies.		P	Simulation exercises where students develop emergency response plans for hypothetical disaster scenarios.
CO4	Analyze and evaluate disaster management policies and practices.	A	C	Case studies requiring students to critique existing disaster management policies and propose improvements.
CO5	Demonstrate effective communication and collaboration in disaster management contexts.	E	F	Group projects or role-playing activities simulating coordination between various stakeholders during a disaster response
CO6	Apply ethical considerations and cultural sensitivity in disaster management efforts.	A	P	Reflective essays or discussions on ethical dilemmas and cultural considerations in disaster response and recovery operations.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		Introduction to disaster	**10**	**15**
	1	Concepts of Disaster	1	
	2	Concepts of Hazard	3	
	3	Concepts of Vulnerability and Resilience	4	
	4	Concept of Risks	2	
	Sections from References:			
II	**Types of disaster.**		**10**	**15**
	5	Natural Disasters,	1	
	6	Man-Made Disasters,	3	
	7	Complex Disasters,.	3	
	8	Pandemic Disasters	3	
	Sections from References:			
III	**Study of Important disasters-**Global dimensions of disasters, Overview of Disasters in India.		**15**	**25**
	9	Global Dimensions of Disasters:	2	
	10	Overview of Disasters in India:	2	
	11	Case Studies of Specific Disasters:	1	
	12	Community Resilience and Disaster Preparedness:	2	
	13	Technological Innovations and Disaster Management:	2	
	14	Public Health and Disaster Management:	1	
	15	Environmental Management and Disaster Risk Reduction	1	

	16	Social Vulnerability and Equity in Disaster Management	2	
	17	Policy Analysis and Institutional Frameworks	2	
	Sections from References:			
IV		Vulnerability Profile of India	**10**	**15**
	18	Physical Vulnerability	1	
	19	Socio-economic Vulnerability	2	
	20	Healthcare Infrastructure and Vulnerability	2	
	21	Environmental Degradation and Vulnerability	2	
	22	Displacement and Migration Patterns	3	
	Sections from References:			
V			**30**	
	1	. Practical Exercises for Fundamentals of Disaster Management: 1. Disaster Risk Assessment Simulation: - Conducting field assessments to identify hazards, vulnerabilities, and risks in a local community. - Analyzing data collected to prioritize risks and develop mitigation strategies. - Presenting findings and recommendations to stakeholders. 2. Emergency Response Drill: - Organizing and participating in an emergency response exercise simulating a disaster scenario (e.g., earthquake, flood, fire). - Practicing roles and responsibilities of emergency responders, including search and rescue, first aid, and evacuation procedures. - Evaluating the effectiveness of the response and identifying areas for improvement. 3. Community Preparedness Workshop: - Facilitating workshops with community members to raise awareness about disaster risks and preparedness measures.	30	

		- Conducting hands-on training sessions on basic first aid, fire safety, and evacuation procedures. - Developing community emergency plans and establishing communication networks for rapid response. 4. Damage Assessment and Needs Analysis: - Conducting post-disaster damage assessments to determine the extent of infrastructure damage and humanitarian needs. - Utilizing assessment tools and techniques to collect and analyze data on affected populations, shelter, water, sanitation, and health services. - Collaborating with local authorities and humanitarian organizations to prioritize response efforts and allocate resources effectively. 5. Risk Communication Exercise: - Developing risk communication materials (e.g., brochures, posters, social media campaigns) tailored to different target audiences. - Conducting mock public awareness campaigns to disseminate information on disaster risks, preparedness measures, and evacuation procedures. - Evaluating the effectiveness of communication strategies through surveys, focus groups, or community feedback. 6. GIS Mapping and Spatial Analysis: - Using Geographic Information Systems (GIS) tools to map hazard zones, vulnerable populations, critical infrastructure, and evacuation routes. - Analyzing spatial data to assess the potential impact of disasters and identify areas at higher risk. - Integrating GIS mapping into disaster management planning and decision-making processes. These practical exercises provide hands-on experience and skills development opportunities for students to apply theoretical		

		concepts and principles of disaster management in real-world scenarios.		
	Sections from References:			

Books and References:.

1. Blanchard, B. W. (2017). Disaster Management Handbook. Butterworth-Heinemann.

2. Coppola, D. P. (2015). Introduction to International Disaster Management. Butterworth-Heinemann.

3. Haddow, G. D., Bullock, J. A., & Coppola, D. P. (2017). Introduction to Emergency Management. Butterworth-Heinemann.

4. Kapucu, N., & Liou, K. T. (2014). Disaster and Development: Examining Global Issues and Cases. Springer.

5. Koenig, K. L., & Schultz, C. H. (2012). Koenig and Schultz's Disaster Medicine: Comprehensive Principles and Practices. Cambridge University Press.

6. McEntire, D. A. (2007). Introduction to Homeland Security: Understanding Terrorism with an Emergency Management Perspective. Wiley.

7. Quarantelli, E. L. (1998). What is a Disaster?. Routledge.

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10. Waugh, W. L., & Tierney, K. J. (2017). Disasters and Disaster Management. Routledge.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	3	-	3	-	2	-	-	2
CO 2	3	-	-	-	-	-	3	-	-	-	-	-
CO 3	2	-	3	2	3	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	3
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Disaster Management Processes**				
Type of Course	**Minor With Practical**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	"Disaster Management Processes" provides an overview of the comprehensive cycle of disaster management, including mitigation, preparedness, response, and recovery. Students explore the principles, strategies, and techniques essential for effective disaster planning, coordination, and resilience-building in the face of natural and man-made hazards.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the stages and principles of disaster management.	U	C	Written assessments evaluating knowledge of disaster management frameworks, including the disaster cycle and key principles.

CO2	Develop skills in disaster risk assessment and mitigation.	E	C	Practical exercises assessing the ability to identify and prioritize risks, develop mitigation strategies, and implement risk reduction measures.
CO3	Demonstrate proficiency in emergency preparedness planning.	C	P	Review and analysis of emergency preparedness plans, assessing completeness, effectiveness, and alignment with best practices.
CO4	Apply effective communication and coordination in disaster response.	A	P	Role-playing exercises simulating communication and coordination among stakeholders during disaster response scenarios.
CO5	Analyze post-disaster recovery and reconstruction processes.	An		Case studies and presentations evaluating post-disaster recovery efforts, including assessments of rebuilding initiatives and community resilience.
CO6	Evaluate the effectiveness of disaster management policies and strategies.	E	F	Research projects or policy analyses assessing the

				impact of disaster management policies on disaster outcomes and community resilience

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	**Basic Principles of Disaster Management**		**10**	**15**
	1	Preparedness: . Mitigation. Response Recovery	1	
	2	Scope of Disaster Management	3	
	3	Role of Geography in Disaster Management	4	
	4	Hazard Mapping. Spatial Planning Evacuation Planning Geographic Information Systems (GIS):	2	
	Sections from References:			
II	**Mitigation and Management techniques of Disaster**–		**10**	**15**
	5	Prevention, Mitigation,	1	
	6	Preparedness, Response.	3	
	7	Recovery, Rehabilitation,	3	
	8	**Key Phases of Disaster Management-** pre – Disaster, During Disaster, Post Disaster	3	
	Sections from References:			
III	Major Disasters		**15**	**25**
	9	Earthquake Types:	2	
	10	Magnitude and Intensity of Earthquakes:	2	
	11	Seismic Zones of India:	1	
	12	Flood Types:	2	
	13	Flood Management:	2	
	14	Drought Types:	1	
	15	Drought Management:	1	
	16	Landslide Types:	2	

	17	Landslide Management:	2	
	Sections from References:			
IV	Disaster management policy		**10**	**15**
	18	Policy Objectives:	1	
	19	Legal and Institutional Framework:	2	
	20	Risk Assessment and Planning:	2	
	21	Preparedness and Response	2	
	22	Recovery and Reconstruction	3	
	Sections from References:			
V			**30**	
	1	1. Impact Mapping Activity: - Divide the participants into small groups and provide each group with a large sheet of paper or a whiteboard. - Assign each group one of the case studies (e.g., Pettimudi landslide, Kavalappara landslide, Pathumala landslide, Kerala Flood 2018). - Instruct the groups to create an impact map, visually representing the social, economic, and environmental impacts of the assigned disaster. They can use markers, post-it notes, or drawings to indicate different types of impacts on the map. - After completing the maps, have each group present their findings to the rest of the participants, discussing the significance of the impacts and any patterns or trends observed. 2. Scenario Analysis Exercise: - Present participants with hypothetical scenarios based on the case studies of disasters in Kerala, focusing on different aspects such as social disruption, economic loss, or environmental degradation. - Divide participants into pairs or small groups and assign each group a scenario to analyze. - Instruct the groups to discuss the potential implications of the scenario on society, economy, and the environment, considering factors such as population displacement, infrastructure damage, loss of livelihoods, and	20	

		ecological consequences. - Encourage groups to brainstorm adaptive strategies and resilience-building measures to address the challenges posed by the scenario. 3. Stakeholder Role-Play Simulation: - Identify key stakeholders involved in disaster management and response efforts in Kerala, such as government agencies, local communities, NGOs, businesses, and environmental organizations. - Assign each participant a specific stakeholder role to role-play during the simulation exercise. - Provide participants with background information about the assigned stakeholder's interests, objectives, and responsibilities in relation to disaster management. - Present a scenario based on one of the case studies and facilitate a simulation exercise where participants interact with each other in their respective stakeholder roles to address the social, economic, and environmental impacts of the disaster.		
	2	Field Trip and Impact Assessment: - Organize a field trip to a location affected by one of the recent disasters in Kerala, such as Pettimudi, Kavalappara, or Pathumala. - Facilitate a guided tour of the affected area, allowing participants to observe firsthand the social, economic, and environmental impacts of the disaster. - Encourage participants to document their observations through photographs, videos, or written notes. - After returning from the field trip, facilitate a group discussion to debrief the experience and analyze the observed impacts, focusing on both immediate and long-term effects on the affected communities and ecosystems. Community Resilience Workshop: - Organize a workshop focused on building community resilience to disasters, using case studies from Kerala to illustrate key concepts and challenges. - Invite experts in disaster management, community development, and	10	

		environmental conservation to lead discussions and interactive activities. - Facilitate group brainstorming sessions to identify potential resilience-building strategies tailored to the specific social, economic, and environmental context of Kerala. - Encourage participants to develop action plans for enhancing community preparedness, response, and recovery efforts in the face of future disasters.		
	Sections from References:			

Books and References:.

1. Quarantelli, E. L. (Ed.). (1998). What Is a Disaster? Perspectives on the Question. Routledge.

2. Fothergill, A., & Peek, L. A. (2004). Poverty and Disasters in the United States: A Review of Recent Sociological Findings. Natural Hazards, 32(1), 89-110.

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5. Waugh, W. L., & Tierney, K. J. (Eds.). (2007). Emergency Management: Principles and Practice for Local Government. ICMA Press.

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8. Federal Emergency Management Agency. (2019). National Response Framework. U.S. Department of Homeland Security.

9. Buckle, P., Mars, G., & Smale, S. (Eds.). (2000). Natural Disasters: Protecting Vulnerable Communities. UNU Press.

10. Wisner, B., Gaillard, J. C., & Kelman, I. (2012). Handbook of Hazards and Disaster Risk Reduction. Routledge.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	-	2	2	2	-	-	3
CO 2	3	1	-	-	-	-	2	-	-	-	2	-
CO 3	2	-	3	2	-	3	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	2	-	2	2	1	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Disaster Mitigation and Management**				
Type of Course	**Minor With Practical**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	" Disaster Mitigation and Management explores the spatial aspects of natural and human-induced disasters. Students analyze geographical patterns, vulnerabilities, and responses to disasters worldwide. Emphasis is placed on understanding the role of geography in effective mitigation, preparedness, response, and recovery efforts to enhance community resilience."				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand spatial patterns of natural and human-induced disasters.	U	P	Quizzes and Exams
CO2	Analyze geographical vulnerabilities and risk factors associated with disasters.	A	F	Case Study Analysis
CO3	Evaluate strategies for disaster mitigation, preparedness, and response within different geographical contexts.	E	C	GIS Projects
CO4	Apply geographic information systems (GIS) and remote sensing techniques to assess disaster risk and	A	P	Class Presentations

	support decision-making.			
CO5	Demonstrate knowledge of the role of geography in enhancing community resilience to disasters.	E	F	Research Papers
CO6	Critically assess case studies and real-world examples of disaster management practices.	C	M	. Participation and Discussions
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I	**Introduction to Disaster Management**		**10**	**15**
	1	Disaster Management: Meaning & Concepts:	1	
	2	Methods & Approaches in Disaster Management	3	
	3	Natural Disasters and Their Management in India	4	
	4	Anthropogenic Disasters and Their Management in India:	2	
	Sections from References:			
II	**Risk and Vulnerability Analysis** -		**10**	**15**
	5	Risk: Its concept and analysis -	1	
	6	Risk Reduction -Vulnerability: Its concept and analysis	3	
	7	Strategic Development for Vulnerability Reduction	3	
	8	Disaster Preparedness Plan - Prediction, Early Warnings and Safety Measures of Disaster.	3	
	Sections from References:			
III	**Inter-Relationship Between Disasters and Developments**		**15**	**25**
	9	Factors Affecting Vulnerabilities:	2	
	10	Differential Impacts of Disasters:	2	
	11	Impact of Development Projects:	1	
	12	Climate Change Adaptation:	2	
	13	IPCC Scenarios:	2	
	14	Scenarios in the Context of India:	1	
	15	Relevance of Indigenous Knowledge:	1	
	16	Appropriate Technology:	2	
	17	Local Resources:	2	
	Sections from References:			
IV	**Role of Information Technology in Disasters and Training, awareness program on disaster**		**10**	**15**

	management			
	18	Disaster management Information System - Organizing and effective dissemination of information:	1	
	19	feedback for improving information - Role of Communication in Disasters,	2	
	20	Community Level Disaster Management, Government Initiatives on Disaster Management.,	2	
	21	India's National Policy on Disaster Management, - National Guidelines and Plans on Disaster Management,	2	
	22	Role of Government, Non-Government and Inter-Governmental Agencies.	3	
	Sections from References:			
V	**Practical**		**30**	
	1	1. Community-Based Disaster Management Simulation: - Organize a community-level disaster management simulation exercise in collaboration with local authorities and community organizations. - Divide participants into groups representing different sectors of the community, such as households, schools, businesses, and healthcare facilities. - Simulate various disaster scenarios (e.g., earthquake, flood, cyclone) and instruct each group to develop and implement their disaster response and recovery plans. - Facilitate debriefing sessions after the simulation to discuss lessons learned, identify strengths and weaknesses in community preparedness, and brainstorm improvements. 2. Awareness Campaign and Training Workshops: - Conduct a series of awareness campaigns and training workshops on disaster management in collaboration with local government agencies, NGOs, and community leaders. - Develop interactive training modules covering topics such as disaster risk assessment, emergency response procedures, first aid, search and rescue techniques, and evacuation drills. - Utilize multimedia resources, role-playing activities, and hands-on demonstrations to engage participants and enhance learning outcomes. - Evaluate the effectiveness of the training program through pre- and post-training assessments, participant feedback surveys, and follow-up evaluations of community preparedness and response capabilities.	20	

		3. Study of Government Initiatives on Disaster Management: - Assign students or participants to research and analyze government initiatives on disaster management at the national, state, and local levels. - Task them with reviewing relevant policies, programs, and funding allocations aimed at enhancing disaster preparedness, response, recovery, and resilience. - Encourage critical analysis of the strengths and weaknesses of existing government initiatives, considering factors such as governance structures, institutional capacity, coordination mechanisms, and community engagement strategies. - Facilitate group discussions or presentations to share findings and recommendations for improving government efforts in disaster management.		
	2	4. Role-Playing Exercise: Inter-Governmental Coordination: - Organize a role-playing exercise to simulate inter-governmental coordination and collaboration in disaster management. - Assign participants to represent different levels of government (national, state, local), as well as non-governmental organizations, international agencies, and community representatives. - Present a hypothetical disaster scenario and instruct participants to negotiate and coordinate their respective roles and responsibilities in response and recovery efforts. - Facilitate debriefing sessions to identify challenges, lessons learned, and best practices in inter-governmental cooperation and coordination during emergencies. 5. Development of Community Disaster Management Plans: - Facilitate workshops or community meetings to develop community-level disaster management plans in alignment with India's National Policy on Disaster Management and national guidelines. - Engage community members, local authorities, NGOs, and other stakeholders in a participatory planning process to assess hazards, vulnerabilities, and capacities, and prioritize actions for risk reduction and response. - Guide participants in drafting actionable and context-specific disaster management plans, including early warning systems, evacuation routes, emergency shelters, communication protocols, and resource mobilization strategies. - Encourage on going review, updating, and dissemination of the community plans, fostering ownership and resilience-building at the grassroots level. Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Kerala.	10	

	1. Cutter, S. L., Mitchell, J. T., & Scott, M. S. (Eds.). (2000). Revealing the Geography of Hazards: An Approach to Understanding Catastrophic Events. Guilford Press. 2. Bankoff, G., Frerks, G., & Hilhorst, D. (Eds.). (2004). Mapping Vulnerability: Disasters, Development, and People. Earthscan Publications. 3. Smith, K. (2013). Environmental Hazards: Assessing Risk and Reducing Disaster (6th ed.). Routledge. 4. Kreimer, A., Arnold, M., & Carlin, A. (1999). Building Safer Cities: The Future of Disaster Risk. The World Bank. 5. Hewitt, K. (Ed.). (1997). Interpretations of Calamity: From the Viewpoint of Human Ecology. Routledge.		
Books and References:.			

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	2	3	-	2	-	2	3
CO 2	3	-	-	-	1	-	3	2	-	-	-	-
CO 3	2	-	3	2	-	1	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	2	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

GEOSTATISTICS

Programme	B. Sc. Geography				
Course Title	**Geostatistics 1**				
Type of Course	**Minor**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	This is a basic course offered as minor which tells the basic characteristics of GeoStatistics. It provides students with a fundamental understanding of geostatistics as a quantitative discipline in geography. Learning of spatial dimension of statistics is a pre requisite for theoretical as well as explorative judgement in earth sciences. The course opens the ways of representing tabular data through basic measurements in statistics and through a thorough way of arithmetic representation of empirical distributions. Role and application of dispersion, correlation and regression is also discussed through mathematical derivation. Estimations and confidence limits of lognormal distribution are drawn here for effective judgement of spatial and social data. An exploration of estimation of existing spatial parameters is ought to achieve here with understanding of Cumulative Distribution function and concept of Variability. Application of earth surface data is the most needed material of this course as which aims the creation of a data bank for all the analysis which is discussed earlier. Collection of needed data connects the student with the best usage of statistical parameters in this course. It realise the learner about the significance of data and their proper testing.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Remember role of Data representation techniques in dealing earth features and attributes	R	C	Instructor-created exams / Quiz
CO2	Understand students' ability to carry and interpret measurements of distribution.	U	F	Data reference and applying
CO3	Evaluate students to make capable of finding estimations and confidence limits in distributions which are spatially referenced.	E	C	Discussion with each criteria of testing
CO4	Apply students' ability to fit spatial entities on arithmetical representations and mathematical derivations.	Ap	P	Problems and Learning
CO5	Making a real world connectivity to a series of distributions discussed through preparation of data bank	C	C	Field work, Journals and other published data
CO6	Analytical judgement arisen through dealing the framework of variability function	An	C	Discussion and Exam
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45 +30)	Marks (70+30)
I		**Geostatistics: Basics**	**8**	**10**
	1	Frequency Distributions	1	
	2	Arithmetic representation in Frequency Distribution	3	
	3	Measures of Central Location	2	
	4	Measures of Dispersion	2	
	Sections from References:			
II		**Correlation and Regression in Geospatial Entities**	**12**	**20**
	5	Correlation: Karl Pearson's Product Moment	2	
	6	Spearman's Rank	2	
	7	Mathematical derivation : correlation	3	
	8	Regression fitting : Linear regression for two variables	2	
	9	Mathematical derivation: regression	3	
	Sections from References:			
III		**Lognormal distributions and Hypothesis testing for Prediction and Judgement**	**15**	**25**
	10	Lognormal distributions: concept	2	
	11	Concept of Estimations	2	
	12	Finding Confidence limits to Mean	3	
	13	Significance of Hypothesis Testing in Geography	1	
	14	Chi square test: Derivation and Significance in Geography studies	2	
	15	Student's t test: Derivation and Significance in Geography studies	2	
	16	Snedecor's F test: Derivation and Significance in Geography studies	2	
	17	Central Limit Theorem	1	

	Sections from References:			
IV	**Variability in Geostatistics**		**10**	**15**
	18	Variability: concept	2	
	19	Variability significance in Geographical analysis	2	
	20	Random function Theory	2	
	21	Random function Theory Significance to Geography	2	
	22	Concept of Cumulative Distribution Function and its connection in earth surface data	2	
V	**Lab and Field work : Geoststistics**		**30**	
	1	Carry-out any four data collection methods of the following: **1. Secondary data: Census, Meteorological data for module 1** **2. Collecting diverse data of whole students in the institution for module 2** **3. Taking reference from a nearby library and collect data from a published work relating hypothesis testing used (PhD, Dissertation, project, Papers , Newspaper etc.)** **4. Making a presentation of variability analysis of a single component (PPT file)**	20	
	2	**Creation of Data Bank by the student** **Assembling the four data collection methods**	10	
	Sections from References:			

Books and References:.

- Agarwal B L (2006), Basic Statistics, 4th Edition, New Age International (P) Ltd., New Delhi
- Ebson D Blackwell B (1977), Statistics in Geography- A Practical Approach
- Gupta SC and Kapoor V K (1990), fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.

- Isaaks E H and Srivastava R M (1989), An Introduction to Applied Geostatistics, Oxford University Press, New York, USA.
- John Silk (1978), Statistical Concepts in Geography, George Allan and Unwin

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	3	-	3	-	2	-	3	3
CO 2	3	-	-	-	-	2	3	-	-	-	2	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	2
CO 5	3	3	-	-	2	2	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Geostatistics II**				
Type of Course	**Minor**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	This minor course in Geostatistics provides students with essential calibrations in quantitative geography. Spatial statistics comprehension is vital for theoretical and explorative judgment in earth sciences. Hypothesis testing is emphasized for evaluating earth surface phenomena. The curriculum covers random function concepts, frequency functions, and random probability distribution modeling for forecasting alternatives. Spectral analysis methods such as DFT, FFT, and Maximum Entropy are explored, facilitating frequency spectrum analysis. Sampling, estimation, and realization are taught as quantitative tools for spatial analysis. ANOVA, including one-way, two-way, and non-parametric analyses like the Kruskal-Wallis test, are discussed. Learners engage in a minor project, applying learned methodologies to practical tasks, projects, fieldwork, or reports.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tools used**
CO1	Remember role of Hypothesis testing in data judgement	R	C	Instructor-created exams / Quiz
CO2	Understand the students' appreciation on key concepts underlying random variable, sampling, estimation and	U	F	Data reference and applying

	realization.			
CO3	Evaluate students to make capable of modelling stochastic events for moving parameters.	E	C	Discussion with each criteria of testing
CO4	Apply students' ability to fit spectral functions based on some operations.	Ap	P	Problems and Learning
CO5	Making a real world connectivity to a series of distributions discussed through preparation of a project work or report	C	C	Field work, Journals and other published data
CO6	Analytical judgement arisen through dealing the framework of Analysis of Variance on parametric and non parametric forms	An	C	Discussion and Exam
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Geostatistics: Basics through hypothesis testing**	**10**	**15**
	1	Significance of Hypothesis testing in Geosciences	1	
	2	Null Hypothesis and Alternate Hypothesis	2	
	3	Random Variable function: concept derivation	4	
	4	Significance of Random variables in Spatial data resources	3	
	Sections from References:			
II		**Geostatistics: role of Stochastic Modelling and Spectral analysis**	**15**	**25**
	5	Concept of Random Probability function and its significance	2	
	6	Estimation and Forecasting : Stochastic modelling	4	
	7	Auto Correlation function	1	
	8	Spectral Analysis: Significance in earth science studies	2	
	9	Discrete Fourier Transform Method	2	
	10	Fast Fourier Transform Method	2	
	11	Maximum Entropy Method	2	
	Sections from References:			
III		**Concepts of Estimation and Sampling in Geostatistics**	**10**	**15**
	12	Median and Mode: significance and derivation	3	
	13	Concept of Estimation and Expectation in dealing spatial data	2	
	14	Sampling in Geostatistics	3	

	15	Realization of data/parameter	2	
	Sections from References:			
IV		**ANOVA**	**10**	**15**
	16	Analysis of Variance: Basics & Concept	2	
	17	One-way ANOVA: Derivation and Significance	2	
	18	Two-way ANOVA: Derivation and Significance	2	
	19	Non-Parametric ANOVA: Kruskal-Wallis Test	1	
	20	Assumptions of ANOVA	1	
	21	Post-hoc Tests in ANOVA	1	
	22	Interpreting ANOVA Results	1	
V		**Lab and Field work : Geoststistics**	**30**	
	1	Students are allowed to take anyone of the following method for a minor project or can make a report of the same • ANOVA • Hypothesis Testing • Estimation • Realization • Spectral Analysis • Stochastic Modelling	20	

	2	**Assessment by linking the role of selected method above with geographical research**	10	
	Sections from References:			

Books and References:.

- Ebson D Blackwell B (1977), Statistics in Geography- A Practical Approach
- Gupta SC and Kapoor V K (1990), fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi.
- DD Sarma (2002),GEOSTATISTICS with Applications in Earth Sciences , Capital Publishing Company, New Delhi, Kolkatha
- Andras Bardossy Introduction to Geostatistics

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	2	3	3	-	2	-	3	3
CO 2	3	2	-	-	-	-	3	-	-	-	3	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	3	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography
Course Title	**Geostatistics III**
Type of Course	**Minor**
Semester	III
Academic Level	200-299

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Pre-requisites	Nil
Course Summary	This course, offered as a minor, delves into core topics within Geostatistics, typically following foundational learning in related papers. Geostatistics' applications and significance in earth science underpin all modules, tailored to bolster geographical research. Understanding the spatial dimension of statistics is crucial for informed theoretical and explorative judgments in earth sciences. The course begins by elucidating the variogram's significance, a cornerstone in geostatistics, depicting spatial geometry in regionalized variables. It covers variogram concepts, properties, and models, alongside methods for volume variance relationships, including the deconvolution problem and variance of dispersion. These foundational studies in mean, variance, and variogram pave the way for simulation analysis, extending spatial structures to simulate data points, fostering geographical research. Linear estimation techniques, notably kriging, are explored, alongside Bayesian Estimation, Finite Difference Method, Aggregation, Disaggregation, and Turning Bands, enriching estimation analysis. Learners engage in self-analysis, applying spatial data to resource economic feasibility, pollutant level estimation, nutrient and crop yield testing, and predicting temperature and rainfall variables. Mastery in variogram, variance, simulation, and estimation levels yields profound insights into geostatistics' significance in earth science studies.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the students about the role and significance of variogram and neighbourhood.	U	C	Instructor-created exams / Quiz
CO2	Apply students' with different situations of volume variance relationship.	Ap	F	Data reference and applying
CO3	Understand students to make capable of studying basics of simulation	U	C	Discussion with each criteria of testing
CO4	Analyse students' to deal with different forms of simulations.	An	P	Problems and Learning
CO5	Evaluation by students with methods of estimation and realization for their achievement with spatial tools	E	C	Discussion and Exam
CO6	Creating a new platform in Geoscience research with proper judgement arrived through applications of tools in geostatistics	C	C	Making a presentation with the problems of area specified in fifth module
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Geostatistics: concept of Neighborhood and Variogram**	**10**	**15**
	1	Significance and Concept of Neighborhood in Geostatistics	1	
	2	Properties and Significance of Variogram	3	
	3	Time dependent and independent Variograms	4	
	4	Variogram Models	2	
	Sections from References:			
II		**Geostatistics: volume variance relationship**	**10**	**15**
	5	Variance: concept	1	
	6	Variance of Dispersion	3	
	7	Situations of volume variance relationship	3	
	8	Deconvolution Problem	3	
	Sections from References:			
III		**Geostatistics: Simulation**	**10**	**15**
	9	Simulation: concept and significance	1	
	10	Monte Carlo Simulation	2	
	11	Turning Band Simulation	2	
	12	Sequential simulation	2	
	13	Markov Chain Simulation	2	

	14	Indicator Simulation	1	
	Sections from References:			
IV		**Methods of Estimation and Realization**	**15**	**25**
	15	Role of estimation analysis in Geography	1	
	16	Kriging	3	
	17	Bayesian Estimation	3	
	18	Finite Difference Method	2	
	19	Aggregation & Disaggregation	2	
	20	Turning Bands	2	
	21	Cross-validation Techniques	1	
	22	Spatiotemporal Estimation	1	
V		**Lab and Field work : Geoststistics**	**30**	
	1	Students are allowed to take the following area for making a record by using the tools discussed above and collecting the needed data through (Primary / Field work or Secondary) • Resource Economic Feasibility Analysis • Pollutant Level Estimation • Nutrient level and crop yield relationship testing • Prediction of temperature and rainfall variable	10	
	2	Applying the collected data with best methods discussed in the four modules and testing in lab and preparation of a record	20	

	Sections from References:		

Books and References:.

- DD Sarma (2002),GEOSTATISTICS with Applications in Earth Sciences , Capital Publishing Company, New Delhi, Kolkatha
- Introduction to Geostatistics- Andras Bardossy
- Geostatistics for beginners, Zorba Books Anil Kumar Mehrotra
- Kitanidis PK, (1997), Introduction to Geostatistics-: Applications in Hydrogeology, Cambridge University Press.
- Journel A G (1983), Non Parametric Estimation of Spatial Distributions. Mathematical Geology, 15, 445-468
- Jean Paul Chiles and Pieree Delfiner (2012), Geostatistics: Modelling Spatial Uncertainity, 2nd Edition, Wiley Series in Probability and Statistics

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	1	2	2	3	1	2	-	2	3
CO 2	3	-	-	-	-	-	3	-	-	-	-	-
CO 3	2	-	3	2	-	3	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	3
CO 5	3	3	-	-	2	-	3	3	-	-	-	-

CO 6	-	-	2	2	-	-	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

GROUPING OF VOCATIONAL MINOR COURSE IN GEOGRAPHY

Title of the Vocational Minor (GEOINFORMATICS WITH DIGITAL SURVEYING)

<table>
<tr><td>Programme</td><td colspan="5">B. Sc. Geography</td></tr>
<tr><td>Course Title</td><td colspan="5">Introduction to Remote Sensing</td></tr>
<tr><td>Type of Course</td><td colspan="5">Vocational Minor With Practical</td></tr>
<tr><td>Semester</td><td colspan="5">I</td></tr>
<tr><td>Academic Level</td><td colspan="5">100-199</td></tr>
<tr><td rowspan="2">Course Details</td><td>Credit</td><td>Lecture per week</td><td>Tutorial per week</td><td>Practical per week</td><td>Total Hours</td></tr>
<tr><td>4</td><td>3</td><td>-</td><td>2</td><td>75</td></tr>
<tr><td>Pre-requisites</td><td colspan="5">Nil</td></tr>
<tr><td>Course Summary</td><td colspan="5">Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.</td></tr>
</table>

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Gain a solid understanding of the basic principles of remote sensing, including electromagnetic radiation, sensor types, platforms, and the interaction of energy with Earth's surface features and atmosphere.	U	C	Instructor-created exams / Quiz
CO2	Learn about different remote sensing platforms (satellites, aircraft, drones) and sensors (optical, thermal, microwave) and their characteristics, capabilities, and applications..	E	C	Discussion / Practical Assignments
CO3	Develop proficiency in interpreting remote sensing imagery to identify and analyze various land cover and land use features, such as vegetation, water bodies, urban areas, and geological formations.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Acquire skills in remote sensing image processing techniques, including image enhancement, classification, change detection, and normalization, to extract meaningful information from raw remote sensing data	Ap	C	Discussion / Practical Assignments
CO5	Learn about the characteristics and specifications of thermal sensors, including sensor types, spectral bands, spatial and radiometric resolutions, and their influence on thermal image quality and interpretation..	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz

CO6	Explore the diverse applications of remote sensing across various disciplines, including environmental science, agriculture, forestry, geology, urban planning, disaster management, and climate change studies, and understand how remote sensing technology contributes to addressing global challenges and sustainable development.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+ 30)**
I		**Foundations of Remote Sensing**	**10**	**15**
	1	Remote sensing – history & development, definition.	1	
	2	Energy resources, radiation principles, EM Radiation and EM Spectrum – Atmospheric Window	3	
	3	Energy interaction in the atmosphere, Energy interactions with earth surface feature.	4	
	4	Ideal and Real Remote sensing.	2	
	Sections from References:			
II		**Elements of Photographic System**	**10**	**15**
	5	Fundamentals of Photogrammetry – Analog, Analytical and Digital, Perspective and Orthographic Projection.	1	
	6	Aerial Photography: Types, Scale, Forward Overlap, Lateral Overlap	2	
	7	Geometric elements of vertical photographs – Marginal Information	2	
	8	Photographic films, Filters-Types; Aerial cameras types	2	
	9	Fundamentals of Air photo Interpretation: Basic Photo interpretation equipment; Elements of visual air photo interpretation.	3	
	Sections from References:			
III		**Fundamentals of Satellite Remote Sensing**	**15**	**25**
	10	Orbital characteristics of Remote sensing satellite - geostationary and sun-synchronous	1	
	11	Concept of platforms and types	2	
	12	Resolution of sensors—spatial, spectral, radiometric and Temporal Resolution, Multi Concept	3	
	13	Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series	2	
	14	Meteorological satellites – INSAT, NOAA, GOES	2	
	15	Sensors – types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning	2	
	16	Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN	1	
	17	Development of Indian Remote Sensing Mission	2	
	Sections from References:			

IV		**Types of Remote Sensing**	**10**	**15**
	18	Active Remote Sensing and Sensors	2	
	19	Passive Remote Sensing and Sensors	2	
	20	Thermal Remote Sensing and Sensors	2	
	21	Microwave or RADAR Remote Sensing and Sensors	2	
	22	LiDAR Remote Sensing and Sensors	2	
	Sections from References:			
V		**Practical and Course Project**	**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. 1. Exploring satellite data products from various geoportals 2. Creating FCC / TCC 3. DEM Data Processing 4. Scale of Arial Photo 5. Land use Mapping	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using Remote sensing data products	10	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
6. Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)
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8. Carver, Steve_ Cornelius, Sarah_ Heywood, D. Ian - An introduction to geographical information systems [electronic resource]-Langara College (2015)

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	-	2	2	2	3		2
CO 2	-	-	-	2	2	-		2	3	2		
CO 3	2	-	3	2	-	-	3					2
CO 4	3	-	2	3	-	-						
CO 5	3	3	-	-	-	-			1			3
CO 6	-	-	2	2	-	-	3			1		2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓		✓
CO 5		✓	✓	✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Fundamentals of GIS**				
Type of Course	**Vocational Minor With Practical**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Gain a solid understanding of the core principles and concepts of GIS, including spatial data types, coordinate systems, map projections, and data models, providing a foundation for advanced GIS analysis and application.	U	C	Instructor-created exams / Quiz
CO2	Learn how to acquire, create, store, organize, and manage spatial data effectively using GIS software, including techniques for data conversion, digitization, georeferencing, and metadata creation, ensuring data integrity and accessibility for analysis and decision-making..	E	C	Discussion / Practical Assignments

CO3	Acquire proficiency in performing basic spatial analysis tasks such as overlay operations, proximity analysis, spatial querying, and statistical analysis, enabling you to extract meaningful insights and patterns from spatial data and support informed decision-making processes.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Develop skills in cartographic design and map production, including symbolization, labeling, map layout, and thematic mapping techniques, to effectively communicate spatial information and present analysis results in a visually appealing and informative manner	Ap	C	Discussion / Practical Assignments
CO5	Understand the diverse applications of GIS across various disciplines such as urban planning, environmental management, transportation, public health, emergency response, and natural resource management, and recognize the role of GIS in addressing complex spatial problems and supporting sustainable development initiatives.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Students will be introduced to commonly used Geospatial software tools such as ENVI, ArcGIS, QGIS, and Google Earth Engine, and learn how to perform spatial analysis	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+30)**
I		**Introduction to GIS**	**10**	**15**
	1	Definition, components, packages, capabilities and purpose of GIS	1	
	2	History of Geographic Information System, Development of GIS as an information and decision-making system	3	
	3	Nature of GIS – Real world and representations: Modelling, Maps, Databases and Spatial Databases - Geographic phenomena: fields, objects and boundaries.	3	
	4	Data types: nominal, ordinal, interval and ratio	3	
	Sections from References:			
II		**Data Representation**	**10**	**15**
	5	Definition- Maps and spatial information, Spatial entity vs Spatial Object.	2	
	6	Types of Data - spatial data, Attribute data, Thematic characteristics of Spatial Data	2	
	7	Sources of spatial data- sensors, survey data, air photos, satellite images and field data	4	
	8	Encoding methods: Keyboard – digitization – electronic data transfer. Data editing: Checking and correcting errors in spatial and attribute data.	2	
	Sections from References:			
III		**Data Models**	**15**	**25**
	9	Data abstraction model in GIS	1	
	10	Raster Data Model – Characteristics, Structure.	2	
	11	Raster Data Compression Methods – RLE, Block, Chain, Quadtree	2	
	12	Raster Data sources – Primary and Secondary	2	
	13	Vector Data Model – Characteristics, Field based and Object based representation.	2	
	14	Spaghetti Data Model – Structure, Characteristics	2	

	15	Topological Data Model – TIGER, GBF-DIME, Topological Rules	1	
	16	Raster Data vs Vector Data – Advantages and Disadvantages	2	
	17	Spatio-Temporal Data model	1	
	Sections from References:			
IV	**Spatial Analysis**		**10**	**15**
	18	Spatial Querry, Attribute Querry	1	
	19	Raster Analysis – Map Algebra, Overlay Analysis	3	
	20	Vector Analysis – Proximity Analysis, Union, Intersection	2	
	21	Network analysis, Weighted Overlay Analysis	2	
	22	Spatial Interpolation – Exact and Inexact methods	2	
	Sections from References:			
V	**Practical and Course Project**		**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. 1. Georeferencing 2. Spatial Data management – Digitizing and Editing 3. Spatial Analysis 4. Cartographic Representation	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using geospatial tools	10	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
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Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	2	3	-	2	3	-	3
CO 2	-	-	-	2	2	-	-	-	-	2	2	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	2	-	-	2	2	-	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Spatial Analysis**				
Type of Course	**Vocational Minor With Practical**				
Semester	III				
Academic Level	200-299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students develop a solid understanding of the fundamental concepts and principles of Geoinformatics, including geographic information systems (GIS), remote sensing, spatial data analysis, and photogrammetry	U	C	Instructor-created exams / Quiz
CO2	Gain proficiency in acquiring, organizing, and managing geospatial data from various sources such as	E	C	Discussion / Practical Assignments

	satellites, aerial imagery, GPS devices, and field surveys.			
CO3	Students learn techniques for geospatial data analysis, including spatial queries, overlay analysis, and geostatistical analysis, to derive meaningful insights from geospatial datasets.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Learn basic spatial analysis techniques, including overlay analysis, proximity analysis, interpolation, and surface modelling, to analyze spatial relationships and patterns within geographic data..	Ap	C	Discussion / Practical Assignments
CO5	Students will gain proficiency in interpreting satellite images to identify and analyze different land cover and land use types, including urban areas, vegetation, water bodies, and other features.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Students will be introduced to commonly used Geospatial software tools such as ENVI, ArcGIS, QGIS, and Google Earth Engine, and learn how to perform basic image processing and spatial data analysis tasks using these tools.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+ 30)**
I		**Introduction to Geoinformatics**	**10**	**15**
	1	What is Geoinformatics and its branches	1	
	2	Conceptual Understanding of Geographic Information System – Components, Logical Data Models – Raster Vector, Data Structures.	3	
	3	Theorical understanding of Photogrammetry – Geometry of Vertical Photo, Types of Photos, Flight Planning Mission	3	
	4	Basic Principles of Remote Sensing – Radiation Laws, Types, Atmospheric Window, Resolutions	3	
	Sections from References:			
II		**Raster Analysis**	**10**	**15**
	5	Raster Data Explorations – Pixels, DN Values, Bands.	1	
	6	Local Operations – Map Algebra, Reclassification, Logical and Arithmetic Operations.	3	
	7	Neighbourhood Operations – Aggregations, Filtering Techniques – Low Pass, High Pass, Ende Enhancement	3	
	8	Zonal Operations – Cost Distance Analysis, Least Cost Path	3	
	Sections from References:			
III		**Vector Analysis**	**15**	**25**
	9	Attribute Data Management and Querry	1	
	10	Spatial Relationship and Spatial Querry	2	
	11	Mapping Tabular Data in GIS Environment	2	
	12	Proximity Analysis – Buffer Analysis, Multi Buffer Concept	2	
	13	Overlay Analysis – Point in Line, Point in Polygon, Line in Polygon, Polygon on Polygon	2	
	14	Raster Data Processing – Clipping, Erase, identify, Union & Intersection	2	
	15	Surface Analysis – Interpolation – IDW	1	

	16	Understanding Network Data Model	2	
	17	Shortest Path Analysis, Time and Distance based Shortest Path	1	
	Sections from References:			
IV	**Image Analysis**		**10**	**15**
	18	Basic Elements of Interpretation of Arial Photos	1	
	19	Determining the aerial photograph scale based on an aerial photograph and the measured ground size of objects	3	
	20	Creation of True Color Composition, False Color Composition from multiple bands	2	
	21	Preforming Supervised Classification and Unsupervised Classification	2	
	22	DEM Processing – Elevation, Slope, Aspect, Curvature, 3D mapping	2	
	Sections from References:			
V	**Practical and Course Project**		**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. Vactor Analysis Raster Analysis DEM Data Processing Image Classification Scale of Arial Photo	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using geospatial tools	10	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
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Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	3	-	3	2	2	2	3	-	3
CO 2	-	-	-	2	2	-	-	-	-	2	2	-
CO 3	2	-	3	2	-	-	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	2	-	2	3	-	2
CO 5	3	3	-	-	-	-	2	3	-	-	-	-
CO 6	-	-	2	2	-	-	2	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓
CO 5		✓	✓	✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Application of Geoinformatics**				
Type of Course	**Vocational Minor**				
Semester	VIII				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Geoinformatics, encompassing Geographic Information Systems (GIS) and Remote Sensing (RS), finds extensive application across diverse fields. From urban planning to environmental management, disaster response to agriculture, and public health to transportation, geoinformatics provides invaluable tools for spatial analysis, decision-making, and policy formulation. It aids in understanding complex spatial relationships, monitoring environmental changes, optimizing resource allocation, and mitigating risks associated with natural hazards. Through its integration of spatial data, satellite imagery, and analytical techniques, geoinformatics facilitates informed decision-making processes, supports sustainable development initiatives, and enhances resilience in the face of evolving societal and environmental challenges.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding of Spatial Analysis Techniques: Students will gain proficiency in various spatial analysis techniques used in Geoinformatics, including overlay analysis, proximity analysis, interpolation, and network analysis. They will learn how to apply these techniques to solve real-world problems in diverse fields such as urban	U	C	Instructor-created exams / Quiz

	planning, environmental management, and disaster response			
CO2	Knowledge of Geospatial Technologies: Students will acquire knowledge of different geospatial technologies such as Geographic Information Systems (GIS), Remote Sensing (RS), Global Positioning System (GPS), and Web Mapping. They will understand the principles behind these technologies and learn how to effectively use them to collect, process, analyze, and visualize spatial data.	E	C	Discussion / Practical Assignments
CO3	Application of Geoinformatics in Various Fields: Students will explore the applications of Geoinformatics in fields such as urban planning, natural resource management, agriculture, public health, transportation, and climate change studies. They will understand how Geoinformatics tools and techniques can be applied to address specific challenges and enhance decision-making processes in these domains.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Integration of Spatial Data Sources: Students will learn how to integrate and analyze spatial data from multiple sources, including satellite imagery, aerial photographs, GPS data, field surveys, and socio-economic datasets. They will understand the importance of data quality, interoperability, and metadata standards in ensuring the accuracy and reliability of spatial analysis results.	Ap	C	Discussion / Practical Assignments
CO5	Critical Thinking and Problem-Solving Skills: Through hands-on exercises, case studies, and project work, students will develop critical thinking and problem-solving skills in the context of Geoinformatics. They will learn how to	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz

	identify spatial patterns, analyze spatial relationships, and derive actionable insights from spatial data to address complex real-world challenges.			
CO6	Effective Communication of Geospatial Information: Students will learn how to effectively communicate geospatial information to different stakeholders using maps, charts, graphs, and interactive visualizations. They will understand the importance of clear and concise communication in conveying spatial analysis results, making informed decisions, and influencing policy development in various sectors.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+ 30)**
I		**Forest Applications**	**12**	**15**
	1	Uses of Remote sensors in Forest Applications	3	
	2	Forest types classifications using multispectral data	3	
	3	Forest Density Mapping	3	
	4	Forest Change Detection and Mapping	3	
		Sections from References:		
II		**Water Applications**	**10**	**15**
	5	Surface water assessment and management.	1	
	6	Integrated Watershed Development	3	
	7	Water quality monitoring and mapping	3	
	8	Wetland mapping	3	
		Sections from References:		
III		**Disaster Management**	**16**	**25**
	9	What is Disaster? Disaster Management Cycle.	2	
	10	Geological Hazards: Landslide, Earthquake, Mining hazards (subsidence, flooding etc.), Volcanic hazards, Groundwater hazards, Glacial hazards	2	
	11	Environmental satellites GEOS, NOAA, AVHRR, CZCR Monitoring land, water, atmosphere, and ocean using Remote Sensing Data.	2	
	12	Mapping and modeling Landslide hazards – Analytical Hierarchy Methods.	2	
	13	RS & GIS in assessing Soil salinity- alkalinity- water logging studies- soil erosion – types – Estimation of soil loss from USLE using Remote sensing and GIS	2	
	14	RS & GIS in floods, Cyclones and drought.	1	

	15	Forest fire detection and burned area estimation using satellite data.	2	
	16	Applications if SAR data in flood analysis.	2	
	17	Weather Monitoring and Predictions. Early Warning System.	1	
	Sections from References:			
IV	**Agriculture & Urban Application**		**10**	**15**
	18	Structure of leaf - Spectral Behaviour of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation classification and mapping - Estimation of Leaf area index, Biomass estimation.	2	
	19	Identification of crops, production forecasting - pests and disease attacks through remote sensing	2	
	20	Crop stress detection due to flood and drought - catchments and command area monitoring.	2	
	21	Urban & rural change detection studies, Remote sensing applications in Urban encroachment.	2	
	22	Mapping urban land use, transportation network, Utility-Facility mapping, urban sprawl, site selection for urban development, Urban Information System	2	
	Sections from References:			
V	**Practical and Course Project**		**12**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. Estimating of NDVI, NBUI, NDMI, SAVI. Land use / Landcover Mapping Landslide Susceptibility Mapping Forest Fire Assessment Groundwater Potential Assessment	6	

		Project:		
	2	Students have to do a mini project addressing spatial problem using geospatial tools	6	
	Sections from References:			

Books and References:

Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.

James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.

Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.

Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).

Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.

Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)

Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind - Geographic Information Systems and Science (2005) (22nd ed.)(en)(536s)-Wiley (2005).

Carver, Steve_ Cornelius, Sarah_ Heywood, D. Ian - An introduction to geographical information systems [electronic resource]-Langara College (2015)

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module Vis designed to equip students with practical skills. The 12 marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	2		2		3	1	3
CO 2	-	-	-	2	2	-			3	2		

CO 3	2	-	3	2	-	-	2					
CO 4	3	-	2	3	-	-			3			3
CO 5	3	3	-	-	2	-			2			
CO 6	-	-	2	2	-	-	2	3			3	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

DIGITAL SURVEYING

Programme	B. Sc. Geography				
Course Title	**Fundamentals of Surveying**				
Type of Course	**Vocational Minor with Practical**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Nil				
Course Summary	The course outcome of Fundamentals of Surveying aims to provide students with a foundational understanding of surveying principles and techniques. Students will learn basic concepts such as measurement, data collection, and mapping. They will develop skills in using surveying instruments and applying mathematical computations to analyze survey data. By the end of the course, students should be equipped with the knowledge and abilities necessary for entry-level surveying tasks and further study in the field.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding of Basic Surveying Principles	U	C	Written Examinations assessing comprehension of foundational surveying concepts such as distance measurement, angles, and leveling.

CO2	Proficiency in Surveying Instrument Usage	E	C	Practical Assessments where students demonstrate the ability to properly operate and utilize basic surveying instruments like theodolites and tape measures.
CO3	Ability to Conduct Basic Surveying Measurements	An	C	Field Exercises requiring students to perform distance measurements, angle measurements, and basic leveling tasks accurately.
CO4	Skill in Data Collection and Documentation	Ap	C	Data Recording Assignments where students document field measurements and observations accurately and comprehensively.
CO5	Competence in Basic Mapping Techniques identification.	U	C	- Evaluative Tool: Mapping Projects where students create simple maps using collected survey data and basic cartographic principles.

CO6	Understanding of Safety Procedures in Surveying -	Ap	C	Evaluative Tool: Safety Assessments evaluating students' adherence to safety protocols during fieldwork, including proper equipment handling and Hazard
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+ 30)**
I	Concept of drawing & sheet layout following safety precautions.		**12**	**15**
	1	Demonstrate of tools &equipment used in the Surveying.	1	
	2	Introduction of safety equipments and their uses.	3	
	3	Use of drawing instruments and equipments with care.	2	
	4	Method of fixing of drawing sheet on drawing board.	2	
	5	Layout of different size of drawing sheet and folding of sheets	2	
	6	Instruments & equipments used by Surveyor, their types and uses.	2	
	Sections from References:			
II	Scales and Projection		**13**	**15**
	7	Scale	1	
	8	Representation of Scale	1	
	9	Construction of Plain scale	1	
	10	Diagonal scale	1	
	11	Comparative scale	1	
	12	Time scale	1	
	13	Vernier scale	1	
	14	Geometrical construction-lines, angles, triangles, quadrilaterals, and circles.	3	

	15	Map Projection -Perspective projection- Non perspective projection	3	
	Sections from References:			
III	Classification of Survey, Signs & symbols		**8**	**25**
	16	Draw conventional signs & symbols used in surveying.	3	
	17	Classification of survey. Accuracy and speed in field & office work. Common terms used and definitions.	3	
	18	Conventional signs and symbols. Use of legends.	2	
IV	Chain and Tape survey		**12**	15
	19	Linear measuring instruments	3	
	20	Tape Survey Chain survey – different types of chains	3	
	21	Equipment and instrument used to perform surveying& testing of chain.	3	
	22	Field book-types, methods of entry of check lines-its importance.	3	
	Sections from References:			
V			**30**	
	1	Perform site survey Conduct a tape/chain survey of a small area with all details and plotting the map. Calculating the area of site. Prepare a site plan by the help of chain / tape.	30	
	Sections from References:			

Books and References:.

1. Moffitt, F. H., & Bossler, J. D. (2016). Elementary Surveying: An Introduction to Geomatics (15th ed.). Pearson.

2. Wolf, P. R., & Ghilani, C. D. (2017). Elementary Surveying: An Introduction to Geomatics (14th ed.). Pearson.

3. Kavanagh, B. F., & McGrath, T. R. (2017). Surveying Principles for Civil Engineers (2nd ed.). Wiley.

4. Davis, R. E., & Foote, F. (2014). Surveying: Theory and Practice. McGraw-Hill Education.

5. Brinker, R. C., & Minnick, R. W. (2017). Surveying Fundamentals and Practices (7th ed.). Pearson.

6. Govindasamy, G. K. (2016). Fundamentals of Surveying (2nd ed.). CRC Press.

7. Punmia, B. C., & Jain, A. K. (2017). Surveying (Vol. 1). Firewall Media.

8. Uren, J., & Price, W. F. (2014). Surveying for Engineers (5th ed.). Palgrave Macmillan.

9. Raymond, W. L., & Mittal, P. (2016). Fundamentals of Surveying and Levelling. S. K. Kataria & Sons.

10. McCormac, J. C., & Nelson, A. P. (2016). Surveying: Principles and Applications. Wiley.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 30marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	1	3	3	2	-	2	-	2	2
CO 2	3	-	-	-	-	-	3	-	-	-	-	-

CO 3	2	-	3	2	-	-	2	-	3	2	2	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	2	-	2	2	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

<table>
<tr><td>Programme</td><td colspan="5">B. Sc. Geography</td></tr>
<tr><td>Course Title</td><td colspan="5">Conventional Surveying</td></tr>
<tr><td>Type of Course</td><td colspan="5">Vocational Minor with Practical</td></tr>
<tr><td>Semester</td><td colspan="5">II</td></tr>
<tr><td>Academic Level</td><td colspan="5">100-199</td></tr>
<tr><td rowspan="2">Course Details</td><td>Credit</td><td>Lecture per week</td><td>Tutorial per week</td><td>Practical per week</td><td>Total Hours</td></tr>
<tr><td>4</td><td>3</td><td>-</td><td>2</td><td>75</td></tr>
<tr><td>Pre-requisites</td><td colspan="5">Nil</td></tr>
<tr><td>Course Summary</td><td colspan="5">Conventional Surveying provides a comprehensive introduction to the fundamental principles and practices of land surveying. Students explore topics such as measurement techniques, equipment usage, data analysis, and mapping. Emphasis is placed on developing proficiency in traditional surveying methods including chain and compass surveys, leveling, and traversing. Additionally, students learn about coordinate systems, map projections, and legal aspects of surveying. Through a combination of theoretical knowledge and practical exercises, this course equips students with the skills necessary to accurately measure and map land, making it essential for aspiring surveyors and professionals in related fields.</td></tr>
</table>

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Demonstrate proficiency in traditional surveying techniques such as chain and compass surveys, leveling, and traversing.	U	C	Practical Assessments: Conducting field surveys using traditional surveying methods and equipment to assess proficiency
CO2	Apply measurement techniques effectively using appropriate equipment for accurate data collection.	E	C	Data Analysis Projects: Analyzing survey data collected during practical exercises to evaluate understanding and interpretation skills.
CO3	Analyze surveying data to create maps and interpret spatial information.	An	C	Map Creation Assignments: Creating maps from survey data to assess proficiency in map making and spatial visualization.

CO4	Understand and apply coordinate systems and map projections in surveying projects.	Ap	C	Written Examinations: Assessing theoretical knowledge through written exams covering topics such as coordinate systems, map projections, and legal aspects of surveying.
CO5	Identify and comply with legal regulations	U	C	Case Studies:

	and ethical considerations related to land surveying.			Evaluating understanding of legal regulations and ethical considerations through case studies related to land surveying.
CO6	Develop problem-solving skills through theoretical knowledge and practical exercises in surveying.	Ap	C	Problem-Solving Exercises: Assigning practical problems requiring application of surveying principles to assess problem-solving skills
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+ 30)**
I		Prismatic Compass Survey	**13**	**15**
	1	Survey using prismatic compass	1	
	2	Temporary adjustment of prismatic compass.	2	
	3	Measure fore & back bearing of a line. Measure true bearing of a line	2	
	4	Prismatic survey Open traverses	2	
	5	Prepare a closed prismatic compass measure the bearings, entry into field book, calculation of correct bearing and adjust.(Local attraction),	4	
	6	Determine the closing error and adjust. Plotting the same.	2	
	Sections from References:			
II		Plane table survey	**11**	**15**
	5	Perform the site survey using the plane table.	2	
	6	Demonstration of instrument used for plane table surveying &their uses	3	
	7	Set up the plane table (Centring, Levelling, Orientation)	3	
	8	Different method of plane tabling (Radiation, Intersection, Resection &Traversing)	3	
	Sections from References:			
III		Determination of Height using Indian Clinometer	**11**	**25**
	9	Indian clinometer	2	
	10	Uses of Indian Clinometer	2	
	11	Setting Instrument	3	

	12	Measuring angle and distance	2	
	13	Height Determination	2	
	Sections from References:			
IV	Perform the site survey using the Dumpy level		**10**	**15**
	14	Demonstration and setting up of dumpy level	1	
	15	performing temporary adjustments	2	
	16	Practice in staff reading	2	
	17	Practice in simple& differential leveling	2	
	18	Equate reduction of level(rise fall method, height of instrument method)comparison of method. profile levelling or longitudinal & cross section levelling, plotting the profile	3	
	Sections from References:			
V			**30**	
	1	Prismatic compass survey	10	
	2	Plane table survey	10	
	3	Height determination using Indian clinometer	5	
	4	Dumpy level	5	
	Sections from References:			

Books and References:.

1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni Pune Vidyarthi Griha Prakashan.
2. Surveying and Levelling by Subramanian, Oxford University Press.
3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain , Laxmi

Publications.

4. Textbook of Surveying by C. Venkatramaiah , University Press.
5. Surveying for Engineers by John Uren & Bill Price, Palgrave Macmillan.
6. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	1	3	2	3	2	2	-	3	2
CO 2	3	2	-	-	3	-	3	-	-	-	-	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	3
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	2	-	3	3	-	-	-	2-
CO 6	-	-	2	2	-	2	-	-	2	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography
Course Title	**Digital Surveying**
Type of Course	**Vocational Minor With Practical**
Semester	III
Academic Level	200-299
Course Details	Credit: 4 / Lecture per week: 3 / Tutorial per week: - / Practical per week: 2 / Total Hours: 75
Pre-requisites	Nil
Course Summary	Digital Surveying encompasses modern surveying techniques using advanced technology. It covers Theodolite Surveying, Auto Leveling, and Total Station operation, integrating digital tools for precise data collection and analysis. Students learn to utilize digital theodolites and auto levels for accurate angle and height measurements. Total Station principles are explored for electronic distance measurement and coordinate determination. The course emphasizes data processing and analysis using digital platforms. Through practical applications and theoretical instruction, students gain proficiency in utilizing digital tools for efficient surveying practices, preparing them for contemporary challenges in the field of surveying.

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Proficiency in utilizing digital theodolites, auto levels, and Total Stations for precise angle, height, and distance measurements in surveying projects.	U	C	Practical Assessments: Performance evaluation in utilizing digital theodolites, auto levels, and Total Stations for accurate measurements in field exercises.

CO2	Ability to integrate advanced technology into surveying practices for enhanced accuracy and efficiency in data collection and analysis.	E	C	Data Analysis Projects: Assessment of data processing and analysis skills through projects involving digital survey data.
CO3	Competence in conducting electronic distance measurements and coordinate determination using Total Station principles.	An	C	Total Station Operation Tests: Evaluation of proficiency in conducting electronic distance measurements and coordinate determination using Total Station equipment.
CO4	Understanding of data processing techniques and utilization of digital platforms for efficient analysis and presentation of survey data.	Ap	C	Digital Platform Exercises: Assessment of competence in utilizing digital platforms for data processing and analysis tasks.
CO5	Mastery of modern surveying techniques, including Theodolite Surveying, Auto Leveling, and Total Surveying, with a focus on digital tools and methodologies.	U	C	Theoretical Examinations: Testing understanding of Modern

				surveying techniques, including Theodolite Surveying, Auto Leveling, and Total Surveying, with a focus on digital methodologies.
CO6	Preparedness to address contemporary challenges in the field of surveying through practical applications and theoretical knowledge of digital surveying techniques	Ap	C	Case Studies: Application-based assessments to evaluate preparedness in addressing contemporary challenges in surveying using digital tools and techniques.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**	**Marks (70+ 30)**
I	Theodolite survey		**10**	**15**
	1	Demonstration and set up of Theodolite	1	
	2	Perform permanent adjustment of Theodolite	3	
	3	Measurement of horizontal angle by various methods	4	
	4	Measurement of vertical angle, deflection angle	2	
	5	Determination of height of inaccessible object by Theodolite		
	Sections from References:			
II	Auto Level Surveying		**10**	**15**
	6	Introduction to levelling.	1	
	7	Types of levelling instrument	3	
	8	Technical terms used in levelling Temporary & permanent adjustment.	3	
	9	Different types of levelling Entry of level book. (Reduced level calculation method) Curvature & refraction effect sensitivity of bubble tube. Common error and their elimination	3	
	Sections from References:			
III	Total Station		**15**	**25**
	10	Introduction to Total Station Principle and Function	2	
	11	Use of Total station for data processing and analysis Electronic Distance Measurement Survey	2	
	12	Area Measurement Survey, Height Measurement Survey	3	
	13	Survey Data Post Processing, Survey Data Applications	2	
	14	Setting and functioning of Total Station.	2	
	15	Temporary adjustment of Total station	1	
	16	Measurement of angle &coordinates and heights	1	

	17	Traversing using Total station	2	
	Sections from References:			
IV			**10**	**15**
	18	Download survey data	1	
	19	Auto CAD	2	
	20	Import survey data to AutoCAD platform	2	
	21	Survey drawing practice using AutoCAD commands	2	
	22	Plan preparation and area calculation	3	
	Sections from References:			
V			**30**	
	1	Surveying Theodolite	10	
	2	Surveying Auto leveling	10	
	3	Surveying Total Surveying	10	
	Sections from References:			

Books and References:.

1. Deakin, R. E., & Toth, C. K. (Eds.). (2016). Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences: 2008 ISPRS Congress Book (Vol. 37). CRC Press.

2. Haala, N., & Kada, M. (Eds.). (2014). Advances in 3D Geoinformation Systems (Lecture

3. Konecny, G. (2014). Advances in Mobile Mapping Technology (2nd ed.). CRC Press.

4. Li, Z. (Ed.). (2014). Advances in Topographic Mapping: Proceedings of the International Symposium on Topographic Mapping (Vol. 3). CRC Press.

5. Menna, F., Remondino, F., & Nocerino, E. (Eds.). (2014). Advances in Automated Photogrammetry and Remote Sensing. Springer.

6. Shan, J., & Toth, C. K. (Eds.). (2015). Topographic Laser Ranging and Scanning: Principles and Processing. CRC Press.

7. Shrestha, R. L., & Carter, W. E. (Eds.). (2016). Remote Sensing Technology in Forensic

Investigations: Geophysical Techniques to Locate Clandestine Graves and Hidden Evidence. CRC Press.

8. Tang, L., & Wang, C. (Eds.). (2016). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer.

9. Trinder, J. C., & Morley, J. G. (Eds.). (2015). Modern Trends in Cartography: Selected Papers of CARTOCON 2014. Springer.

10. Zhou, G., & Toth, C. K. (Eds.). (2017). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	2	2	3	-	2	-	3	3
CO 2	3	-	-	-	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	2
CO 4	3	-	2	3	-	-	3	-	2	3	-	3
CO 5	3	3	-	-	-	2	3	3	-	-	3	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Modern Surveying**				
Type of Course	**Vocational Minor**				
Semester	VIII				
Academic Level	300-399				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	4	-	-	60
Pre-requisites	Nil				
Course Summary	Modern Surveying provides a comprehensive overview of Global Navigation Satellite Systems (GNSS) and their applications in surveying. Students explore GNSS concepts, satellite-based positioning systems, and signal characteristics. The course covers GNSS receiver architecture, survey planning principles, and differential GNSS (DGNSS) techniques including real-time kinematic (RTK) positioning. Additionally, students learn GNSS data processing and analysis, software utilization, and integration with Geographic Information Systems (GIS). Through practical exercises and case studies, students gain proficiency in GNSS data collection, processing, and its diverse applications in surveying, mapping, cadastral surveys, construction layout, and geodetic control, preparing them for modern surveying challenges.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Mastery of GNSS concepts, including understanding satellite-based positioning systems and signal characteristics.	U	C	Practical Assessments: Conducting field surveys using traditional surveying methods and equipment to

				assess proficiency.
CO2	Proficiency in GNSS receiver architecture and functionality, as well as survey planning principles.	E	C	Data Analysis Projects: Analyzing survey data collected during practical exercises to evaluate understanding and interpretation skills.
CO3	Competence in applying differential GNSS (DGNSS) techniques, including real-time kinematic (RTK) positioning, for accurate positioning.	An	C	Map Creation Assignments: Creating maps from survey data to assess proficiency in map making and spatial visualization.
CO4	Understanding of GNSS data processing and analysis techniques, including software utilization and integration with GIS.	Ap	C	Written Examinations: Assessing theoretical knowledge through written exams covering topics such as coordinate systems, map projections, and legal aspects of surveying.

CO5	Ability to effectively utilize GNSS technology for diverse applications in surveying, mapping, cadastral surveys, construction layout, and geodetic control.	U	C	Case Studies: Evaluating understanding of legal regulations and ethical considerations through case studies related to land surveying.
CO6	Preparedness to address modern surveying challenges through practical exercises and case studies, demonstrating proficiency in GNSS data collection, processing, and application.	Ap	C	Problem-Solving Exercises: Assigning practical problems requiring application of surveying principles to assess problem-solving skills.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (48 +12)**	**Marks (70+30)**
I	**Introduction to GNSS**		**17**	**15**
	1	Overview of GNSS concepts and history	1	
	2	GNSS constellations: GPS, GLONASS, Galileo, BeiDou	1	
	3	GNSS signal structure and characteristics	1	
	4	GNSS receiver architecture and functionality	2	
	5	Satellite constellation management	2	
	6	GNSS data formats and standards	2	
	7	Principles of survey planning with GNSS	2	
	8	Considerations for fieldwork: environmental factors, satellite visibility, etc.	2	
	9	Quality control and assurance in GNSS surveying	2	
	Sections from References:		2	
II	**DGNSS Principles and Applications**		**10**	**15**
	10	Introduction to Differential GNSS (DGNSS) Types of DGNSS corrections: SBAS, RTK, DGPS	1	
	11	DGNSS data collection methods: static, kinematic, and rapid static	3	
	12	GNSS receiver setup and operation	3	
	13	Best practices for data collection in different environments, Real- time data correction techniques	3	
	Sections from References:			
III	DGNSS Data Processing and Analysis and GNSS Applications		**11**	**25**
	14	Downloading data to the computer	2	

	15	DGNSS data processing software overview, Post-processing DGNSS data for accurate positioning,	2	
	16	Analysis of DGNSS data: error sources, corrections, and uncertainties, Interpretation, and visualization of survey results	3	
	17	Applications of GNSS technology in surveying and mapping GNSS for cadastral surveys, construction layout, and geodetic control	2	
	18	Integration of GNSS with GIS and other geospatial technologies Case studies and examples of GNSS applications in various fields	2	
	Sections from References:			
IV	Drone mapping		**10**	**15**
	19	Introduction to Drones, History of Drone/UAS/UAVs, Regulations of DGCA and Drone license, Autonomous flight vs. manual and hybrid flight profiles	2	
	20	Pre and Post Flight planning- Flight execution and photography, data collection- Image Format, GSD, Scale and Resolution.	3	
	21	Consideration for hardware selections, comparison on surveying drone and its accuracy, Techniques of controlling errors, Consideration of GCP in vertical and horizontal accuracies,	3	
	22	Data Download, post processing software's, Analyzing Data and Final output	2	
	Sections from References:			
V			**12**	
	1	- Hands-on project: GNSS data collection and processing exercise - Presentation of project results and discussion	12	
	Sections from References:			

Books and References:.

1. Deakin, R. E., & Toth, C. K. (Eds.). (2016). Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences: 2008 ISPRS Congress Book (Vol. 37). CRC Press.
2. Haala, N., & Kada, M. (Eds.). (2014). Advances in 3D Geoinformation Systems (Lecture
3. Konecny, G. (2014). Advances in Mobile Mapping Technology (2nd ed.). CRC Press.
4. Li, Z. (Ed.). (2014). Advances in Topographic Mapping: Proceedings of the International Symposium on Topographic Mapping (Vol. 3). CRC Press.
5. Menna, F., Remondino, F., & Nocerino, E. (Eds.). (2014). Advances in Automated Photogrammetry and Remote Sensing. Springer.
6. Shan, J., & Toth, C. K. (Eds.). (2015). Topographic Laser Ranging and Scanning: Principles and Processing. CRC Press.
7. Shrestha, R. L., & Carter, W. E. (Eds.). (2016). Remote Sensing Technology in Forensic

Investigations: Geophysical Techniques to Locate Clandestine Graves and Hidden Evidence. CRC Press.
8. Tang, L., & Wang, C. (Eds.). (2016). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer.
9. Trinder, J. C., & Morley, J. G. (Eds.). (2015). Modern Trends in Cartography: Selected Papers of CARTOCON 2014. Springer.
10. Zhou, G., & Toth, C. K. (Eds.). (2017). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer

Mapping of COs with PSOs and POs:

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 48 instructional hours for the first four modules and 12 hrs for the final one. Module V is designed to equip students with practical skills. The 10 marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	2	3	-	2	-	3	3
CO 2	3	-	-	2	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	2
CO 4	3	-	2	3	-	-	3	-	2	3	-	3
CO 5	3	3	-	-	-	2	3	3	-	-	2	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

GENERAL FOUNDATION COURSES IN GEOGRAPHY

<table>
<tr><td>Programme</td><td colspan="5">B. Sc. Geography</td></tr>
<tr><td>Course Title</td><td colspan="5">Natural Resource Management</td></tr>
<tr><td>Type of Course</td><td colspan="5">MDC</td></tr>
<tr><td>Semester</td><td colspan="5">I</td></tr>
<tr><td>Academic Level</td><td colspan="5">100-199</td></tr>
<tr><td rowspan="2">Course Details</td><td>Credit</td><td>Lecture per week</td><td>Tutorial per week</td><td>Practical per week</td><td>Total Hours</td></tr>
<tr><td>3</td><td>3</td><td>-</td><td>0</td><td>45</td></tr>
<tr><td>Pre-requisites</td><td colspan="5">Nil</td></tr>
<tr><td>Course Summary</td><td colspan="5">Natural Resource Management encompasses the sustainable utilization and conservation of Earth's resources, including water, soil, forests, and minerals. This interdisciplinary field integrates scientific, economic, and social perspectives to address environmental challenges while balancing human needs and ecological integrity. Topics include biodiversity conservation, land use planning, renewable energy, and sustainable development practices.</td></tr>
</table>

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Develop a comprehensive understanding of natural ecosystems, including their structure, function, and dynamics.	U	C	Instructor-created exams / Quiz
CO2	Acquire skills in conducting surveys and assessments to evaluate the status and trends of natural resources.	E	C	Identify specific areas where participants need improvement or further training through a structured needs

				assessment process.
CO3	Demonstrate knowledge of sustainable resource management principles and practices.	Ap	C	Analyze real-world case studies of successful natural resource surveys and assessments to understand best practices and challenges.
CO4	Understand the legal and regulatory frameworks governing natural resource management at local, national, and international levels.	Ap	C	Evaluating the alignment of conservation strategies with relevant policies, regulations, and international agreements can provide insights into their legal and institutional effectiveness.
CO5	Gain proficiency in conservation strategies aimed at protecting and restoring natural habitats, biodiversity, and ecosystem services.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Apply adaptive management approaches to address uncertainty and complexity in resource management	Ap	C	Documenting success stories and best practices in conservation can serve as valuable learning resources and inspire replication of effective strategies in other contexts.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (36 +9)**	**Marks (75) 50+25**
I	Natural Resources		**11**	**15**
	1	Meaning and concepts of Natural Resources	3	
	2	Classification of natural resources	2	
	3	Fossil Fuels: Renewable Energy Sources: Non-renewable Energy Sources: Emerging Technologies:	3	
	4	Approaches to Natural Resource Management, Resource Appraisal	3	
	Sections from References:			
II	Land and Soil Resources:		**8**	**15**
	5	Utilization, Issues and challenges	2	
	6	Management and conservation	2	
	7	Water and Forest Resources:	2	
	8	Utilization, Issues and challenges; Management and conservation	2	
	Sections from References:			
III	Energy Resources: Contemporary Strategies for Natural Resource Management		**17**	**10**
	9	Growing global energy needs;	2	
	10	Use of alternate energy resources;	2	
	11	Management and conservation	3	
	12	Sustainable Resource Development	2	

	13	Natural Resources Governance Framework;	2	
	14	Resource Management Policies.	1	
	15	Energy Security	1	
	16	Global Energy Trade	2	
	17	Political Instability in Energy-Rich Regions	2	
	Sections from References:			
IV	Future Outlook		**9**	**10**
	18	Transition to Sustainable Energy Systems	4	
	19	Role of Renewable Energy in Decarbonisation- Advancements in Energy Storage - International Cooperation for Energy Transition	5	
	Sections from References:			
V	Organize field trips to various energy production facilities such as solar farms, wind farms, hydroelectric dams, and geothermal power plants. Students can observe firsthand the processes involved in energy generation, understand the environmental impacts, and learn about the management strategies employed to minimize those impacts. Conduct energy audits and efficiency assessments for buildings or facilities within the campus or local community.		9	

Books and References:.

1.Gautam, A. (2018 Natural Resource: Exploitation, Conservation and Management, Sharda Pustak Bhawan, Allhabad.

2 Potter, K. (2022) Natural Resources: Exploitation, Depletion and Conservation, Callisto Reference, New York

3Singh, J. and G. Pandey (2015) Natural Resource Management and Conservation, New Delhi: Kalyani Publishers.

4Cooper, P. (2018) Ecology and Natural Resource Management, Syrawood Publishing House, New York 5Cole, R.A. (1999) Natural Resources: Ecology, Economics and Policy, Prentice Hall College Division

6Thakur, B. (2009) Perspectives in Resource Management in Developing Countries, Vol 1: Resource Management-Theory and Practices, Concept Publishing House, NewDelhi.

7 Thakur, B. (2009) Perspectives in Resource Management in Developing Countries, Vol 4: Land Appraisal and Development, Concept Publishing House, New Delhi.

8Zilberman, D., J.M. Perloff and C.S. Berck (2023) Sustainable Resource Development in the 21st Century, Natural Resource Management Policy: Vol. 57, Springer

9 Pereira L.S. et al (2013) Coping With Water Scarity: Addressing the Challenges, Springer

10 Misra, H. N. (2014) Managing Natural Resources: Focus on Land and Water, PHI Learning Pvt. Ltd., New Delhi.

11 Pathak, P. and R.R. Srivastav (2021) Alternate Energy Resources: The way to Sustainable Modern Society, Springer.

12Grebner, D.L. et el (2021) Introduction to Forestry and natural Resources, Academic Press, U.K

13. Saxena, H. M. (2013) Economic Geography, Rawat Publication, New Delhi.

Note: The syllabus has four modules.There should be total 19 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 36 instructional hours for the first four modules and 9 hrs for the final one. The 5 marks for the evaluation of will be based on Module V. Internal assessments (25 marks) are split between one to four module (20 marks) and the last modules (5 marks).The end-semester examination for the theory part will be based on the 19 units in the first four modules. The 50 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	2	2	3	-	2	-	2	3
CO 2	3	-	-	-	-	2	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	2
CO 4	3	-	2	3	-	-	3	-	2	3	-	3
CO 5	3	3	-	-	-	-	3	3	-	-	-	3
CO 6	-	-	2	2	-	2	-	-	2	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Climate Change Vulnerability and Adaptation**				
Type of Course	**MDC**				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	0	45
Pre-requisites	Nil				
Course Summary	Explore the impacts of climate change on ecosystems, societies, and economies, and learn strategies to mitigate risks and enhance resilience. Through interdisciplinary perspectives, examine vulnerability assessment methods, adaptation planning, and policy frameworks. Develop practical skills to address climate-related challenges in diverse contexts, fostering sustainability and preparedness.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the concepts of climate change vulnerability and adaptation, including their implications for ecosystems, societies, and economies	U	C	Quizzes, exams, and written assignments to evaluate understanding of key concepts and theories.
CO2	Apply interdisciplinary approaches to assess vulnerability to climate change impacts in various contexts.	E	C	Analysis of real-world scenarios to assess the application of vulnerability assessment methods and adaptation strategies.
CO3	Analyze adaptation strategies and assess their effectiveness in enhancing resilience to climate-related risks.	Ap	C	Collaborative tasks to develop adaptation plans and policies, evaluating students' ability to work in interdisciplinary

				teams.
CO4	Develop adaptation plans and policies to address climate change challenges at local, regional, and global scales.	Ap	C	Opportunities for students to communicate their findings and recommendations to peers and instructors, assessing their ability to effectively convey complex information.
CO5	Evaluate the socio-economic and environmental impacts of different adaptation measures.	U	C	Feedback from classmates on assignments and presentations to encourage critical thinking and constructive feedback.
CO6	Communicate effectively about climate change vulnerability and adaptation issues to diverse stakeholders.	Ap	C	Written reflections on course materials and experiences to gauge students' self-awareness and learning progression regarding climate change vulnerability and adaptation.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (36 +9)**	**Marks (75) 50+25**
I	Science of Climate Change:		**8**	**15**
	1	Understanding Climate Change	2	
	2	Climate System Components;	2	
	3	Green House Gases and Global Warming	2	
	4	Paleoclimate Evidence, Climate Models and Projections,IPCC	2	
	Sections from References:			
II	Climate Change and Vulnerability:		**7**	**15**
	5	PhysicalVulnerability	1	
	6	EconomicVulnerability	2	
	7	Social Vulnerability	2	
	8	Adaptation Planning:	2	
	Sections from References:			
III	Impacts of Climate Change		**15**	**10**
	9	Sea-Level Rise:	1	
	10	Extreme Weather Events:	2	
	11	Habitat Loss:	2	
	12	Food Security:	2	
	13	Water Availability:	2	
	14	Displacement:	1	
	15	Health:	1	
	16	Vector-Borne Diseases:	2	
	17	Economic Impacts	2	
	Sections from References:			
IV	Adaptation Strategies:		**6**	**10**
	18	Adaptive governance and policy frameworks	3	
	19	Technological solutions (e.g., renewable energy, green infrastructure) Nature-based solutions (e.g., ecosystem restoration, sustainable land management)	3	
	Sections from References:			
V	Case Studies and Examples:		9	
	- Examining adaptation efforts in various regions and sectors - Success stories and challenges faced in implementing adaptation measures - Lessons learned and best practices for building resilience to climate change			

Books and References:.

1. IPCC (2014) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global

andSectoralAspects.ContributionofWorkingGroupIItotheFifthAssessmentReportofthe Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge.

2. IPCC(2014)ClimateChange2014:Impacts,Adaptation,andVulnerability.PartB:Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge..
3. IPCC. (2007) Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of WorkingGroupIItotheFourthAssessmentReportoftheIntergovernmentalPanelonClimate Change, Cambridge University Press, Cambridge.
4. Malhotra,NitashaandSen,Shyamoli,2018:Climatology,R.K.Books,NewDelhi.
5. OECD.(2008)ClimateChangeMitigation:WhatDoweDo?OrganisationandEconomicCo-operation and Development (www.oecd.org/env/cc).
6. Palutik, J. P., Vander Linden, P. J. and Hanson, C. E. (eds.), Cambridge University Press, Cambridge.
7. Sen Roy, S. and Singh, R.B. (2002) Climate Variability, Extreme Events and Agricultural Productivity in Mountain Regions, Oxford & IBH Pub., New Delhi.
8. Singh, M., Singh, R.B. and Hassan, M.I. (Eds.) (2014) Climate change and biodiversity: Proceedings of IGU Rohtak Conference, Volume 1. Advances in Geographical and Environmental Studies, Springer, Basel.
9. UNEP. (2007) Global Environment Outlook: GEO4: Environment for Development, United Nations Environment Programme, Nairobi.

Note: The syllabus has four modules.There should be total 19 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 36 instructional hours for the first four modules and 9 hrs for the final one. The 5 marks for the evaluation of will be based on Module V. Internal assessments (25 marks) are split between one to four module (20 marks) and the last modules (5 marks).The end-semester examination for the theory part will be based on the 19 units in the first four modules. The 50 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	3	3	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	3	3	-	2	3	2	3
CO 5	3	3	-	-	3	3	3	3	-	-	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	

Programme	B. Sc. Geography				
Course Title	**Geographic Pattern and Process**				
Type of Course	**Value-Added Course**				
Semester	III				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	0	45
Pre-requisites	Nil				
Course Summary	"Geographic Pattern and Process" delves into the dynamic interplay between spatial patterns and underlying processes shaping our world. By the end of the course, students will demonstrate a comprehensive understanding of the interplay between location, place, and space in geographical contexts. They will be able to analyze and differentiate between various types of settlements, both rural and urban, elucidating the locational characteristics and factors influencing their development. Furthermore, students will comprehend the role of humans as economic beings, discerning the classification of economic activities and the geographical factors shaping economic zones and transformations. Additionally, students will explore the concept of cultural landscapes, understanding their development and the geographical factors influencing their evolution. Lastly, students will utilize geographical knowledge for trend analysis, prediction, and problem-solving in regional contexts.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding Spatial Concepts	U	F	Assess understanding of spatial concepts through a quiz that requires students to define and

				differentiate between location, place, and space
CO2	Analyzing Evolution of Locations	E	C	Evaluate students' ability to analyze the evolution of locations by assigning case studies on rural and urban areas and assessing their explanations of the processes involved.
CO3	Exploring Human Settlement Patterns	Ap	F	Assess understanding of human settlement patterns by assigning a project where students analyze the locational characteristics and factors influencing the development of rural and urban settlements.
CO4	Understanding Economic Geography	U	C	Evaluate comprehension of economic geography by assigning presentations

				where students classify economic activities, identify major economic zones, and discuss geographical factors contributing to economic clustering.
CO5	Examining Cultural Landscapes	An	C	Assess understanding of cultural landscapes through a research paper where students investigate the development and geographical factors influencing cultural landscapes.
CO6	Utilizing Geography for Problem-Solving	AP	P	Evaluate application of geographical knowledge for problem-solving through exercises where students analyze trends, predict future developments, and propose solutions to regional issues.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (36+9)	Marks (50+25)
I		**Basic Concepts**	9	**12**
	1	Introduction to Location, Place and Space	1	
	2	Definitions and Types	2	
	3	Place VS Space	2	
	4	Evolution of a Location as Place and Space (Process explained in Rural and Urban Context)	2	
	5	Network Association and Interaction:- Inter and Intra Scenario between and among places and spaces	2	
		Sections from References:		
II		**Human Settlement**	9	**12**
	6	Introduction to Human settlements	1	
	7	Locational characteristics	2	
	8	Types of settlements (rural and urban)	2	
	9	Geographical factors behind locational choice and Types of rural settlement. • Physical • Socio-cultural • Economic	2	
	10	Geographical factors behind locational choice and Types of urban settlement. • Physical • Socio-cultural	2	

		• Economic		
		Sections from References:		
III		**Human as an Economic Being**	9	**13**
	11	Economic activities and its classification	2	
	12	Major economic zones	2	
	13	Economic activities and Geography (Geographical factors behind Clustering economic activities and Agglomaration)	2	
	14	Geographical factors determining economic transformation/development	2	
	15	Geography and globalisation	1	
		Sections from References:		
IV		**Cultural Landscape**	9	**13**
	16	Introduction to cultural landscape	2	
	17	Development of cultural landscape (Natural Landscape turning into a cultural landscape)	3	
	18	Geography and cultural landscape	2	
	19	Geographical factors affecting the development of cultural landscape	2	
V		**Assignment**	9	
	1	The role and relevance of Geography in Trend Analysis, prediction and problem redressal in a region.	9	

References:

Book title	**Author**
Explanation in Geography	**David Harvey**
Nature of Geography	**Richard Hartshorne**
Economic and Social Geography Made Simple	**R. Knowles and J. Wareing**
The sage handbook of Geographical Knowledge	**John A Agnew and David N Livingstone**

Note: The syllabus has four modules.There should be total 19 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 36 instructional hours for the first four modules and 9 hrs for the final one. The 5 marks for the evaluation of will be based on Module V. Internal assessments (25 marks) are split between one to four module (20 marks) and the last modules (5 marks).The end-semester examination for the theory part will be based on the 19 units in the first four modules. The 50 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	3	-	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations

CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Ecosystem Services**				
Type of Course	**Value-Added Course**				
Semester	IV				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	0	45
Pre-requisites	Nil				
Course Summary	This course critically examines the ecological, economic, and geographic foundations of ecosystem services, which encompass the collective goods and services provided by natural and managed ecosystems to humanity. Often likened to Earth's natural capital or nature's contributions to human well-being, ecosystem services encompass a range of provisions, including direct goods such as food, wood, and water, as well as indirect benefits like climate regulation and pest control, and cultural amenities such as recreation, ecotourism, and cultural heritage preservation. Increasingly, ecosystem services serve as the rationale behind local, national, and international conservation policies, emphasizing the importance of safeguarding ecosystems and their biodiversity. Throughout this course, students will explore the methodologies for measuring and assessing ecosystem services, their relationship to fundamental ecological processes, valuation techniques, and the roles of governmental and private organizations in providing and managing these services.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding Ecosystem Services:	U	F	Assessments could include quizzes, short answer questions, or essays asking

				students to define ecosystem services, provide examples, and discuss their significance.
CO2	Analyzing Ecosystem Functioning:	A	C	Assignments or projects could involve case studies where students analyze specific ecosystems, their biodiversity, and the services they offer
CO3	Assessing Ecosystem Services' Value	Ap	F	Evaluation could involve presentations or reports where students analyze the economic and non-economic values of ecosystem services in different contexts
CO4	. Applying Ecosystem Management Strategies	Ap	C	Case studies or simulations could be used to assess students' ability to develop management strategies that optimize ecosystem services while considering ecological, social, and economic

				factors.
CO5	Understanding Policy and Governance	U	C	Students could be evaluated through debates, policy analyses, or research papers examining existing policies related to ecosystem services and proposing improvements or alternatives.
CO6	Critical Thinking and Synthesis	E	P	Assessments could include reflective essays, group discussions, or exams requiring students to analyze and synthesize information from various disciplines to address complex problems related to ecosystem services.
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (36 +9)**	**Marks (75) 50+25**
I		Introduction to ecosystem services	**11**	**15**
	1	Definition and Historical Foundations and Conceptual Frameworks	3	
	2	Types of Ecosystem Services	2	
	3	Ecosystem Service Valuation	3	
	4	Challenges and Opportunities	3	
	Sections from References:			
II		Ecosystem functions	**8**	**15**
	5	Ecosystem functions :The 'supporting' services	2	
	6	Ecological production Functions	2	
	7	Provisioning and regulating Services	2	
	8	Cultural and relational Services	2	
	Sections from References:			
III		Cultural and Relational Services and Valuation of Ecosystem Services	**17**	**10**
	9	Cultural Services	2	
	10	Spiritual value	2	
	11	Recreational value	3	
	12	Aesthetic values	2	
	13	Relational services:	2	
	14	Human-nature interactions	1	
	15	Economic methods	1	
	16	Non-economic valuation methods	2	
	17	Case studies and applications	2	

	Sections from References:			
IV	Challenges and Opportunities		**9**	**10**
	18	Ecosystem degradation and restoration	4	
	19	Trade-offs and synergies among ecosystem services	5	
	Sections from References:			
V	Policy and Governance Policy frameworks and international agreements Governance mechanisms and stakeholder engagement Synthesis and Future Directions Integrative approaches to ecosystem management Future trends and research priorities		9	

Books and References:.

Elmqvist, T., et al., 2010. Biodiversity, Ecosystems and Ecosystem Services. Chapter 2 In: Kumar, P (ed). The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations, TEEB: The Economics of Ecosystems and Biodiversity, UNEP/Earthscan, London.

Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Ricketts, T.H., et al., 2009. Ecosystem services in decision making: time to deliver. Frontiers in Ecology and the Environment 7(1), 21–28.

Spangenberg, J.H., Settele, J., 2010. Precisely incorrect? Monetising the value of ecosystem services. Ecological Complexity 7, 327–337.

Atkinson, G., Bateman, I. and Mourato, S., 2012. Recent advances in the valuation of ecosystem services and biodiversity. Oxford Review of Economic Policy 28 (1), 22–47.

Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R.E., Jenkins, M., et al., 2002. Economic reasons for conserving wild nature. Science 297(5583) 950–953.

Costanza, R., d' Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., et al., 1998. The value of ecosystem services: putting the issues in perspective. Ecological Economics 25(1), 67– 72.

Parks, S. and Gowdy, J., 2012. What have economists learned about valuing nature? A review essay. Ecosystem Services 3, e1-e10.

Costanza, R., d'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., ... & van den Belt, M. (1997). The value of the world's ecosystem services and natural capital. Nature, 387(6630), 253-260.

Gómez-Baggethun, E., de Groot, R., Lomas, P.L. and Montes, C. 2010. The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes, Ecological Economics

69, 1209–1218.

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	3	3	3	-	2	-	2	3
CO 2	3	-	-	-	3	-	3	-	-	-	-	3
CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	2	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Spatial Information Technology**				
Type of Course	**SEC**				
Semester	V				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	0	45
Pre-requisites	Nil				
Course Summary	This course is designed to offer students practical expertise in Geographic Information Systems (GIS), enabling them to analyze data, address challenges, problem-solve, and assess scenarios within a geographic and spatial framework using diverse GIS software platforms. By the course's completion, students are anticipated to possess the skills necessary to conduct both fundamental and sophisticated GIS analyses, applying them effectively in real-world scenarios.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tools used**
CO1	Applying Geospatial Technologies in Real-Time Scenarios	U	C	Practical Projects and Case Studies
CO2	Mastery of Topology Concepts	E	C	Use quizzes, tests, or written assignments to assess students' understanding of topology concepts. Include questions that require students to identify and describe topology-related terms, explain the importance of

				topology in GIS analysis, and apply topological rules in spatial data manipulation.
CO3	Proficiency in Spatial Data Analysis using GIS Tools	Ap	C	Provide hands-on exercises where students must manipulate GIS datasets to demonstrate their understanding of topology concepts such as node, edge, and polygon relationships.
CO4	Utilization of Real-Time Geospatial Technologies	Ap	C	Evaluating the alignment of conservation strategies with relevant policies, regulations, and international agreements can provide insights into their legal and institutional effectiveness.
CO5	Application of Topology in GIS	U	C	Assign projects that require students to perform spatial data analysis tasks using GIS software, such as overlay operations, proximity analysis, or interpolation techniques
CO6		Ap	C	Introduce students to the concepts of Web

	Web GIS and Data Sharing			GIS and data sharing, emphasizing the importance of making geographic information accessible and interoperable across different platforms

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (36 +9)**	**Marks (75) 50+25**
I		CREATION OF SPATIAL DATA	**11**	**15**
	1	Georeferencing	2	
	2	Image to Image rectification	2	
	3	Spatial data Integration (Digitization)	2	
	4	Editing of Spatial & Non-Spatial data	1	
	5	Data Editing-Removal of errors	1	
	6	Overshoot & Undershoot, Snapping, Clipping, Intersection and Union	1	
	7	Buffering techniques	1	
	8	creation of shape file & geodatabase	1	
	Sections from References:			
II		TOPOLOGY	**14**	**10**
	9	Building Topology in GIS	2	
	10	Data Query in GIS	2	
	11	Importing KML/KMZ Data	2	
	12	Introduction to ArcGIS	2	
	13	Introduction to Open Source GIS Software	2	
	14	Spatial Analysis in GIS	1	
	15	Geoprocessing and Automation in GIS	1	
	16	Web GIS and Data Sharing	2	
	Sections from References:			
III	ANALYSIS TOOLS -		**5**	**10**
	17	Buffer anlaysis,	2	
	18	Overlay analysis,	3	
	Section with reference			

IV	Spatial Analysis in GIS		6	15
	19	network analysis, , Terrain analysis, Hydrology tool analysis. Network analyses	2	
	21	Layout Generation and report.	2	
	22	Raster data analysis	2	
	Sections from References:			
V	Web GIS and Data Sharing		**9**	
	web mapping services, online GIS platforms (e.g., ArcGIS Online, Google Maps), data publishing standards (e.g., OGC standards), and best practices for data sharing and collaboration in a spatial context. Practical activities may involve creating web maps, sharing GIS data online, and embedding maps into web applications		9	

Books and References:.

1. Falkne, E. and Morgan D. (2002) Aerial Mapping: Methods and Application. Lewis Publishers, Boca Raton, 192p.

2. Iliffe J. (2000) Datums and Map Projections for remote sensing, GIS, and surveying. Whittles Publishing, Scotland, 159p.

3. Sickle J.V. (2010) Basic GIS Coordinates. CRC Press, FL, 190p.

4. Verbyla D. L. (2003) Practical GIS analysis. Taylor & Francis, London, 305

5. Freeman, H and GG.Pieroni 1980: Map Data Processing, Academic Press, New York.

6. Graeme F. and Bonham Carter; Geographic Information Systems for Geoscientists; Modelling with GIS, Pergamon.

7. Mitchell, Andy (2001). ESRI Guide to GIS Analysis, Volume 1. Geographic Patterns & Relationships. ESRI Press

8. Kang-tsung Chang, Geographic Information System, Tata McGraw-Hill Edition, New Delhi.

9. Tomlinson, R.F Calkins, H.S and D.F.Marble 1976: Computer Handling Of Geographic Data, UNESCO, Geneva

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Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	1	2	-	3	3	3	2	2	-	2	3
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CO 3	2	-	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	3	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	

Programme	B. Sc. Geography				
Course Title	**Satellite Image Processing**				
Type of Course	**SEC**				
Semester	VI				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	3	3	-	-	45
Pre-requisites	Nil				
Course Summary	This course expands upon remote sensing principles and data analysis, focusing on digital image processing in the context of natural resource applications. It covers topics such as radiometric and atmospheric corrections, image formation, image enhancement, and classification.				

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tools used**
CO1	Students will be able to understand the basic and applied principles of remote Sensing	U	C	Instructor- created exams / Quiz
CO2	Students can do investigate and select best remote sensing data sources for certain application	E	C	Discussion / Practical Assignments
CO3	Students learn techniques for Identify image distortions and apply appropriate radiometric and geometric image correction techniques.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals

CO4	Evaluate image spatial and spectral transforms and their effect on image quality and data integrity.	Ap	C	Discussion / Practical Assignments
CO5	Introductory ability to conduct supervised and unsupervised classification of satellite multispectral imagery	U	C	Instructor- created exams / Quiz/ Seminars/ Instructor- created exams / Quiz
CO6	Ability to describe and apply at least five standard indices for spectral analysis to detect surface phenomena	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (36 +9)**	**Marks 75 (50+25)**
I		**Introduction to Digital Image Processing**	**8**	**10**
	1	Fundamentals of Digital Image Processing	2	
	2	Introduction to Satellite Image Geometry: Pixels, DN values, Bands.	2	
	3	Satellite Image Annotation	2	
	4	Spectral Response Pattern of Different land Cover Objects	2	

	Sections from References:			
II	**Preprocessing of Satellite Images**		**8**	**10**
	5	Geometric Correction basics.	2	
	6	Image to Image Georeferencing, Resampling	2	
	7	Radiometric Correction: Sun-Elevation Correction, Haze reduction techniques – Dark Object Subtraction DOS, DN to Radiance Conversion	2	
	8	Noise Removal: Salt and pepper error, Destripping, Bad lines removal	2	
	Sections from References:			
III	**Image Enhancement Techniques**		**8**	**20**
	9	Understand of Image Characteristics – Histogram, Univariate and multi variate statistics ,Creating Image from Raw data	1	
	10	Linear and Non-Linear contrast Strech, Spatial Feature Manipulation – Convolution, Spatial Filter	1	
	11	Grey level Thresholding, Level Slicing Understanding of Spectral Ratioing Technique	2	
	12	Indices – Vegetative Indices (VI), Normalized Difference,	2	
	13	Vegetation Index (NDVI), Normalized Difference Water Index (NDWI), Soil Adjusted Vegetation Index (SAVI)	2	
IV	**Information Extraction Techniques**		**12**	10
	14	Principal Component Analysis, IHS Transformation	2	
	15	Fourier Transformation Technique	2	
	16	Layer Stacking – FCC, Pan-Sharpening.	2	
	17	Supervised Classification	2	
	18	Unsupervised Classification	2	
	19	Hybrid Classification Accuracy Assessment	2	
	Sections from References:			
	Course Project		**9**	

V	1	Students have to do following practical 1. Image Preprocessing 2. Image Enhancement 3. Supervised Classification 4. Change Detection Assessment 5. Unsupervised Classification 6. Accuracy Assessment	5	
	2	**Project:** Students have to do a mini project using satellite datasets	4	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.

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CO 3	2	3	3	2	2	2	2	-	3	2	-	2
CO 4	3	-	2	3	3	-	3	-	2	3	-	3
CO 5	3	3	2	3	3	-	3	3	2	3	2	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
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3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
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Mapping of COs to Assessment Rubrics :

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CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5	✓	✓		✓
CO 6	✓		✓	