PERIYAR UNIVERSITY

Periyar Palkalai Nagar

SALEM – 636011

DEGREE OF MASTER OF SCIENCE

(Choice Based Credit System)

Syllabus for

M.Sc., GEOGRAPHY

Semester Pattern

(For Candidates admitted in the Colleges affiliated to Periyar University from 2026–2027 onwards)

CONTENTS

MEMBERS OF BOARD OF STUDIES

Sl.No	Name & Address	Designation
1	**Dr. S. Moorthy,** Associate Professor, Department of Geography, Govt. Arts College (Autonomous), Thanthonimalai, Karur – 5	Chairman
2	**Dr. P. Arul**, Associate Professor, Department of Geography, Govt. Arts College (Autonomous), Salem – 7	Member
3	**Dr. A. Ilanthirayan,** Associate Professor, Department of Geography, Govt. Arts College (Autonomous), Salem – 07	Member
4	**Mrs. S. Bharathi,** Assistant Professor, Department of Geography, J.K.K. Nataraja College of Arts & Science, Komarapalayam – 83	Member
5	**Dr.R.Sunil Kumar**, Associate Professor, Department of Geography, Govt. Arts College (Autonomous), Coimbatore -18	External Member
6	**Dr.K.Sumesh**, Assistant Professor, Department of Geography, Govt. Arts College (Autonomous), Coimbatore - 18	External Member
7	**Dr. P. Thangaraj**, Geo Exploration and Mining Solutions (GEMS), 17, Advaitha Ashram Road, Fairlands, Salem – 636004	Industrial Personnel
8	**Dr. M. Vijay Prabhu, M.Sc., M.Phil., Ph.D.**, UGC Post Doctoral Fellow, Pachanampatty, Omalur Taluk, Salem District	Alumni

I. INTRODUCTION

M.Sc. Geography

Geography is the scientific study of the Earth's physical environment, human societies, and the spatial interactions between natural and human systems. As an advanced interdisciplinary discipline, it integrates concepts and methods from the natural and social sciences to understand contemporary environmental, economic, and regional issues. The M.Sc. Geography programme provides specialized and research-oriented knowledge in Physical Geography, Human Geography, Economic Geography, Geography of Health, Disaster Management, Hydrology and Oceanography, Geographic Information Systems (GIS), Remote Sensing, Spatial Analysis, and Regional Planning.

The programme is designed to enhance students' analytical, technical, and research competencies through advanced coursework, laboratory training, field investigations, geospatial analysis, project work, and dissertation research. It emphasizes the application of modern geospatial technologies and research methodologies to address environmental and developmental challenges at local, regional, and global scales.

The curriculum fosters critical thinking, scientific reasoning, problem-solving, and professional skills through fieldwork, seminars, internships, and independent research. Students gain expertise in spatial data analysis, resource management, environmental assessment, and evidence-based planning for sustainable development.

Graduates of the programme will be well prepared for doctoral research, higher education, teaching, scientific research, urban and regional planning, environmental management, disaster risk reduction, geospatial industries, government departments, international organizations, and consultancy services. The programme also promotes ethical values, lifelong learning, and leadership qualities, enabling graduates to contribute effectively to sustainable development and informed decision-making.

II. REGULATIONS

1. Condition for Admission

A candidate seeking admission to the Master of Science (M.Sc.) Degree Programme in Geography must have successfully completed a Bachelor of Science (B.Sc.) Degree in Geography from this University or from any other University recognized by the Syndicate as equivalent

thereto. Admission shall be made in accordance with the rules, regulations, and admission policies of the University in force from time to time.

The programme shall extend over two academic years, consisting of four semesters, and shall be offered under the Choice Based Credit System (CBCS) in accordance with the Regulations, Curriculum Framework, and Academic Ordinances of the University. The programme comprises Theory Courses, Practical Courses, Elective Courses, Non-Major Electives (NMC), Skill Enhancement Courses (SEC) Field Studies, Seminars, Project Work, and dissertation, enabling students to acquire advanced knowledge, research competence, and professional skills in Geography and Geospatial Sciences.

2. Duration of the Programme

The Master of Science (M.Sc.) Degree Programme in Geography shall extend over a period of two academic years, comprising four semesters, with a total of 92 credits under the Choice Based Credit System (CBCS). Each semester shall consist of 120 working days.

3. Programme Structure

The M.Sc. Geography Programme shall consist of the following components:

- Core Courses
- Practical Courses
- Elective Courses
- Skill Enhancement Courses (SEC)
- Non-Major Elective (NME)
- Internship / Industrial Visit / Field Visit
- Project

4. Examination Scheme

The M.Sc. Programme shall follow the semester system, with End Semester Examinations (ESE) conducted at the end of each semester. The examination for each theory paper shall be of three hours' duration. Semester I and Semester III examinations shall ordinarily be conducted during November/December, while Semester II and Semester IV examinations shall be conducted during April/May, in accordance with the regulations of the University.

Candidates who fail in one or more theory or practical courses shall be permitted to reappear for the failed course(s) in the subsequent University examinations, subject to the rules and regulations of the University. Practical examinations for the Postgraduate Programme shall be

conducted at the end of the respective semesters in which the practical courses are offered, as prescribed in the curriculum.

During the Fourth Semester, every candidate shall undertake a Project Work and submit a Project Report within the prescribed time. The Project Report shall be evaluated, followed by a Viva-Voce Examination conducted by a Board comprising one Internal Examiner and one External Examiner. The final assessment shall be based on the quality of the project report and the candidate's performance in the viva-voce examination, in accordance with the prescribed evaluation scheme.

During the Two-year programme, students shall appear for four semester examinations as follows:

Academic Year	Semester	Examination Session
First Year	Semester I	November / December
	Semester II	April / May
Second Year	Semester III	November / December
	Semester IV	April / May

5. Attendance and Credits Requirement

A candidate shall be eligible to appear for the University Examinations only if he/she has secured a minimum of 75% attendance in each course, subject to the norms and regulations of the University.

Credits

Under the Choice Based Credit System (CBCS), each course is assigned credits based on its syllabus content, contact hours, and academic workload. To qualify for the award of the M.Sc. Geography Degree, a student shall successfully earn the prescribed 92 credits of the programme.

6. Passing Minimum

A candidate shall be declared to have passed a course if he/she secures:

- Not less than 50% of marks in the University (End Semester) Examination, and not less than 50% of marks in the aggregate of Internal Assessment and University Examination

marks combined. For Practical Courses, the marks awarded for the Record Notebook shall form part of the total practical marks as prescribed in the scheme of examination.

- For Project Work and Viva-Voce, a candidate shall secure not less than 50% of the total prescribed marks to pass the course.

- A candidate who fails to secure the prescribed minimum marks in any theory paper, practical course, project work, or viva-voce shall be required to reappear for the respective examination and pass it in a subsequent University examination, subject to the rules and regulations of the University.

DISTRIBUTION OF MARKS – THEORY AND PRACTICAL

	Internal	**External**	**Pass %**	**Internal Pass Mark**	**External Pass Mark**
Theory	25	75	50	13	38
Practical	40	60	50	20	30

Theory - Classification of Internal Assessment Structure – Marks

Tests	: 10 Marks
Assignment / Seminar	: 10 Marks
Attendance	: 05 Marks
Total Marks	**: 25 Marks**

Practical - Classification of Internal Assessment Structure - Marks

Record	: 25 Marks
Test	: 10 Marks
Attendance	: 05 Marks
Total Marks	**: 40 Marks**

Project	**: 200**
Internal Valuation	: 75
External Valuation	: 75
Joint Viva Voce 25 + 25	: 50

A candidate shall be declared to have passed a theory course if he/she secures a minimum of 38 marks out of 75 in the University Examination (External Assessment) and 13 marks out of 25 in the Internal Assessment, with an aggregate of not less than 50 marks out of 100. For practical courses, a candidate shall secure a minimum of 30 marks out of 60 in the University Examination (including Record Notebook marks) and 20 marks out of 40 in the Internal Assessment, with an aggregate of not less than 50 marks out of 100.

There shall be no separate minimum pass mark for the Record Notebook. However, submission of the Record Notebook is mandatory for appearing in the Practical Examination.

7. Question Paper Pattern

THEORY QUESTION PAPER PATTERN

Time: 3hours. **Maxi. Marks: 75**

Part –A (15 x 1 = 15) Answer ALL Questions
Each Unit Carry 3 Multiple Choice Question

Part – B (2 x 5 = 10) Answer Any TWO Questions (out of five)
One Question should be in Each Unit

Part –C (5 x 10 = 50) Answer ALL Questions (either or type)
One Question should be in Each Unit

PRACTICAL QUESTION PAPER PATTERN

Time: 3hours. **Maxi. Marks: 60**

Part –A (4 x 15 = 60) Answer ALL Questions
Each Units carry two Question (a and b)

a. Question carries 5 Mark and **b.** question 10 Marks

8. Classification of Successful Candidates

Candidates who successfully complete the programme shall be classified based on the aggregate marks obtained in Part III courses, as follows:

Classification	Percentage of Marks
First Class with Distinction	75% and above, and passing all examinations in the first appearance
First Class	60% and above but below 75%
Second Class	All other successful candidate

The classification shall be awarded in accordance with the regulations and norms prescribed by the University from time to time.

9. University Ranking

Candidates who satisfy the following conditions shall be eligible for the award of University Rank:

- Shall have passed all the examinations prescribed for the programme in the first appearance;
- Shall have completed the programme within the stipulated two academic years (four semesters);
- Shall not have any break in the course of study; and
- Shall satisfy all other conditions prescribed by the University from time to time.

10. Maximum Duration for Completion of the Programme

A candidate shall complete all the requirements for the award of the M.Sc. Geography Degree within a maximum period of eight semesters from the date of admission to the programme.

11. Commencement of Regulations

The foregoing regulations shall come into force with effect from the Academic Year 2026–2027 and shall apply to all students admitted to the M.Sc. Geography Programme from the Academic Year 2026–2027 onwards.

12.Transitory Provision

Candidates admitted to the Postgraduate Programme under the previous regulations shall be permitted to appear for the University examinations under those regulations for a period of three years from the date of completion of the programme**,** as notified by the University. Thereafter, candidates who have not completed the programme shall be permitted to appear for the examinations only under the regulations then in force**,** subject to the norms and conditions prescribed by the University.

III. Programme Outcomes (POs) for M.Sc. Geography Programme

Learning Outcomes-Based on Curriculum Framework Guidelines and Regulations For Postgraduate Programme

PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what has been learned and apply competencies to solve different kinds of non-familiar problems rather than replicate curriculum content knowledge; apply one's learning to real-life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples; address opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant questions, synthesizing and articulating problems; recognize cause-and-effect relationships; define problems; formulate hypotheses; test hypotheses; analyse, interpret and draw conclusions from data; establish hypotheses; predict cause-and-effect relationships; plan, execute and report results of experiments or investigations.

PO7: Cooperation/Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group; act together as a group or team in the interests of a common cause and work efficiently as a member of a team.

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensitivity to lived experiences, with self-awareness and reflexivity of both self and society.

PO10: Information/digital literacy: Capability to use ICT in a variety of learning situations; demonstrate ability to access, evaluate and use a variety of relevant information sources; use appropriate software for analysis of data.

PO11: Self-directed learning: Ability to work independently; identify appropriate resources required for practical work completion.

PO12: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PO13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life; formulate a position/argument about an ethical issue from multiple perspectives; use ethical practices in all work; identify ethical issues related to one's work; avoid unethical behaviour such as fabrication, falsification or misrepresentation of data, plagiarism, and violation of intellectual property rights; appreciate environmental and sustainability issues; adopt objective, unbiased and truthful actions in all aspects of work.

PO14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or organization; setting direction; formulating an inspiring vision; building a team to achieve the vision; motivating and inspiring team members; using management skills to guide people to the right destination smoothly and efficiently.

PO15: Lifelong learning: Ability to acquire knowledge and skills, including learning how to learn, necessary for participating in learning activities throughout life through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing workplace demands through knowledge/skill development and reskilling.

Programme Specific Outcomes (PSO)

PSO1 – Communication Skill

Demonstrate advanced communication skills through effective oral, written, and digital presentations, enabling the dissemination of scientific knowledge, research findings, and professional ideas in academic, national, and international contexts.

PSO2 –Disciplinary Knowledge

Acquire advanced theoretical and practical knowledge in the discipline and demonstrate the ability to critically integrate, apply, and extend subject-specific concepts to address contemporary scientific and societal challenges.

PSO3 – Critical Thinking

Develop advanced critical thinking skills by evaluating theories, analyzing complex problems, interpreting scientific evidence, and synthesizing information to make informed academic and professional decisions.

PSO4 – Analytical Reasoning

Strengthen analytical and quantitative reasoning skills through advanced data analysis, spatial interpretation, scientific inquiry, and evidence-based decision-making to develop innovative solutions.

PSO5 – Scientific Reasoning

Apply advanced scientific principles, research methodologies, and modern scientific tools to investigate discipline-specific problems, validate findings, and contribute to scientific knowledge.

PSO6 – Self-directed Learning

Demonstrate the ability to engage in independent learning, critically evaluate emerging knowledge, utilize advanced learning resources, and prepare scholarly reports for academic and professional development.

PSO7 – Reflective Thinking

Apply reflective thinking to assess research methodologies, professional practices, and societal implications, thereby promoting continuous improvement, ethical responsibility, and sustainable development.

PSO8 – Problem Solving

Employ interdisciplinary approaches, scientific reasoning, and advanced analytical techniques to identify, evaluate, and solve complex discipline-related problems in diverse professional settings.

PSO9 – Research-related Skills

Demonstrate research competency by formulating research problems, designing investigations, collecting and analyzing data, applying appropriate methodologies, interpreting findings, and communicating research outcomes through dissertations, publications, and professional presentations.

PSO10 – Lifelong Learning

Recognize the importance of lifelong learning by adapting to emerging technologies, interdisciplinary knowledge, professional advancements, and global challenges through continuous academic and professional development.

CURRICULAM DESIGN AND CREDIT DISTRIBUTION FOR M.Sc., GEOGRAPHY

For the candidates admitted from the year 2026 - 27

Semester	Course Group	Subjects	Credits	No. of Hours	Exam hours	CIA	EA	TOTAL
I	Core	Applied Geomorphology	5	6	3	25	75	100
	Core	Principles of Cartography	5	6	3	25	75	100
	Core	Population Geography	5	6	3	25	75	100
	Practical	Terrain Mapping and Climatic Data Analysis	4	6	3	40	60	100
	Elective-I	1. Environmental Geography 2. Transport Geography	3	4	3	25	75	100
	SEC - I	Geography of Water Resources	2	2	3	25	75	100
			24	**30**				
II	Core	Advanced Climatology	5	6	3	25	75	100
	Core	Urban Geography	5	6	3	25	75	100
	Core	Hydrology and Oceanography	5	6	3	25	75	100
	Practical	Techniques of Remote Sensing	4	5	3	40	60	100
	Elective - II	1. Economic Geography 2. Geography of Health	3	4	3	25	75	100
	NMC - I	Disaster Management	2	2	3	25	75	100
		Human Rights	1	1	3	25	75	100
			25	**30**				
III	Core	Agricultural Geography	5	6	3	25	75	100
	Core	Research Methodology In Geography	5	6	3	25	75	100
	Core	Geographic Thought	5	6	3	25	75	100
	Practical	Geospatial Lap	4	6	3	40	60	100
	Elective - II	1. Geography Of Travel and Tourism 2. Political Geography	3	4	3	25	75	100
	NMC - II	Physical Geography Of India	2	2	3	25	75	100
		Internship	1					
			25	**30**				
IV	Core	Geography of India	5	6	3	25	75	100
	Core	Techniques of Remote Sensing And GIS	5	6	3	25	75	100
		Project With Viva Voce	5	16				
	SEC - II	Geoinformatics	2	2	3	25	75	100
		Extension Activity	1	-				
			18	**30**				

Core Theory – APPLIED GEOMORPHOLOGY

Course Objectives

- *To develop a comprehensive understanding of the concepts, principles, and scope of geomorphology and its role in interpreting Earth's surface features.*
- *To examine endogenic and exogenic geomorphic processes responsible for the evolution of landforms.*
- *To analyze major geomorphological theories, tectonic processes, and geomorphic cycles in relation to landscape development.*
- *To evaluate the significance of geomorphology in terrain analysis, resource exploration, and environmental management.*
- *To apply geomorphological knowledge in solving practical problems related to engineering, hydrology, and sustainable land-use planning.*

Unit I: Geomorphology: Nature, Scope and Development of Geomorphology-Recent trends in Geomorphology-Geological Time-Scale - Fundamental concepts of Geomorphology (Thronbury)

Unit II: Internal Process: Isostasy, Continental Drift, Sea floor Spreading-Plate Tectonics: Major and Minor Plats, Plate Boundaries and Margins- Seismic and Volcanic Zones.

Unit III: External Processes: Erosional, Transportational and Depositional Land forms of Fluvial, Glacial, Aeolian, Coastal and Karst.

Unit IV: Conceptual Development in Geomorphology: Normal Cycle of Erosion by Davis and Penck-Slope development: Slope Decline Theory of Davis, Slope Replacement Theory of W. Penck-Morphogenetic Regions.

Unit V: Applied Geomorphology: Applications of Geomorphology in Mineral Exploration, Oil Exploration and Hydrology; Terrain Evaluation: Highway Construction-Location of Land and Gravel Pits and Dam site selection.

Reference

1. *Thornbury, W.D. (2004). Principles of Geomorphology. Wiley Eastern Ltd., New Delhi.*
2. *Summerfield, M.A. (2014). Global Geomorphology. Routledge, London.*
3. *Kale, V.S. & Gupta, A. (2010). Introduction to Geomorphology. Orient Blackswan, Hyderabad.*
4. *Huggett, R.J. (2017). Fundamentals of Geomorphology. Routledge, London.*
5. *Strahler, A.N. & Strahler, A.H. (2013). Modern Physical Geography. Wiley, New York.*
6. *Singh, S. (2018). Geomorphology. Prayag Pustak Bhawan, Allahabad.*

Learning Outcomes	
CO1	Recall the fundamental concepts of geomorphology, geological time scale, earth structure, endogenic and exogenic processes, weathering, erosion, transportation, deposition, plate tectonics, and major landforms .
CO2	Apply geomorphological principles to explain landform development, tectonic activities, geomorphic processes, slope evolution, and the formation of fluvial, glacial, aeolian, coastal, and karst landscapes.
CO3	Compare and evaluate geomorphological theories, geomorphic cycles, and the influence of internal and external processes on landscape evolution and environmental change.
CO4	Demonstrate self-directed and lifelong learning by critically exploring geomorphic processes, terrain evolution, environmental hazards, and sustainable land resource management.
CO5	Communicate geomorphological concepts, landform characteristics, geomorphic processes, and terrain analysis effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret geomorphological data through critical thinking and scientific reasoning, undertake terrain investigations, and evaluate the applications of geomorphology in engineering, hydrology, mineral exploration, and environmental planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	–	–	–	–	–
CO2	–	3	2	2	3	–	–	2	–	–
CO3	–	2	3	3	2	–	1	2	–	–
CO4	1	2	2	1	1	3	3	2	–	3
CO5	3	2	1	–	–	1	–	–	1	2
CO6	1	3	3	3	3	2	2	3	3	2

Core Theory – PRINCIPLES OF CARTOGRAPHY

Course Objectives

- *To provide comprehensive knowledge of cartographic concepts, principles, and the evolution of map-making.*
- *To develop skills in map projections, coordinate systems, and spatial data representation.*
- *To familiarize students with cartographic design principles, thematic mapping, and visualization techniques.*
- *To enhance competencies in digital cartography, web mapping, and geospatial information systems.*
- *To apply cartographic methods for effective communication and spatial decision-making.*

Unit – I: Fundamentals of Cartography: Nature and Scope of Cartography - History and Future of Cartography - Cartography as Language and Communication -Visual Thinking and Visual Communication-Spatial Information System.

Unit – II: Map Projections and Coordinate Systems: Coordinate Systems and Map Projections - Geographical Data – Spatial Objects and Attributes – Map Scale and Accuracy.

Unit – III: Map Design and Layout: Map Compilation - Levels of Data Measurement, Generalization, Cartographic Design Principles - Map Symbolization- Qualitative and Quantitative Symbols - Graphic Communication – Map Elements and Layout.

Unit – IV: Terrain and Surface Analysis: Production and Map output - Typography and Labelling - Thematic Map Forms - Animation – Isarithmic, Choropleth & Surface Mapping- Map Reproduction, Publishing, & Sharing – Cartographic Products.

Unit – V: Online Mapping and Web Services: e-Mapping, Online Map Data Sources - Geospatial Web Services- Dynamic/Interactive Mapping- Cartography and Spatial Information Policy.

Reference

1. *Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. & Guptill, S.C. (2015). Elements of Cartography. John Wiley & Sons.*
2. *Tyner, J.A. (2014). Principles of Map Design. Guilford Press.*
3. *Dent, B.D., Torguson, J.S. & Hodler, T.W. (2009). Cartography: Thematic Map Design. McGraw-Hill.*
4. *Slocum, T.A., McMaster, R.B., Kessler, F.C. & Howard, H.H. (2022). Thematic Cartography and Geovisualization. Pearson.*
5. *Raisz, E. (2005). General Cartography. McGraw-Hill.*
6. *Singh, R.L. & Singh, R.P.B. (2010). Elements of Practical Geography. Kalyani Publishers.*

Learning Outcomes	
CO1	Remember the fundamental concepts of cartography, map-making principles, coordinate systems, map projections, map scales, spatial data, cartographic design, thematic mapping, and geospatial information systems.
CO2	Employ cartographic principles to prepare, interpret, and represent spatial information using appropriate map projections, symbols, coordinate systems, thematic mapping techniques, and digital cartographic tools.
CO3	Distinguish and evaluate different map projections, cartographic techniques, thematic maps, visualization methods, and digital mapping approaches for effective spatial representation and decision-making.
CO4	Illustrate self-directed and lifelong learning by critically exploring modern cartographic technologies, web mapping, spatial visualization, and geospatial information systems while promoting sustainable spatial planning.
CO5	Communicate cartographic concepts, map interpretation techniques, spatial information, and geographical data effectively through oral, written, graphical, and digital presentations using appropriate cartographic terminology.
CO6	Investigate and interpret spatial data through critical thinking and scientific reasoning, prepare thematic maps, evaluate cartographic outputs, and apply digital cartography for geographical analysis and planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	–	–	–	–	–
CO2	1	3	2	3	3	–	–	2	1	–
CO3	–	2	3	3	2	–	1	2	1	–
CO4	1	2	2	2	1	3	2	2	–	3
CO5	3	2	1	1	–	1	–	–	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – POPULATION GEOGRAPHY

Course Objectives

- *To introduce the concepts, scope, and significance of Population Geography.*
- *To analyze population distribution, growth, composition, fertility, mortality, and migration patterns.*
- *To evaluate demographic theories and population-resource relationships at different spatial scales.*
- *To examine population issues and policies in relation to sustainable development.*
- *To develop skills in demographic analysis using census and population datasets*

Unit - I - Introduction to Population Geography: Nature and scope of population Geography- Sources of population data: Census, Sample survey- population register- Vital registration system and International publications- problems in reliability of data.

Unit – II - Factors affecting population distribution: world population distribution; dynamics of population – measures and determinants of fertility and mortality – world trends; population growth – world trend.

Unit - III - Migration: Types – causes and consequences; population theories: Malthusian theory and demographic transition theory of W.S. Thompson.

Unit - IV - Pattern of Population Composition: Racial Composition, Age – Sex composition; problems of aged - Religious, Linguistic composition – world pattern of literacy.

Unit – V - Population and Resource Study: Resources: Human Resource – Natural Resource – Population resource ratio; Over – Under – Optimum Populations; Population and resource regions.

Reference

1. Chandna, R.C. (2017). *Population Geography*. Kalyani Publishers.
2. Clarke, J.I. (2015). *Population Geography*. Pergamon Press.
3. Weeks, J.R. (2020). *Population: An Introduction to Concepts and Issues*. Cengage Learning.
4. Garnier, B.J. (2009). *Geography of Population*. Longman.
5. Woods, R. (2018). *Population Analysis in Geography*. Routledge.
6. Singh, J. (2016). *Population Geography*. Rawat Publications.

Learning Outcomes	
CO1	Recollect the fundamental concepts of population geography, population distribution, growth, fertility, mortality, migration, demographic transition, population composition, and population-resource relationships.
CO2	Use demographic concepts and geographical principles to explain population dynamics, fertility, mortality, migration patterns, demographic transition, and population-resource interactions at different spatial scales.
CO3	Differentiate and evaluate demographic theories, migration patterns, population composition, population distribution, and resource utilization in relation to regional and global development.
CO4	Exhibit self-directed and lifelong learning by critically exploring demographic changes, population policies, sustainable resource utilization, and emerging population issues.
CO5	Express demographic concepts, population characteristics, migration patterns, and population issues effectively through oral, written, graphical, and statistical presentations using appropriate geographical terminology.
CO6	Examine and interpret demographic data through critical thinking and scientific reasoning, evaluate population trends, and assess their implications for regional planning and sustainable development.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	–	–	–	–	–
CO2	1	3	2	2	2	–	–	2	1	–
CO3	–	2	3	3	2	–	1	2	1	–
CO4	1	2	2	1	1	3	3	2	–	3
CO5	3	2	1	–	–	1	–	–	1	2
CO6	1	3	3	3	2	2	2	3	3	2

Core Practical – TERRAIN AND CLIMATICS DATA ANALYSIS

Course Objectives

- *To develop practical skills in terrain representation and topographic interpretation.*
- *To train students in profile drawing, slope analysis, and morphometric analysis techniques.*
- *To provide practical experience in climatological data analysis using standard graphical methods.*
- *To develop competencies in interpreting terrain characteristics for environmental and planning applications.*
- *To enhance analytical and technical skills required for geographical field investigations.*

Unit - I - Slope Analysis: Went worth – Smith - Robinson Methods

Unit - II Morphometric Analysis: Shape Measurement - Identification of Stream Orders - Bifurcation Ratio - Drainage Density - Miller's Circularity Ratio - Boyce Clark Method - Length Breadth Ratio Methods

Unit – III Drawing Profiles: Simple, Superimposed, Projected, Composite and Longitudinal Profiles

Unit - IV Climatic data Analysis: Foster's Climograph, Taylor's Climograph, Climatograph and Rainfall Variability

Reference

1. *Singh, R.L. & Singh, R.P.B. (2010). Elements of Practical Geography. Kalyani Publishers.*
2. *Monkhouse, F.J. & Wilkinson, H.R. (2014). Maps and Diagrams. Methuen.*
3. *Mishra, R.P. & Ramesh, A. (2016). Fundamentals of Cartography. Concept Publishing.*
4. *Gopal Singh (2015). Map Work and Practical Geography. Vikas Publishing.*
5. *Lo, C.P. & Yeung, A.K.W. (2018). Concepts and Techniques of Geographic Information Systems. Pearson.*
6. *Strahler, A.N. & Strahler, A.H. (2013). Modern Physical Geography. Wiley.*

Learning Outcomes	
CO1	State the fundamental concepts of terrain mapping, slope analysis, morphometric analysis, topographic profiles, climatic data, and graphical methods used in geographical investigations.
CO2	Execute practical techniques to perform slope analysis, morphometric measurements, terrain profiling, and climatic data analysis using standard geographical methods and graphical techniques.
CO3	Evaluate and evaluate different terrain analysis methods, morphometric parameters, climatic graphs, and their applications in geographical investigations and environmental studies.
CO4	Explain self-directed and lifelong learning by critically exploring terrain analysis, climatic variability, and spatial data interpretation for sustainable environmental management.
CO5	Express terrain characteristics, climatic patterns, analytical procedures, and graphical representations effectively through practical records, maps, diagrams, and scientific presentations using appropriate geographical terminology.
CO6	Asses and interpret terrain and climatic data through critical thinking and scientific reasoning, undertake geographical investigations, and evaluate their applications in environmental planning and resource management.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	–	–	–	–	–
CO2	1	3	2	3	3	–	–	2	2	–
CO3	–	2	3	3	2	–	1	2	2	–
CO4	1	2	2	2	2	3	2	2	–	3
CO5	3	2	1	1	–	1	–	–	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective - I – ENVIRONMENTAL GEOGRAPHY

Course Objectives

- *To provide a comprehensive understanding of the concepts, principles, scope, and significance of Environmental Geography and its interdisciplinary nature.*
- *To examine the structure and functioning of ecosystems, biogeochemical cycles, and the distribution of major world biomes.*
- *To analyze the impact of human activities on environmental quality, natural resources, and ecosystem sustainability.*
- *To evaluate environmental problems, environmental legislation, and conservation strategies for sustainable development.*
- *To develop scientific and analytical skills for environmental assessment, planning, and management at local, regional, and global levels.*

Unit I: Environmental Geography: Meaning, Nature and Scope – Elements of Environment - Atmosphere - Hydrosphere - Lithosphere – Biosphere.

Unit – II Concept of ecosystem: Structure and functions of ecosystem – Food chain, Food web food Pyramids; Nutrient cycles: Carbon cycle – Oxygen cycle – Nitrogen cycle

Unit III: Biomes: Concept – Major Biomes –Tropical Biome- Temperate Biome – Temperate Grassland Biome – Tundra Biome.

Unit – IV Human interference of the ecosystem: Population growth and its impact – Man's impact on the biosphere – Agriculture – Green Revolution - HYV and pesticides – Man's impact on land – Mining – Soil – Costal areas

Unit - V Environmental Management: Environmental quality – Management and planning - Plan of Environmental Impact Assessment- Environment law and protection-conservation movements- Earth summits

Reference

1. *Singh, S. (2020). Environmental Geography. Prayag Pustak Bhawan, Allahabad.*
2. *Chandna, R.C. (2018). Environmental Geography. Kalyani Publishers.*
3. *Goudie, A. (2018). The Human Impact on the Natural Environment. Wiley-Blackwell.*
4. *Cunningham, W.P. & Cunningham, M.A. (2021). Environmental Science: A Global Concern. McGraw-Hill.*
5. *Miller, G.T. & Spoolman, S.E. (2022). Environmental Science. Cengage Learning.*
6. *Odum, E.P. & Barrett, G.W. (2018). Fundamentals of Ecology. Cengage Learning.*

Learning Outcomes	
CO1	Recall the fundamental concepts of environmental geography, ecosystem structure and functions, biogeochemical cycles, biomes, environmental quality, conservation, and environmental management.
CO2	Apply environmental principles to explain ecosystem processes, nutrient cycles, biome characteristics, environmental degradation, and conservation strategies in different geographical regions.
CO3	Compare and evaluate ecosystem components, environmental issues, conservation measures, environmental legislation, and sustainable management practices at local, regional, and global scales.
CO4	Demonstrate self-directed and lifelong learning by critically exploring environmental challenges, biodiversity conservation, environmental policies, and sustainable resource management.
CO5	Communicate environmental concepts, ecosystem processes, environmental problems, and conservation strategies effectively through oral, written, graphical, and scientific presentations using appropriate environmental terminology.
CO6	Analyze and interpret environmental data through critical thinking and scientific reasoning, evaluate human impacts on ecosystems, and recommend sustainable environmental management practices.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	2	3	-	-	2	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective - I – TRANSPORT GEOGRAPHY

Course Objectives

- *To familiarize students with the concepts, scope, and significance of Transport Geography in regional and economic development.*
- *To examine transportation systems, network structures, accessibility, connectivity, and spatial interactions.*
- *To analyze transportation theories, transport costs, and freight movement in geographical contexts.*
- *To evaluate transport planning strategies for rural, urban, and regional development.*
- *To develop analytical skills for assessing transportation networks using quantitative and spatial techniques.*

Unit – I: Introduction: Nature, scope and Significance of Transport Geography – Different Types of Transportation and their Merits and Demerits – Choice of Mode of Transport.

Unit – II: Transportation and Cost: Terminal Charges and Operating Charges – Tapering Cost Structure – Variation in Freight Structure on Distance, Commodity, Size and Elasticity of Demand.

Unit – III: Transportation and Spatial Structure: Transportation network – Nodes and links – Connectivity – Accessibility – Centrality – Structural Analysis of Transportation Network – Graph Theoretic Measures – Stages of Development of Network – Measures of Nodal Accessibility – Matrix Measures – Shortest Path – Desire Line – Detour Index.

Unit – IV: Transportation Theories: Theories of Spatial Interaction – Interaction Models – Gravity Models – Ullman‟s Triad – Critical Appreciation of Gravity Model – Flows in the Network – Intensity of Flow – Allocation Model for Transportation.

Unit – V: Transportation and planning: Transportation and Spatial Structure – Hinterlands – Regional Specialization – Idealized Process of Transport Development – Rural and Urban Transport Problems – Urban and Regional Transport Planning.

Reference

1. *Rodrigue, J.P. (2020). The Geography of Transport Systems. Routledge.*
2. *Taaffe, E.J., Gauthier, H.L. & O'Kelly, M.E. (2014). Geography of Transportation. Pearson.*
3. *Hoyle, B.S. & Knowles, R.D. (2015). Modern Transport Geography. Wiley.*
4. *Hanson, S. & Giuliano, G. (2017). The Geography of Urban Transportation. Guilford Press.*
5. *Khisty, C.J. & Lall, B.K. (2018). Transportation Engineering. Prentice Hall.*
6. *Rodrigue, J.P. (2022). Transport, Mobility and Logistics. Routledge.*

Learning Outcomes	
CO1	Retrieve the fundamental concepts of transport geography, transportation systems, transport networks, accessibility, connectivity, spatial interaction, transport costs, and transport planning.
CO2	Utilise geographical principles to explain transportation networks, freight movement, transport costs, accessibility, connectivity, and regional transportation planning.
CO3	Relate and evaluate transportation models, spatial interaction theories, network structures, accessibility measures, and transport planning strategies for regional development.
CO4	Show self-directed and lifelong learning by critically exploring transportation systems, sustainable mobility, regional connectivity, and transport.
CO5	Communicate transportation concepts, network analysis, planning strategies, and spatial interaction effectively through oral, written, graphical, and digital presentations using appropriate geographical terminology.
CO6	Explore and interpret transportation data through critical thinking and scientific reasoning, evaluate transport networks, and recommend sustainable transportation solutions for regional development.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	3	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

SEC- I - GEOGRAPHY OF WATER RESOURCES

Course Objectives

- *To understand the concepts, scope, and significance of water resource geography and hydrological processes.*
- *To examine surface and groundwater systems, drainage basins, aquifers, and watershed characteristics.*
- *To evaluate water quality parameters, water resource management practices, and conservation techniques.*
- *To analyze water resource policies, river basin management, and contemporary water-related issues in India.*
- *To develop practical knowledge for sustainable water resource planning and integrated watershed management.*

Unit I: Fundamentals of Hydrology: Definitions: Water Resources Geography and Hydrology- Scope and significance of Water Resources Geography: Sources of Water: Surface Water and Groundwater.

Unit II: Surface and Ground Water resources: Drainage Basins and River Systems: Basin Hydrological Process: Overland Flow, Base Flow and Stream Flow - Aquifers: Characteristics and Classification

Unit III: Water Quality: Principles and indicators of Water Quality - Suspended and Dissolved Solids - Electrical Conductivity (EC), pH and Trace Constituents – Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) - Indian and International Standards (BIS and WHO) water quality.

Unit IV: Water Management Practices: Traditional Water Harvesting, Storage and Management in: Northern India, Central India and Southern India - Sustainable Water Conservation Measures

Unit V: Contemporary Issues and Concepts: Inter-State River Water Disputes: Cauvery, Krishna, Indus, Ganges and Brahmaputra System - Water Policy of India: Surface Water and Groundwater.

Reference

1. *Todd, D.K. & Mays, L.W. (2015). Groundwater Hydrology. Wiley.*
2. *Subramanya, K. (2017). Engineering Hydrology. McGraw-Hill.*
3. *Chow, V.T., Maidment, D.R. & Mays, L.W. (2016). Applied Hydrology. McGraw-Hill.*
4. *Raghunath, H.M. (2018). Hydrology: Principles, Analysis and Design. New Age International.*
5. *Singh, V.P. (2019). Hydrology and Water Resources. Springer.*
6. *Garg, S.K. (2020). Irrigation Engineering and Hydraulic Structures. Khanna Publishers.*

Learning Outcomes	
CO1	Recall the fundamental concepts of water resources geography, hydrology, surface water, groundwater, drainage basins, aquifers, water quality, watershed management, and water conservation.
CO2	Employ hydrological principles to explain drainage systems, groundwater occurrence, aquifer characteristics, water quality assessment, watershed management, and water conservation techniques.
CO3	Compare and evaluate water resource distribution, water quality parameters, watershed management practices, river basin issues, and national water policies for sustainable development.
CO4	Explain self-directed and lifelong learning by critically exploring integrated water resource management, water conservation strategies, water security, and sustainable utilization of freshwater resources.
CO5	Express hydrological concepts, water resource issues, watershed management practices, and water conservation strategies effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret hydrological and water quality data through critical thinking and scientific reasoning, evaluate water resource management practices, and recommend sustainable solutions for water resource planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	2	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – ADVANCED CLIMATOLOGY

Course Objectives

- *To provide advanced knowledge of atmospheric structure, climatic processes, and global circulation systems.*
- *To examine atmospheric dynamics, pressure systems, winds, air masses, fronts, and weather disturbances.*
- *To analyse climatic classifications, climate variability, climate change, and their environmental implications.*
- *To evaluate weather forecasting techniques and the impacts of anthropogenic activities on climate systems.*
- *To develop scientific understanding of atmospheric processes for environmental planning and climate adaptation.*

Unit – I- Climatology: Definition – Nature, Scope and trends – Atmosphere – Composition and structure – Insolation - Heat budget- Processes of heat energy transfer – Distribution of temperature: Horizontal and Vertical – Temperature inversion.

Unit – II - Atmospheric Pressure: Vertical and Horizontal distribution – Tricellular Meridional Circulation; Surface wind system: Planetary winds – Latitudinal shifting of wind belts – Jet stream – Monsoon – Concepts of its origin– Local winds – Geostrophic wind – Gradient wind - La_Nino and El-Nino

Unit - III - Precipitation: Definition – Forms and types; Humidity – Definition – Absolute – Relative – Specific; Dew point; Atmospheric equilibrium: Stability and instability – Adiabatic process – Temperature change – Condensation – Clouds and its types

Unit – IV- Air Masses: Definition and Characteristics – Source regions – Classification; Fronts: Types – Characteristics - Frontogenesis – Frontolyzes. Atmospheric disturbances: Cyclones: Tropical and Temperate and Anticyclones – Characteristics.

Unit - V Climatic Classification: Koppen's and Thornthwaite's – Climate change – Process of weather forecasting – Heat island – Air pollution – Green house effects – Ozone depletion – Human comfort zones.

Reference

1. *Barry, R.G. & Chorley, R.J. (2019). Atmosphere, Weather and Climate. Routledge.*
2. *Lutgens, F.K., Tarbuck, E.J. & Tasa, D. (2021). The Atmosphere. Pearson.*
3. *Critchfield, H.J. (2018). General Climatology. Prentice Hall.*
4. *Trewartha, G.T. & Horn, L.H. (2017). An Introduction to Climate. McGraw-Hill.*
5. *Ahrens, C.D. (2020). Meteorology Today. Cengage Learning.*
6. *Singh, S. (2020). Climatology. Prayag Pustak Bhawan.*

Learning Outcomes	
CO1	Remember the fundamental concepts of climatology, atmospheric structure, weather and climate, heat budget, winds, humidity, clouds, precipitation, air masses, fronts, cyclones, climatic classification, and climate change.
CO2	Apply climatological principles to explain atmospheric processes, heat balance, wind circulation, monsoon, cloud formation, precipitation, air masses, fronts, weather systems, and climatic variations.
CO3	Correlate and evaluate atmospheric factors, climatic classifications, weather systems, and the impacts of climate change, urban heat islands, air pollution, greenhouse effect, and ozone depletion.
CO4	Demonstrate self-directed learning by exploring climate variability, weather forecasting, climate adaptation, mitigation and environmental sustainability.
CO5	Articulate climatological concepts, weather phenomena, climatic classifications, climate change issues, and forecasting techniques using appropriate geographical and meteorological terminology.
CO6	Analyze climatological data, interpret weather and climate patterns, assess climatic hazards, and recommend strategies for climate adaptation and sustainable environmental management.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	2	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – URBAN GEOGRAPHY

Course Objectives

- *To understand the concepts, theories, and development of Urban Geography and urbanization processes.*
- *To examine urban land use patterns, city structure, urban morphology, and models of urban growth.*
- *To analyse urban hierarchy, functional classification, urban ecology, and metropolitan development.*
- *To evaluate urban problems, planning approaches, and smart city initiatives in India.*
- *To develop analytical skills for sustainable urban planning and management using geographical techniques.*

Unit - I - Urban Geography: Nature, Scope and Development of Urban Geography - Urbanization – factors affecting urban growth - World urbanization - Urbanization in developing countries - Urbanization in India.

Unit – II - Internal Structure of Cities: CBD-delimitation; Demographic structure of cities - Age and sex structure – Occupational structure; Urban land use: Types- Change in urban land use pattern.

Unit - III - Urban Land use Models: Burgess - Hoyt - Harris and Ullman – Urban ecology - Social Area analysis - Factorial ecology - Economic base and functional organization of the city - Basic and Non-basic concepts – Functional classification of cities

Unit – IV - Urban Expansion: Vertical - Urban renewal - Horizontal - Urban sprawl; Rural-Urban fringe - Suburbs - Growth and characteristics; City region – Umland demarcation

Unit – V - Urban Hierarchy: Rank size rule - Central Place theory - Urban problems: Slums, Transport – Pollution - Drinking water supply - Solid waste management - Urban Planning-Smart cities in India.

Reference

1. *Carter, H. (2016). The Study of Urban Geography. Edward Arnold.*
2. *Pacione, M. (2020). Urban Geography. Routledge.*
3. *Knox, P.L. & McCarthy, L. (2018). Urbanization: An Introduction to Urban Geography. Pearson.*
4. *Hall, T. (2019). Urban Geography. Routledge.*
5. *Kaplan, D.H., Wheeler, J.O. & Holloway, S.R. (2017). Urban Geography. Wiley.*
6. *Ramachandran, R. (2015). Urbanization and Urban Systems in India. Oxford University Press.*

Learning Outcomes	
CO1	State the fundamental concepts of urban geography, urbanization, urban growth, urban morphology, land use, urban hierarchy, urban ecology, and models of city structure.
CO2	Perform geographical principles to explain urbanization processes, urban land use patterns, city growth, urban expansion, and functional classification of cities in different geographical regions.
CO3	Compare and evaluate urban land use models, urban ecological theories, city functions, urban hierarchy, and planning approaches in relation to sustainable urban development.
CO4	Display self-directed and lifelong learning by critically exploring urban development, smart cities, sustainable urban planning, environmental quality, and urban governance.
CO5	Communicate urban geographical concepts, urban planning strategies, city structure, urban problems, and sustainable development measures effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Evaluate and interpret urban spatial data through critical thinking and scientific reasoning, evaluate urban growth patterns, and recommend sustainable planning strategies for improving urban environments.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	2	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – HYDROLOGY AND OCEANOGRAPHY

Course Objectives

- *To provide comprehensive knowledge of hydrological and oceanographic principles, processes, and their significance in the Earth's environmental system.*
- *To examine the hydrological cycle, groundwater dynamics, ocean circulation, and marine processes influencing the global water system.*
- *To analyse the characteristics, movement, and distribution of ocean waters and their role in climate regulation and coastal environments.*
- *To evaluate the utilization, conservation, and sustainable management of freshwater and marine resources in the context of environmental change.*
- *To develop analytical and scientific skills for investigating hydrological and oceanographic phenomena using geographical approaches.*

Unit – I - Hydrologic Cycle: Hydrological cycle and its sub-cycle; Man's interference on hydrological cycle - elements of hydrological cycle: precipitation – intensity and duration; evaporation; infiltration, surface runoff, urban flooding

Unit – II - Ground water: occurrence and movements –Water balance and application **–** Ground water Hydrology: Aquifer types –Occurrences, Recharge – Water quality - Human impact on hydrological cycle.

Unit - III – Oceans: Nature of Oceans – origin and history; ocean circulation: factors affecting circulation– horizontal and vertical circulation; relief features of ocean floor; sea water: temperature and salinity distribution; sea floor spreading.

Unit – IV - Movement of Ocean water: waves – tides – currents: types, causes and effects; Tsunami: characteristics and effects

Unit – V - Ocean Resources: Coastal ecosystems - Fisheries – Hydrothermal Power – Mangrove forest - Corals reefs – Types; coast: types and characteristics.

Reference

1. *King, C.A.M. (2013). Oceanography for Geographers. Edward Arnold, London.*
2. *Pidwirny, M. (2019). Fundamentals of Physical Geography. University of British Columbia.*
3. *Sharma, R.C. & Vatal, M. (2018). Oceanography for Geographers. Chaitanya Publishing House.*
4. *Subramanya, K. (2017). Engineering Hydrology. McGraw-Hill Education, New Delhi.*
5. *Thurman, H.V. & Trujillo, A.P. (2020). Essentials of Oceanography. Pearson Education.*
6. *Garrison, T. (2021). Oceanography: An Invitation to Marine Science. Cengage Learning.*

Learning Outcomes	
CO1	Recall the fundamental concepts of hydrology, hydrological cycle, groundwater, oceans, ocean circulation, waves, tides, currents, coastal ecosystems, and marine resources.
CO2	Apply hydrological and oceanographic principles to explain the movement of water, groundwater recharge, ocean circulation, marine processes, and coastal dynamics in different environmental settings.
CO3	Compare and evaluate hydrological processes, groundwater systems, oceanic circulation, marine resources, and coastal environments in relation to climate and environmental sustainability.
CO4	Demonstrate self-directed and lifelong learning by critically exploring water resource conservation, marine ecosystem protection, coastal management, and sustainable utilization of freshwater and ocean.
CO5	Communicate hydrological and oceanographic concepts, marine processes, water resource issues, and coastal management practices effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret hydrological and oceanographic data through critical thinking and scientific reasoning, evaluate water resource management practices, and recommend sustainable solutions for coastal and freshwater management.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	2	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Practical – TECHNIQUES OF REMOTE SENSING

Course Objectives

- *To develop practical skills in the use of aerial photographs for stereoscopic viewing, scale determination, and height estimation.*
- *To Interpret physical and cultural features from aerial photographs using standard visual interpretation techniques.*
- *To apply satellite image interpretation principles, digital image processing, and image classification techniques for analysing Earth's surface features.*
- *To prepare thematic maps and interpret geospatial information from remotely sensed data for environmental and resource management applications.*

Unit – I: Aerial Photographs:

Stereovision test - Marginal Information - Determination of Scale - Determination of Height.

Unit – II: Interpretation of Aerial Photographs:

Physical Features - Cultural Features.

Unit – III: Satellite Images:

Marginal Information - Elements of Image Interpretation – digital Image processing and Classification

Unit – IV: Interpretation of Satellite Image Interpretation

Physical Features - Cultural Features

Reference

1. *Lillesand, T. M., Kiefer, R. W. & Chipman, J. W. – Remote Sensing and Image Interpretation, Wiley, 2023.*
2. *Jensen, J. R. – Introductory Digital Image Processing: A Remote Sensing Perspective, Pearson, 2015.*
3. *Campbell, J. B. & Wynne, R. H. – Introduction to Remote Sensing, Guilford Press, 2011.*
4. *Joseph, G. – Fundamentals of Remote Sensing, Universities Press, Hyderabad, 2005.*

Learning Outcomes	
CO1	Define the fundamental concepts of aerial photographs, satellite imagery, stereoscopy, image interpretation, digital image processing, and image classification techniques.
CO2	Implement practical skills to interpret aerial photographs, determine scale and height, analyze satellite images, and perform digital image processing using standard remote sensing techniques.
CO3	Compare and evaluate aerial photographs, satellite imagery, interpretation elements, and image classification methods for geographical investigations and environmental studies.
CO4	Present self-directed and lifelong learning by critically exploring remote sensing technologies, satellite applications, and geospatial innovations for sustainable resource management.
CO5	Communicate remote sensing concepts, image interpretation procedures, thematic mapping techniques, and geospatial applications effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret remotely sensed data through critical thinking and scientific reasoning, prepare thematic maps, and evaluate their applications in environmental monitoring, resource management, and regional planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	3	2	-
CO3	-	2	3	3	2	-	1	2	2	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective- II– ECONOMIC GEOGRAPHY

Course Objectives

- *To provide an advanced understanding of the concepts, principles, and contemporary approaches in Economic Geography.*
- *To examine the spatial distribution of agricultural, industrial, mineral, and energy resources influencing regional economic development.*
- *To analyze economic sectors, location theories, globalization, trade patterns, and regional economic integration.*
- *To evaluate the impact of transport, trade, technological change, and globalization on economic development at various spatial scales.*
- *To develop analytical skills for interpreting economic landscapes and formulating strategies for balanced and sustainable regional development.*

Unit – I – Economic Geography: Nature, Scope and importance of Economic Geography- Economic Sectors Activities: Primary, Secondary, Tertiary, Quaternary and Quinary; Regional Pattern of Economic Development

Unit – II - Agricultural Resources: Major Agricultural Regions and Factors; Industrial Resources: Major Industrial Regions and Factors; Location theories: Weber, Losch, Christaller, Ullman and Krugman;

Unit – III - Pattern of Economic Development: Developed, Developing and under Developed; Characteristics of Economies; Agglomeration Economies; Energy Resources: Production and Consumption pattern.

Unit – IV - Transport and Trade: Transport and Economic Development; Impact of Globalization on International Trade; Trends in Pattern of International Trade.

Unit – V – Trade Blocks: Major Regional Blocks of the World - Free Trade Initiatives: GATT, UNCTAD- WTO

Reference

1. *Alexander, J.W. (2015). Economic Geography. Prentice Hall.*
2. *Coe, N.M., Kelly, P.F. & Yeung, H.W.C. (2020). Economic Geography: A Contemporary Introduction. Wiley-Blackwell.*
3. *Knox, P., Agnew, J. & McCarthy, L. (2018). The Geography of the World Economy. Routledge.*
4. *Hartshorne, T.A. & Alexander, J.W. (2017). Economic Geography. Prentice Hall.*
5. *Wheeler, J.O., Muller, P.O., Thrall, G.I. & Fik, T.J. (2016). Economic Geography. Wiley.*
6. *Singh, J. & Dhillon, S.S. (2019). Agricultural Geography. Tata McGraw-Hill.*

Learning Outcomes	
CO1	Recall the fundamental concepts of economic geography, economic sectors, agricultural and industrial resources, energy resources, location theories, globalization, trade, and regional development.
CO2	Apply geographical principles to explain the spatial distribution of economic activities, industrial location, agricultural development, transport systems, trade patterns, and globalization.
CO3	Differentiate and evaluate economic development patterns, industrial location theories, regional trade blocs, globalization, and international trade in relation to sustainable economic development.
CO4	Validate self-directed and lifelong learning by critically exploring economic transformation, regional development strategies, globalization, and sustainable utilization of natural resources.
CO5	Communicate economic geographical concepts, industrial development, trade systems, resource distribution, and regional planning effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Examine and interpret economic and spatial data through critical thinking and scientific reasoning, evaluate regional economic disparities, and recommend strategies for balanced and sustainable development.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	-	-	-	-	-
CO2	1	3	2	3	2	-	-	2	1	-
CO3	-	2	3	3	2	-	1	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective- II – GEOGRAPHY OF HEALTH

Course Objectives

- *To introduce the concepts, scope, and significance of Health Geography and its contribution to understanding spatial patterns of health and disease.*
- *To examine disease ecology, epidemiological processes, and environmental determinants influencing human health.*
- *To analyze the spatial distribution of communicable and non-communicable diseases and regional disparities in health care.*
- *To evaluate health care systems, public health policies, and the role of national and international health organizations.*
- *To develop analytical and research skills for assessing health-related issues and promoting sustainable public health planning.*

Unit I: Introduction to Health Geography: Meaning, Nature, Scope and Significance of Health Geography - Development of Health Geography - Determinants of Health: Physical, Social, Economic and Environmental Factors.

Unit II: Disease Ecology and Epidemiology: Concept and Classification of Diseases - Disease Ecology: Agents of Diseases - Modes of Disease Transmission - Prevention and Control Measures.

Unit III: Health and Disease Patterns: Spatial Patterns of Health and Disease - Health and Disease in Environmental Context with Special Reference to India - Communicable and Non-Communicable Diseases and their Regional Distribution.

Unit IV: Health Care System in India: Structure and Organization of Health Care Services - Hierarchy of Public Health Care System (Sub-Centre, PHC, CHC and Hospitals) - Health Planning, Policies and Programmes in India.

Unit V: Health Organizations: Role and Functions of International and National Health Organizations - WHO, UNICEF and UNDP - National Health Mission (NHM), NRHM and NUHM - Challenges and Future Prospects of Health Care in India.

Reference

1. *Meade, M.S. & Emch, M. (2019). Medical Geography. Guilford Press.*
2. *Gatrell, A.C. & Elliott, S.J. (2015). Geographies of Health. Wiley-Blackwell.*
3. *Curtis, S. (2018). Space, Place and Mental Health. Routledge.*
4. *Cliff, A.D., Haggett, P. & Smallman-Raynor, M. (2016). Oxford Textbook of Infectious Disease Control. Oxford University Press.*
5. *Akhtar, R. (2019). Geography of Health. Rawat Publications.*
6. *World Health Organization (WHO). (2023). World Health Statistics. WHO Publications.*

Learning Outcomes	
CO1	List out the fundamental concepts of health geography, determinants of health, disease ecology, epidemiology, health care systems, communicable diseases, non-communicable diseases, and health organizations.
CO2	Implement geographical principles to explain disease distribution, environmental determinants of health, health care delivery systems, and public health programmes in different geographical regions.
CO3	Examine and evaluate disease patterns, health care services, national and international health programmes, and regional health disparities in relation to public health planning.
CO4	Demonstrate self-directed and lifelong learning by critically exploring emerging health challenges, disease prevention strategies, environmental health, and sustainable public health management.
CO5	Communicate health geographical concepts, disease patterns, health care systems, and public health programmes effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Investigate and interpret health-related data through critical thinking and scientific reasoning, evaluate public health policies, and recommend strategies for improving community health and healthcare accessibility.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	2	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

NMC-I– DISASTER MANAGEMENT

Course Objectives

- *To provide a comprehensive understanding of disaster concepts, hazards, vulnerability, risk assessment, and disaster management frameworks.*
- *To examine the causes, characteristics, impacts, and mitigation measures of geological, hydro-climatic, and environmental hazards.*
- *To analyze disaster preparedness, response, recovery, and resilience-building strategies at local, national, and global levels.*
- *To evaluate the roles of disaster management institutions, early warning systems, and policy frameworks in reducing disaster risks.*
- *To develop professional competencies for disaster risk reduction, emergency planning, and sustainable community resilience.*

Unit I - Fundamentals of Disasters and Vulnerability: Meaning of Disaster, Hazard, Risk and Vulnerability – Classification of Disasters - Vulnerability: Physical, Social, Economic and Environmental Vulnerability

Unit II - Geological Hazards: Causes, Distribution - Consequences and Mitigation Measures of Volcano – Earthquake - Tsunami and Landslides.

Unit III - Hydro-Climatic Hazards: Mass Wasting and their effects - Drought hazards – Types – Effects of drought – Drought hazards in India

Unit IV- Environment Hazards: Source, Cause and Consequences of Air and Water Pollutions –- Toxic and Nuclear Wastes.

.

Unit V - Disaster Management: Disaster Management: National (NDMA) and Tamil Nadu State Disaster Management Authority (SDMA) - Early Warning and Prediction Systems in India.

Reference

1. *Singh, S. (2021). Disaster Management. Prayag Pustak Bhawan, Allahabad.*
2. *Carter, W.N. (2018). Disaster Management: A Disaster Manager's Handbook. Asian Development Bank.*
3. *Coppola, D.P. (2020). Introduction to International Disaster Management. Butterworth-Heinemann.*
4. *Alexander, D. (2016). Principles of Emergency Planning and Management. Oxford University Press.*
5. *Goel, S.L. (2017). Disaster Administration and Management. Deep & Deep Publications.*
6. *National Disaster Management Authority (NDMA). (Latest Edition). National Disaster Management Guidelines. Government of India.*

Learning Outcomes	
CO1	Recall the fundamental concepts of disasters, hazards, vulnerability, risk, disaster management cycle, geological hazards, hydro-climatic hazards, environmental hazards, and disaster management institutions.
CO2	Put into practice disaster management principles to explain the causes, impacts, preparedness, mitigation, response, recovery, and resilience strategies for natural and human-induced disasters.
CO3	Relate and evaluate different types of disasters, disaster risk reduction measures, early warning systems, institutional frameworks, and disaster management policies at national and global levels.
CO4	Demonstrate self-directed and lifelong learning by critically exploring disaster preparedness, climate resilience, community participation, environmental protection, and sustainable disaster risk reduction.
CO5	Discuss disaster management concepts, hazard mitigation measures, emergency response strategies, and disaster preparedness plans effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret disaster-related data through critical thinking and scientific reasoning, assess disaster risks, and recommend appropriate mitigation, preparedness, and recovery strategies for sustainable community resilience.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – AGRICULTURAL GEOGRAPHY

Course Objectives

- *To provide an advanced understanding of the concepts, scope, approaches, and significance of Agricultural Geography in regional development.*
- *To examine the physical, socio-economic, technological, and institutional factors influencing agricultural productivity and land use.*
- *To analyze agricultural systems, agricultural regionalization, and classical models of agricultural location.*
- *To evaluate the characteristics, challenges, and sustainability of Indian agriculture in the context of global agricultural development.*
- *To develop analytical and research skills for agricultural planning, resource management, and sustainable agricultural practices.*

Unit I - Agricultural Geography: Nature and Scope - Origin and Development of Agriculture - Objectives of Agricultural Geography; **Approaches to Agricultural Geography**: Commodity – Regional – Systematic.

Unit II – Determinants of Agriculture: Physical Factors: Topography and Altitude; Climate: Temperature, Sunshine, Frost, Moisture, Drought, Snow and Winds; Soils: Parent Material, Climate, Living Organism; **Socioeconomic Factors**: Land Tenancy, Size of Holdings and Fragmentation of Fields, Consolidation of Holdings and Operational Efficiency, Labour, Capital, Mechanization and Equipments and Government Policy.

Unit III - Agricultural systems of the world: Nomadic Herding, Livestock Ranching, Commercial Grazing, Shifting Cultivation, Sedentary Agriculture, Intensive Subsistence Agriculture, Intensive Agriculture, Extensive Agriculture, Mixed Farming, Dairy Farming, Horticulture, Collective Farms and State Farms.

Unit IV - Agricultural Regionalization: Delimitation of Agricultural Regions, Methodology for Agricultural Regionalization, Crop Combination Regions, Crop Diversification, Land Capability Classification in India; **Models in Agricultural Geography**: Vonthunen's and Jonasson's – Significance and Limitations

Unit V- Indian Agriculture: Characteristics of Indian Agriculture - **Green revolution in India:** Merits of High Yielding Varieties, Socioeconomic Constraints in the Adoption of High Yielding Varieties, Green Revolution and Rotation of Crops; Negative Impacts, Green Revolution and Social Tension and Ecological Implications of the Green revolution.

Reference

1. *Grigg, D. (1995). An Introduction to Agricultural Geography. Routledge.*
2. *Singh, J. & Dhillon, S.S. (2014). Agricultural Geography. Tata McGraw-Hill.*
3. *Morgan, W.B. & Munton, R.J.C. (2018). Agricultural Geography. Routledge.*
4. *Bowler, I.R. (2017). The Geography of Agriculture. Longman.*
5. *Hussain, M. (2020). Agricultural Geography. Rawat Publications.*
6. *Singh, G. (2019). Agricultural Geography. Atma Ram & Sons.*

Learning Outcomes	
CO1	Remember the fundamental concepts of agricultural geography, origin and development of agriculture, agricultural systems, determinants of agriculture, agricultural regionalization, and agricultural location theories.
CO2	Apply geographical principles to explain the influence of physical, socio-economic, technological, and institutional factors on agricultural production, cropping patterns, land use, and agricultural development.
CO3	Examine and evaluate different agricultural systems, agricultural regions, land capability classifications, and classical agricultural location theories in relation to regional agricultural development.
CO4	Exhibit self-directed and lifelong learning by critically exploring sustainable agriculture, food security, agricultural innovations, climate-resilient farming, and resource conservation.
CO5	Communicate agricultural geographical concepts, farming systems, agricultural practices, land capability, and rural development issues effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Investigate and interpret agricultural data through critical thinking and scientific reasoning, evaluate agricultural productivity and regional disparities, and recommend sustainable agricultural planning and resource management strategies.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	-	-	-	-	-
CO2	1	3	2	3	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – RESEARCH METHODOLOGY IN GEOGRAPHY

Course Objectives

- *To introduce the concepts, principles, and approaches of scientific research in Geography.*
- *To develop competencies in research design, hypothesis formulation, sampling techniques, and quantitative analysis.*
- *To provide practical knowledge of data collection, processing, statistical analysis, and interpretation using geographical methods.*
- *To familiarize students with thesis writing, research ethics, citation styles, and academic writing standards.*
- *To prepare students for independent research and dissertation work in geographical sciences.*

Unit – I - Research methodology: Introduction- Meaning of Research- Objectives- Types - Approaches- Significance- Identification of Research Problem – Sources, Types and Components of Research Problem.

Unit – II - Research Design: Selection of Topic – Statement of Problem – Formulation and Testing of Hypothesis – Time Schedule – Literature – Role of Internet – Bibliography.

Unit –III - Data Acquisition and Analysis: Collection of Data –Sources of Data: Primary and Secondary, Structuring Data – Data Transformation - Simple Quantitative Techniques in Analysis of Data: Correlation, Regression, Chi-Square, F-Test and T-Test.

Unit – IV - Sampling Techniques: Introduction – Need for Sampling – Methods of Sampling: Probability Sampling Simple, Stratified, Systematic, Cluster or Multistage Random Samplings, Non-Probability Sampling: Judgment, Convenience, Quota and Snow Ball – Merits and Limitations.

Unit – V - Thesis writing: Organization of the Thesis: The preliminaries, the text and the Reference Materials- Drafting of Thesis- Language and Presentation (form and style)- Writing of Abstract and Project Proposal.

Reference

1. *Kothari, C.R. (2019). Research Methodology: Methods and Techniques. New Age International.*
2. *Creswell, J.W. (2018). Research Design. Sage Publications.*
3. *Gomez, B. & Jones, J.P. (2017). Research Methods in Geography. Wiley.*
4. *Clifford, N., Cope, M., Gillespie, T. & French, S. (2016). Key Methods in Geography. Sage Publications.*
5. *Montgomery, D.C. & Runger, G.C. (2020). Applied Statistics and Probability for Engineers. Wiley.*
6. *Mishra, R.P. (2015). Research Methodology in Geography. Concept Publishing.*

Learning Outcomes	
CO1	Recall the fundamental concepts of research methodology, scientific methods, research design, hypothesis formulation, sampling techniques, data collection methods, statistical analysis, and thesis writing.
CO2	Use research methods and quantitative techniques to formulate research problems, collect primary and secondary data, test hypotheses, and interpret geographical data systematically.
CO3	Distinguish and evaluate different research designs, sampling methods, statistical techniques, and analytical approaches used in geographical investigations and scientific research.
CO4	Demonstrate self-directed and lifelong learning by critically exploring contemporary research methods, ethical research practices, academic integrity, and emerging technologies.
CO5	Communicate research findings, project proposals, statistical interpretations, and scientific reports effectively through oral, written, graphical, and academic presentations using appropriate research terminology.
CO6	Interpret geographical data through critical thinking and scientific reasoning, undertake independent research investigations, and prepare research reports following accepted academic standards and ethical practices.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	2	3	1	-	-	2	-
CO2	1	3	2	3	3	2	-	2	3	-
CO3	-	2	3	3	3	1	1	2	3	-
CO4	1	2	2	2	2	3	3	2	2	3
CO5	3	2	1	1	1	2	-	-	3	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – GEOGRAPHIC THOUGHT

Course Objectives

- *To provide comprehensive knowledge of the historical evolution and philosophical foundations of geographical thought.*
- *To examine the contributions of major geographical schools and scholars to the development of Geography.*
- *To analyze the evolution of geographical paradigms, dualisms, theories, and quantitative revolutions.*
- *To evaluate contemporary perspectives and emerging trends in geographical research and methodology.*
- *To develop critical thinking and philosophical understanding of Geography as a scientific discipline.*

Unit – I: Contribution in the Field of Geography: Nature of Geography - Greeks, Romans, Arabs, German, French, British, American and Indian Geographical Thought.

Unit – II: Traditions and Explanations in Geography: Traditions in Geography – Man – Land, Area Studies, Spatial and Earth Science Traditions – Explanations in Geography: David Harvey.

Unit – III: Dualism in Geography: Dualism and Dichotomy – Systematic and Regional, Deterministic and Possibilistic, Physical and Human, Ideographic and Nomothetic, Qualitative and Quantitative.

Unit – IV: Models and Quantitative Revolution in Geography: Theories and Models in Geography – Quantitative Revolution and Paradigms - Themes in Geography – Positivism – Pragmatism – Behaviouralism – Functionalism – Idealism – Realism and Marxism.

Unit – V: Status of Modern Geography: Conceptual and Methodological Developments and Changing Paradigms; Status of Indian Geography and Future of Geography.

Reference

1. *Hussain, M. (2020). Evolution of Geographical Thought. Rawat Publications.*
2. *Dikshit, R.D. (2018). Geographical Thought. Prentice Hall of India.*
3. *Johnston, R.J. (2016). Geography and Geographers. Routledge.*
4. *Martin, G.J. (2015). All Possible Worlds. Oxford University Press.*
5. *Peet, R. (2017). Modern Geographical Thought. Blackwell.*
6. *Hartshorne, R. (2006). The Nature of Geography. Association of American Geographers.*

Learning Outcomes	
CO1	Define the fundamental concepts of geographical thought, philosophical foundations, major schools of geography, geographical traditions, paradigms, dualisms, and contemporary geographical approaches.
CO2	Utilise geographical philosophies and theoretical perspectives to explain the evolution of geographical thought, regional analysis, spatial organization, and changing paradigms in geographical research.
CO3	Compare and evaluate the contributions of major geographers, geographical schools, dualistic approaches, quantitative revolution, and contemporary paradigms in the development of geographical knowledge.
CO4	Exhibit self-directed and lifelong learning by critically exploring emerging trends in geographical research, interdisciplinary perspectives, scientific innovations, and sustainable development.
CO5	Communicate geographical philosophies, conceptual developments, theoretical perspectives, and research paradigms effectively through oral, written, graphical, and academic presentations using appropriate geographical terminology.
CO6	Examine and interpret geographical theories through critical thinking and scientific reasoning, evaluate their relevance to modern geographical research, and apply conceptual frameworks to contemporary geographical issues.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	1	2	-	-	-	-	-
CO2	1	3	3	2	2	-	1	2	1	-
CO3	-	2	3	3	2	-	2	2	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	2	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Practical – GEOSPTIAL LAB

Course Objectives

- *To provide practical training in GIS software, spatial database creation, and digital mapping techniques.*
- *To develop skills in geo-referencing, digitization, spatial data editing, and attribute database management.*
- *To apply GIS tools for thematic mapping, overlay analysis, proximity analysis, and spatial modelling.*
- *To familiarize students with open-source GIS software and contemporary geospatial technologies.*
- *To strengthen technical competencies required for professional applications in planning, resource management, and research.*

Unit – I - Fundamental of GIS Software: Introduction: Arc GIS / open-source GIS software (QGIS) - Exploration of standard, editor, layout tools (Arc GIS/QGIS); Scanning – Adding spatial and non-spatial data.

Unit – II - Basics in GIS Software: Geo-Referencing – Introduction; Exploration of Arc Catalog – shapefile creation (Point, Line and Polygon); Map projection and transformation.

Unit – III – Digitization: Digitization: Introduction – Point, Line and Polygon; Types of digitizing errors – Attribute data management.

Unit – IV - Thematic Mapping: Thematic mapping: Distribution maps, Dot map, Located Pie and Bar chart; Proximity analysis – Overlay analysis.

Reference

1. *Burrough, P.A. & McDonnell, R.A. (2015). Principles of Geographical Information Systems. Oxford University Press.*
2. *Longley, P.A., Goodchild, M.F., Maguire, D.J. & Rhind, D.W. (2021). Geographical Information Systems and Science. Wiley.*
3. *Chang, K.T. (2020). Introduction to Geographic Information Systems. McGraw-Hill.*
4. *Lo, C.P. & Yeung, A.K.W. (2018). Concepts and Techniques of Geographic Information Systems. Pearson.*
5. *Bolstad, P. (2019). GIS Fundamentals. XanEdu Publishing.*
6. *QGIS Development Team (Latest Edition). QGIS User Guide.*

Learning Outcomes	
CO1	Recall the fundamental concepts of Geographic Information Systems (GIS), spatial and non-spatial data, georeferencing, digitization, spatial databases, thematic mapping, and spatial analysis techniques.
CO2	Execute GIS software to perform georeferencing, digitization, spatial database creation, thematic mapping, overlay analysis, proximity analysis, and spatial data management for geographical investigations.
CO3	Compare and evaluate different GIS techniques, spatial analytical methods, mapping procedures, and geospatial technologies for solving geographical and environmental problems.
CO4	Display self-directed and lifelong learning by critically exploring advancements in GIS, open-source geospatial technologies, spatial modelling, and digital mapping.
CO5	Communicate geospatial concepts, GIS applications, thematic maps, spatial analysis results, and digital cartographic outputs effectively through oral, written, graphical, and scientific presentations using appropriate geospatial terminology.
CO6	Investigate and interpret spatial data through critical thinking and scientific reasoning, develop GIS-based solutions, and evaluate their applications in resource management, environmental monitoring, and regional planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	3	2	-
CO3	-	2	3	3	3	-	1	3	2	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	2	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective -II – GEOGRAPHY OF TRAVEL AND TOURISM

Course Objectives

- *To provide comprehensive knowledge of tourism concepts, classifications, and the geographical dimensions of travel and tourism.*
- *To examine tourism resources, infrastructure, travel services, and tourism organizations at national and international levels.*
- *To analyze tourism planning, destination development, marketing strategies, and sustainable tourism practices.*
- *To evaluate the socio-economic and environmental impacts of tourism on regional development.*
- *To develop professional competencies in tourism planning, destination management, and tourism entrepreneurship*

Unit-I – Tourism: Scope, Content and Importance; Classification of travellers: Tourists - merchants- Explorers-Pilgrims; Factors influencing tourism; Tourism types: Religions- recreational - cultural – Ecological- Sporting – Medical – Domestic – International.

Unit-II - Tourist Facilities and Services: Transport – Accommodation – Catering – Entertainment; their role in the development of tourism; Travel Documents: Passport- Visa and its types – travellers cheque – credit cards.

Unit - III - Tourism Promotion: Advertisement – Sales support activates –public relations – marketing of tourist products; Travel Agencies - Tour operators and their functions; Types of hotels – motels - chaultries – guest house; their role in tourism promotion.

Unit-IV - Tourism Organisation in India: Tourism organisation in India: Department of tourism in India – Ministry of Tourism – Indian Tourism Development corporation – Tamil Nadu Tourism Development corporation.

Unit-V - Major Tourist Sports in India: Delhi – Kolkatta – Mumbai – Hyderabad- Jaipur- Shimla- Holy places in North India; Major tourist parts in Tamil Nadu: Chennai – Madurai – Ooty –Kodaikanal.

Reference

1. Cooper, C., Fletcher, J., Gilbert, D. & Wanhill, S. (2019). Tourism: Principles and Practice. Pearson.
2. Hall, C.M. & Page, S.J. (2020). The Geography of Tourism and Recreation. Routledge.
3. Page, S.J. (2019). Tourism Management. Routledge.
4. Bhatia, A.K. (2018). Tourism Development. Sterling Publishers.
5. Sharma, J.K. (2017). Tourism Planning and Development. Kanishka Publishers.
6. Robinson, P. (2018). Tourism: The Key Concepts. Routledge.

Learning Outcomes	
CO1	Recall the fundamental concepts of tourism geography, tourism resources, tourism types, travel services, tourism organizations, destination development, and tourism planning.
CO2	Apply geographical principles to explain tourism development, tourism infrastructure, travel management, destination planning, tourism promotion, and regional tourism potential.
CO3	Compare and evaluate different tourism resources, tourism organizations, destination management strategies, tourism marketing techniques, and sustainable tourism practices.
CO4	Demonstrate self-directed and lifelong learning by critically exploring responsible tourism, ecotourism, cultural heritage conservation, tourism entrepreneurship, and sustainable destination management.
CO5	Communicate tourism concepts, tourism planning strategies, destination characteristics, tourism promotion techniques, and travel management practices effectively through oral, written, graphical, and scientific presentations using appropriate tourism terminology.
CO6	Analyze and interpret tourism data through critical thinking and scientific reasoning, evaluate tourism development strategies, and recommend sustainable tourism planning for regional economic development.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	2	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Elective - II – POLITICAL GEOGRAPHY

Course Objectives

- *To introduce the concepts, approaches, and contemporary perspectives in Political Geography.*
- *To examine the evolution of nation-states, political boundaries, frontiers, and geopolitical theories.*
- *To analyze global political systems, international relations, and strategic geopolitical issues.*
- *To evaluate the political geography of India with special reference to federalism, boundary disputes, and regional development.*
- *To develop critical understanding of the spatial dimensions of political processes and global governance.*

Unit – I: Nature of Political Geography: Political Geography - Nature and Scope – Contemporary Traditions in Political Geography – Approaches to Study – Its Relation to other Social Science Disciplines.

Unit – II: Concept of Nation and State: Nation - Concept – Characteristics – Elements of Nation Building – Nationalism; State: Concept – Characteristics – Types; Land Locked – Littoral – Island States.

Unit – III: Frontiers and Boundaries: Frontiers and Boundaries: Evolution and Classification – Core Areas and Capitals, Centre – Periphery Relations.

Unit – IV: Theories in Political Geography: Global Strategic Views; Heartland and Rim Land Theories – Indian Ocean Politics – International Relations – Multinational Organizations: Political, Economic and Cultural Blocks.

Unit – V: Political Geography in India: Political Geography of India: Federalism - State Reorganization after Independence – Emergence of New States – India‟s Border Problems – Inter State Disputes with Tamil Nadu.

Reference

1. *Agnew, J. (2018). Geopolitics: Re-visioning World Politics. Routledge.*
2. *Cox, K.R., Low, M. & Robinson, J. (2017). The Sage Handbook of Political Geography. Sage.*
3. *Jones, M., Jones, R. & Woods, M. (2014). An Introduction to Political Geography. Routledge.*
4. *Taylor, P.J. & Flint, C. (2018). Political Geography. Pearson.*
5. *Glassner, M.I. (2015). Political Geography. Wiley.*
6. *Dikshit, R.D. (2019). Political Geography. PHI Learning.*

Learning Outcomes	
CO1	Remember the fundamental concepts of political geography, nation, state, boundaries, frontiers, geopolitics, political systems, international relations, and global political organizations.
CO2	Apply geographical principles to explain nation-building, political boundaries, geopolitical theories, international relations, regional conflicts, and political organization at different spatial scales.
CO3	Relate and evaluate geopolitical theories, political systems, international organizations, boundary disputes, and regional political developments in relation to global peace and development.
CO4	Explain self-directed and lifelong learning by critically exploring global political changes, governance systems, international cooperation, border management, and sustainable peace.
CO5	Communicate political geographical concepts, geopolitical issues, international relations, political organizations, and governance systems effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Explore and interpret political geographical issues through critical thinking and scientific reasoning, evaluate geopolitical developments, and recommend strategies for regional cooperation, conflict resolution, and sustainable governance.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	1	2	-	-	-	-	-
CO2	1	3	2	2	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

NMC- II – PHYSICAL GEOGRAPHY OF INDIA

Course Objectives

- *To develop an advanced understanding of India's physical environment, physiography, climate, drainage, soils, and natural vegetation.*
- *To examine the processes influencing the evolution and distribution of India's physical landscapes and natural resources.*
- *To analyze environmental issues, land-use patterns, and resource management strategies in different regions of India.*
- *To evaluate the interrelationships between physical processes and sustainable development in the Indian context.*
- *To strengthen geographical interpretation skills through the study of India's diverse physical features and environmental challenges.*

Unit – I - Physiographic Divisions of India: Location and Extent - Physiographic Divisions: Northern Mountains, Northern Plains, Peninsular Plateau, Indian Desert, Coastal Plains and Islands of India

Unit – II - Climate of India: Mechanism of Southwest and Northeast Monsoon - Seasons of India - Distribution of Rainfall and Climatic Regions

Unit III: Drainage and Water Resources: Himalayan and Peninsular River Systems - Major River Basins of India - Multipurpose River Valley Projects.

Unit IV: Soils and Natural Vegetation: Major Soil Types: Alluvial, Black, Red, Laterite, Forest and Mountain Soils, Arid and Desert Soils; Natural Vegetation of India: Forest Types and Biodiversity Conservation

Unit V: Natural Resources and Environmental Issues: Land Resources and Land Use Pattern - Environmental Problems: Soil Erosion, Desertification, Deforestation Floods and Droughts- Sustainable Management of Physical Resources

Reference

1. *Singh, S. (2021). Physical Geography of India. Prayag Pustak Bhawan.*
2. *Khullar, D.R. (2023). India: A Comprehensive Geography. Kalyani Publishers.*
3. *Sharma, T.C. & Coutinho, O. (2020). Economic and Commercial Geography of India. Vikas Publishing.*
4. *Husain, M. (2019). Geography of India. McGraw-Hill Education.*
5. *Spate, O.H.K. & Learmonth, A.T.A. (2017). India and Pakistan: A General and Regional Geography. Routledge.*
6. *Nag, P. & Sengupta, S. (2021). Geography of India. Concept Publishing House.*

Learning Outcomes	
CO1	List out the fundamental concepts of India's physiography, climate, drainage systems, soils, natural vegetation, natural resources, land use, and environmental issues.
CO2	Apply geographical principles to explain the formation and distribution of physiographic divisions, monsoon mechanisms, river systems, soil types, vegetation patterns, and land resource utilization in India.
CO3	Assess and evaluate India's physical regions, climatic characteristics, drainage patterns, soil resources, biodiversity, and environmental problems in relation to sustainable development.
CO4	Illustrate self-directed and lifelong learning by critically exploring environmental conservation, natural resource management, biodiversity protection, and sustainable utilization of India's physical resources.
CO5	Communicate the concepts of India's physical environment, climatic systems, drainage patterns, soils, vegetation, and environmental issues effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Investigate and interpret physical geographical data through critical thinking and scientific reasoning, evaluate environmental challenges, and recommend sustainable resource management strategies for India.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	-	-	-	-	-
CO2	1	3	2	3	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – GEOGRAPHY OF INDIA

Course Objectives

- *To develop a comprehensive understanding of India's physical, economic, social, and cultural geography in relation to regional development.*
- *To examine the spatial distribution of natural resources, agriculture, industries, population, transport, and trade across India.*
- *To analyze the interrelationship between physical and human environments influencing regional disparities and economic development.*
- *To evaluate contemporary issues related to resource utilization, population dynamics, environmental sustainability, and regional planning in India.*
- *To develop analytical and interpretative skills for understanding India's geographical diversity using maps, statistical data, and geospatial techniques.*

Unit - I: Introduction: Location and Extent – Administrative Divisions – India and Neighbouring Countries - Physiographic Divisions – Drainage – Climate - Climatic Regions by Koppen – Natural Vegetation: Types and Distribution.

Unit - II: Soils and Agriculture: Types and Distribution of Soil – Types of Irrigation – Major Food Crops: Paddy, Wheat, Jowar, Bajra, Ragi and Pulses – Major Cash Crops: Sugarcane, Cotton, Jute and Tobacco – Plantation Crops: Tea, Coffee and Rubber – Oil seeds: Groundnut, Sesame, Coconut, Mustard, Castor and Soya beans.

Unit - III: Minerals and Industries: Coal, Petroleum, Iron ore, Manganese, Aluminum, Zinc, Gold and Silver – Atomic minerals – Mineral Policies. Industries: Iron and Steel, Cotton Textile, Sugar, Paper, Cement, Chemical, Automobile and Electronics Industries – Industrial Policies - Major Industrial Regions.

Unit - IV: Population: Growth, Distribution and Density of Population – Migration: Causes, Types and Problems – Population Policies - Human Development Index – Health Indicators.

Unit - V: Transport and Trade: Roadways, Railways, Airways, Waterways, Pipelines – Internal and External Trade – Balance of Trade – Importance of Ports in Trade – Trade Policy

Reference

1. *Khullar, D.R. (2023). India: A Comprehensive Geography. Kalyani Publishers.*
2. *Husain, M. (2020). Geography of India. McGraw-Hill Education.*
3. *Singh, R.L. (2019). India: A Regional Geography. National Geographical Society of India.*
4. *Sharma, T.C. & Coutinho, O. (2021). Economic and Commercial Geography of India. Vikas Publishing House.*
5. *Nag, P. & Sengupta, S. (2020). Geography of India. Concept Publishing Company.*
6. *Spate, O.H.K. & Learmonth, A.T.A. (2017). India and Pakistan: A General and Regional Geography. Routledge.*

Learning Outcomes	
CO1	Recall the fundamental concepts of India's physical, economic, agricultural, industrial, demographic, transport, and trade geography, including the spatial distribution of natural and human resources.
CO2	Apply geographical principles to explain the interrelationships among physiography, climate, agriculture, industries, minerals, population, transport, trade, and regional development across India.
CO3	Compare and evaluate agricultural systems, industrial development, demographic characteristics, transport networks, trade patterns, and regional disparities in relation to balanced national development.
CO4	Demonstrate self-directed and lifelong learning by critically exploring resource conservation, regional planning, sustainable economic development, environmental management, and national development policies.
CO5	Communicate geographical concepts related to India's physical features, economic activities, population characteristics, transport systems, and regional development effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret geographical data through critical thinking and scientific reasoning, evaluate regional development issues, and recommend sustainable planning strategies for balanced national development.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	2	-	-	-	-	-
CO2	1	3	2	3	2	-	-	3	1	-
CO3	-	2	3	3	2	-	2	3	1	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	1	2
CO6	2	3	3	3	3	2	2	3	3	2

Core Theory – REMOTE SENSING: TECHNIQUES AND APPLICATIONS

Course Objectives

- *To provide advanced knowledge of the principles, concepts, and technological developments in remote sensing and Earth observation systems.*
- *To familiarize students with aerial photographs, satellite imagery, sensors, image characteristics, and digital image processing techniques.*
- *To develop practical skills in image interpretation, classification, enhancement, and spatial analysis for geographical investigations.*
- *To evaluate the applications of remote sensing in natural resource management, environmental monitoring, agriculture, urban planning, and disaster management.*
- *To strengthen geospatial analytical competencies for solving real-world environmental and regional planning problems.*

Unit – I - Remote Sensing: Fundamentals – Development of Remote Sensing - Electro Magnetic Radiation (EMR) – Energy Interactions with the Atmosphere and Earth – Remote Sensing Centers and Activities in India

Unit – II - Remote Sensing: Types – Aerial and Satellite, Types of Satellites, Aerial Photos, Platforms and Resolutions; Marginal information of Air Photo & Images – Elements of Air Photo & Image Interpretation.

Unit –III - Resolution and Sensor Characteristics: Spatial, Spectral, Radiometric and Temporal Resolutions of IRS, LANDSAT, SPOT, IKNOS and QUICKBIRD

Unit – IV - Digital Image Processing: Image Rectification and Restoration- Image Enhancement Techniques –Image Classification- Supervised & Unsupervised Classifications- Image Out Put

Unit – V - Application of Remote Sensing in Geography: Geomorphology, Land use/ Land cover, Agriculture, Forest, Water Resource, Urban Planning and Environmental Assessment.

Reference

1. *Lillesand, T.M., Kiefer, R.W. & Chipman, J.W. (2022). Remote Sensing and Image Interpretation. Wiley.*
2. *Jensen, J.R. (2016). Introductory Digital Image Processing. Pearson.*
3. *Campbell, J.B. & Wynne, R.H. (2018). Introduction to Remote Sensing. Guilford Press.*
4. *Joseph, G. (2018). Fundamentals of Remote Sensing. Universities Press.*
5. *Sabins, F.F. & Ellis, J.M. (2020). Remote Sensing: Principles and Interpretation. Waveland Press.*
6. *Rees, W.G. (2020). Physical Principles of Remote Sensing. Cambridge University Press.*

Learning Outcomes	
CO1	Recall the fundamental concepts of remote sensing, electromagnetic radiation, sensors, aerial photographs, satellite imagery, GIS, digital image processing, image classification, and geospatial technologies.
CO2	Apply remote sensing and GIS principles to acquire, process, interpret, classify, and analyze geospatial data for natural resource assessment, environmental monitoring, and spatial planning.
CO3	Compare and evaluate different remote sensing platforms, sensor characteristics, image processing techniques, GIS applications, and geospatial analytical methods in solving geographical problems.
CO4	Demonstrate self-directed and lifelong learning by critically exploring advancements in remote sensing, GIS, artificial intelligence, spatial technologies, and sustainable geospatial applications.
CO5	Convey remote sensing and GIS concepts, geospatial analyses, image interpretation techniques, thematic maps, and spatial modelling results effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Assess and interpret remotely sensed and GIS data through critical thinking and scientific reasoning, evaluate environmental and regional issues, and recommend geospatial solutions for sustainable planning and decision-making.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	3	2	-
CO3	-	2	3	3	3	-	1	3	2	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	2	2
CO6	2	3	3	3	3	2	2	3	3	2

SEC - II – GEOINFORMATICS

Course Objectives

- *To provide comprehensive knowledge of Geoinformatics and its components, including Remote Sensing, GIS, GPS, and GNSS technologies.*
- *To develop practical skills in spatial data acquisition, management, analysis, visualization, and geospatial database development.*
- *To examine the principles and applications of GIS, GPS, and remote sensing in solving geographical and environmental problems.*
- *To evaluate the role of geospatial technologies in natural resource management, urban planning, disaster management, and sustainable development.*
- *To enhance professional competencies in the application of geospatial technologies for research, planning, and decision-making.*

Unit I - Introduction to Geoinformatics: Definition, Scope and Components of geoinformatics - Spatial and Non-Spatial Data - Geoinformatics in Geography.

Unit II - Fundamentals of Remote Sensing: Principles of Remote Sensing - Electromagnetic Spectrum - Platforms and Sensors

Unit III - Geographic Information System (GIS): Components and Functions of GIS - Raster and Vector Data - Data Input, Storage and Retrieval - Map Preparation and Visualization

Unit IV - GPS and GNSS: Principles of GPS and GNSS - Segments and Working of GPS - Data Collection and Navigation.

Unit V - Applications of Geoinformatics: Natural Resource Management - Urban and Regional Planning - Disaster Management - Agriculture and Land Use Mapping

Reference

1. *Longley, P.A., Goodchild, M.F., Maguire, D.J. & Rhind, D.W. (2021). Geographical Information Systems and Science. Wiley.*
2. *Chang, K.T. (2020). Introduction to Geographic Information Systems. McGraw-Hill.*
3. *Lo, C.P. & Yeung, A.K.W. (2018). Concepts and Techniques of Geographic Information Systems. Pearson Education.*
4. *Burrough, P.A. & McDonnell, R.A. (2015). Principles of Geographical Information Systems. Oxford University Press.*
5. *Bolstad, P. (2019). GIS Fundamentals: A First Text on Geographic Information Systems. XanEdu Publishing.*
6. *DeMers, M.N. (2018). Fundamentals of Geographic Information Systems. Wiley.*

Learning Outcomes	
CO1	Recall the fundamental concepts of geoinformatics, Geographic Information Systems (GIS), Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS), remote sensing, spatial data, and geospatial technologies.
CO2	Apply geoinformatics principles to acquire, manage, analyze, visualize, and interpret spatial and non-spatial data using GIS, GPS, GNSS, and remote sensing technologies.
CO3	Compare and evaluate different geospatial technologies, spatial databases, GIS applications, navigation systems, and remote sensing techniques for geographical investigations and decision-making.
CO4	Demonstrate self-directed and lifelong learning by critically exploring advancements in geoinformatics, digital mapping, satellite navigation, spatial technologies, and sustainable geospatial applications.
CO5	Communicate geoinformatics concepts, spatial analyses, GIS outputs, GPS applications, thematic maps, and geospatial solutions effectively through oral, written, graphical, and scientific presentations using appropriate geographical terminology.
CO6	Analyze and interpret geospatial data through critical thinking and scientific reasoning, evaluate GIS-based solutions, and recommend appropriate geoinformatics applications for resource management, disaster mitigation, environmental monitoring, and regional planning.

Mapping of PO with CO

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	1	2	3	-	-	-	-	-
CO2	1	3	2	3	3	-	-	3	2	-
CO3	-	2	3	3	3	-	1	3	2	-
CO4	1	2	2	2	2	3	3	2	-	3
CO5	3	2	1	1	-	2	-	-	2	2
CO6	2	3	3	3	3	2	2	3	3	2

Model Exam Question Paper – Theory
PRINCIPLES OF REMOTE SENSING

Time: 3 Hrs **Max: 75 Marks**

SECTION – A **(15x1=15)**

Choose the Correct Answer

1. The primary source used for remote sensing is _____
   a. Scattering energy b. Solar Light
   c. Electromagnetic energy d. All the above

2. The city which was first photographed by Gaspard-Félix_____
   a. Paris b. New York
   c. Germany d. France

3. In remote sensing _____types of platforms are used
   a. 4 b. 2
   c. 3 d. 1

4. The wavelength 0.4 – 0.7 micro meter is
   a. Micro wave radiation b. Infrared radiation
   c. Visible radiation d. Radio waves

5. The first aerial photograph was taken on
   a. 1968 b. 1858
   c. 1978 d. 1898

6. The Aerial photo which has 30 - 60 degree camera axis is
   a. Vertical b. Oblique
   c. Low Oblique d. High Oblique

7. The smoothness or roughness in aerial photograph is indentified by
   a. Tone b. Texture
   c. Size d. Shape

8. The process of Combining multiple images together is
   a. Overlay b. Image processing
   c. Image classification d. Mosaic

9. The term used to describe the difference in radiant energy is_____resolution
   a. Spatial b. Spectral
   c. Temporal d. Radiometric

10. Geostationary orbit refers the altitude approximately
    a. 25000 km b. 36000 km
    c. 10000 km d. 5000 km

11. Forest appears _____in color in satellite images
    a. Green b. Blue
    c. Red d. Black

12. _____ refers the area imaged by the sensor

a. Swath
b. Principle Point
c. Spatial Resolution
d. All the above

13. Which one of the following is not associated with a digital image

a. Raster format
b. Pixels
c. Geo-reference
d. None of the above

14. The range of digital number is

a. 1 - 255
b. 0 - 265
c. 0 - 250
d. 0 - 255

15. Which one of the following refers extraction of information from an image

a. Image analysis
b. Image acquisition
c. Image rectification
d. Image segmentation

Section - B (2 x 5 = 10)

Answer any **TWO** questions

16. Write an essay on the history and development of remote sensing
17. Illustrate about the aerial triangulation and its importance
18. Give a detailed account on the different types of resolutions
19. Explain the application of image classification techniques on land use change
20. Give a detailed account on the different types of RADARS

Section - C (5 x 10 = 50)

Answer **ALL** questions

21. a. Classify and explain the different types of scattering (or)
    a. What are remote sensing platforms? Explain about them

22. a. Write a note on photogrammetry and its uses (or)
    b. Differentiate the vertical and oblique aerial photograph

23. a. What is Orbit? Explain about their different types (or)
    b. What is swath? Explain the swath of GEO

24. a. Illustrate about the structure of satellite images (or)
    b. Compare and contrast about geometric and radiometric corrections

25. a. Compare and contrast about RADAR and LIDAR, write their advantages (or)
    b. Explain the basic principle and components of RADAR

Model Exam Question Paper – Practical

REPRESENTATION OF RELIEF FEATURES

1. a. What is meant by Bench Marks? (5)
   b. Give a detailed account on hachuring and hill shading. (10)

2. a. Write about Uniform Slope. (5)
   b. Trace out and interpret the cultural features in the aerial photographs (10)

3. a. Define the term Profile. (5)
   b. Draw a superimposed profile for the given contour. (10)

4. a. Write few lines about longitudinal profile. (5)
   b. Draw a longitudinal profile for the given river map. (10)