

தமிழ்நாடு மத்தியப்
பஸ்கலைக்கழகம்



**CENTRAL
UNIVERSITY OF
TAMIL NADU**

तमिलनाडु केन्द्रीय
विश्वविद्यालय

ESTABLISHED BY

AN ACT OF PARLIAMENT IN 2009



M.Sc., GEOGRAPHY PROGRAMME

CURRICULUM STRUCTURE

(Academic Year 2023-2024 Onwards)

**Department of Geography
School of Earth Sciences
Central University of Tamil Nadu
Thiruvarur - 610 005**

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VISION

To establish a center of advanced geographical research so as to develop ethical and scientific knowledge to solve the spatial problems by taking the role of leaders, decision-makers, and policy makers.

MISSION

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

PROGRAMME OUTCOMES

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



PROGRAMME SPECIFIC LEARNING OUTCOMES

After the successful completion of M.Sc., Geography, the student will be able to

- PSO1 - Explain the planet’s physical processes and human interactions at varying spatio-temporal scales.
- PSO2 - Demonstrate proficiency in handling geospatial tools and techniques.
- PSO3 - Appreciate the relevance of geographical knowledge and to provide geographic insights on important societal issues.
- PSO4 - Identify current research trends within the breadth and depth of geography and produce meaningful scholarly contribution.
- PSO5 - Create community awareness and demonstrate ethics in conducting geographical research.

GRADUATE ATTRIBUTES

Through M.Sc., Geography, the student will be able to acquire:

- Critical thinking and observation power
- Skills to handle traditional and modern geospatial instruments
- Ability to perform spatial analysis
- Communication and teamwork skills
- Attitude to conduct scientific research projects
- Values of environmental ethics and sustainability
- Paths for self-directed and life-long learning

PROGRAMME MAPPING

Programme Outcomes to Mission Statements

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

Programme Specific Learning Outcomes to Programme Outcomes

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



PROGRAMME STRUCTURE

Sl. No.	Seme ster	Courses Offered			Credits	Assessment	
		Category	Code	Title		CIA	ESE
First Year							
1	I	CC	GEO2011	Geomorphology	4	40	60
2	I	CC	GEO2012	Hydrology and Oceanography	4	40	60
3	I	CC	GEO2013	Geographical Thought	3	40	60
4	I	CC	GEO2014	Population and Settlement Geography	4	40	60
5	I	CC	GEO2015	Geography of Health	4	40	60
6	I	CCP	GEO2016	Cartographic Techniques - Practical	2	100	
7	I	CCP	GEO2017	Survey Methods - Practical	2	100	
Total					23	700	
Total Credit Points Earned = 23 x 6 (NCrF Level PG1)					138		
8	II	CC	GEO2021	Climatology	4	40	60
9	II	CC	GEO2022	Social, Cultural and Political Geography	4	40	60
10	II	CC	GEO2023	Remote Sensing	3	40	60
11	II	CC	GEO2024	Geographic Information Science	3	40	60
12	II	CCP	GEO2025	Image Analysis - Practical	2	100	
13	II	CCP	GEO2026	GIS - Practical	2	100	
14	II	SEC	GEOSE01	Field Work	2	100	
15	II	SEC	GEOSE02	Internship	2	100	
16	II	OE	GEOOE	Open Elective *	3	40	60
Total					25	700	
Total Credit Points Earned = 25 x 6 (NCrF Level PG1)					150		
	II	VAC	GEOVA01	Conservation of Natural Resources	2		

NOTE:

* In the place of Open Elective, students can choose any open elective course offered by the University Departments. The course should have at least three credits.



Second Year							
17	III	CC	GEO2031	Geography of India	4	40	60
18	III	CC	GEO2032	Regional Planning and Development	4	40	60
19	III	CC	GEOON01	Research Methodology (Optional MOOC)	4	40	60
20	III	CC	GEOON02	Disaster Risk Reduction (Optional MOOC)	3	40	60
21	III	CCP	GEO2033	Quantitative Techniques - Practical	2	100	
22	III	CCP	GEO2034	Advanced Geospatial Techniques - Practical	2	100	
23	III	DSE	GEOEC01 GEOEC02 GEOEC03 GEOEC04	Environment and Sustainable Development Models in Geography Applied Geomorphology Urban GIS	4	40	60
24	III	SS	GEO2035	Academic Writing	2	40	60
Total					25	800	
Total Credit Points Earned = 25 x 6.5 (NCrF Level PG2)					162.5		
25	IV	CC	GEO2041	Dissertation	14	100	
26	IV	CC	GEOON03	Research Ethics (Optional MOOC)	3	40	60
27	IV	DSE	GEOON04	Online Educational Resources Based Course **	4	40	60
Total					21	300	
Total Credit Points Earned = 21 x 6.5 (NCrF Level PG2)					136.5		
Grand Total					94	2500	
Grand Total of Credit Points Earned					587		
CCP: Core Course Practical					CC: Core Course		
SEC: Skill Enhancement Course					OE: Open Elective		
DSE: Discipline Specific Elective					SS: Soft Skill		
VAC: Value Added Course							

NOTE:

** In the place of Online Educational Resources based course, students can choose any of the dissertation relevant courses in consultation with the internal supervisor and with the due approval of BoS committee. The courses shall be selected from the UGC recognized online educational platforms. The concerned supervisor shall conduct the internal and end semester examination. The students are also allowed to undertake UGC SWAYAM exam and transfer the marks and credits earned upon successful completion of the course.

For those courses which are mentioned “Optional MOOC”, students can pursue these courses in UGC SWAYAM platform. The course should have minimum credits as prescribed in the structure and should be of Post-Graduate learning path. Students can transfer the marks and credits earned upon successful completion of the course.

**EVALUATION SCHEME**

The Choice-Based Credit System (CBCS) is adopted for M.Sc., Geography programme that offers flexibility to the students to choose the electives. Each course in the programme is assigned with a fixed number of credits based on the contents to be learned and it is evaluated by the course instructor(s). The evaluation of the internal component of the courses is continuous and the minimum passing mark for all the courses is 50%.

Evaluation of Theory Courses

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

Components	Weightage (%)
Internal Exams (Best 2 of 3)	20
Assignments / Case Studies	10
Seminar	05
Interaction	05
End Semester Exams	60

Students failing to put 75% of attendance in any course/s will not be allowed to write ESE. For other conditions, the University's regulations will be governed. They have to redo the course/s only when it is offered next time and to fulfil the attendance criteria to appear for ESE in that course.

Evaluation of Laboratory Courses

The Continuous Internal Assessment (CIA) will be the only component for Laboratory Courses. No separate examinations will be conducted.

Components	Weightage (%)
Lab Exercises	60
Assignments / Case Studies	20
Interaction	10
Submission of Record	10

Students failing to put in 75% of attendance in laboratory courses have to redo the course only when it is offered next time. For other conditions, the University's regulations will be governed.

Evaluation of Dissertation / Internship / Field Work

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

Components	Weightage (%)	
	Dissertation	Internship/Field Work
Regular interactions with the supervisor	20	20
Statement of the problem and methods adopted	20	--
Outputs and scientific merits	20	30
Structure of thesis/report	20	20
Viva-voce	20	30



END SEMESTER EXAMINATION – QUESTION PAPER PATTERN

Programme: M.Sc. Geography

Duration: 3 Hours

Course Code: XXX

Maximum Marks: 60

Course Title: XXX

Date: XXX

Section-A [5 X 2 = 10 Marks]

Answer ALL Questions not exceeding 100 words each

All the questions to be asked here under are definition or short types to test the students' remembrance and understanding of domains

- 1.
- 2.
- 3.
- 4.
- 5.

Section-B [4 X 5 = 20 Marks]

Answer any FOUR Questions not exceeding one page each

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

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.

Section-C [2 X 15 = 30 Marks]

Answer any TWO Questions not exceeding five pages each

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

- 12.
- 13.
- 14.
- 15.



Syllabus

SEMESTER - I



Credits: 4

Course Code: GEO2011

GEOMORPHOLOGY

Learning Outcomes

After completion of this course, the students will be able to:

- 1. understand the physical earth systems and controls of geomorphic processes*
- 2. describe the exogenic and endogenic processes and their importance in landform development*
- 3. prepare geomorphology maps and apply the geomorphology skills in geographical research*

Unit - I

Basic Concepts: Geological time scale - Evolution of geomorphic ideas – Fundamental concepts in geomorphology

Unit - II

Endogenic Processes: Internal structure and Isostasy - Plate tectonics - Tectonic and structural landforms - Volcanoes and earthquakes

Unit - III

Exogenic Processes: Weathering and mass movement – Fluvial processes and landforms - Fluvial geomorphic cycle - Slope development theories

Unit - IV

Landscapes: Aeolian landforms - Glacial processes and glacio-fluvial landscapes - Karst landscapes – Coastal landforms

Unit - V

Morphogenetic regions – Dynamic equilibrium in geomorphology – Quaternary geomorphology - Anthropogeomorphology

Field trips will be arranged to recognize landforms and to understand geomorphic data collection methods.



REFERENCES:

1. Thornbury, W. D. (2019). Principles of Geomorphology, Third Edition, New Age International Publishers.
2. Huggett, R.J. (2007). Fundamentals of Geomorphology, Routledge.
3. Summerfield M.A. (2013). Global Geomorphology, Routledge.
4. Goudie, A.S. and Viles, H.A., (2016). Geomorphology in the Anthropocene, Cambridge University Press.
5. Lobeck A.K. (1939). Geomorphology, McGraw-Hill Company.
6. Von Engel, O.D. (1957). Geomorphology, The Macmillan Company
7. Kale, V. and Gupta, A. (2018). Introduction to Geomorphology, Orient Black Swan
8. Mc Geary, D. and Plummer, C. C., (1994). Earth Revealed, W. C. B. Publishers.
9. Ritter, D.F., Kochel, R.C. and Miller, J.R., (2002). Process Geomorphology, Waveland Press.
10. Bierman, P. R. and Montgomery, D. R., (2014). Key concepts in geomorphology, Freeman and Company Publishers.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEO2012

HYDROLOGY AND OCEANOGRAPHY

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the fundamental components of hydrological cycle and water resource evaluation.*
- 2. explain the comprehend practices of integrated watershed management and groundwater management.*
- 3. analyse oceanic circulation systems as well as their interconnections and driving forces.*
- 4. understand the origin and distribution of marine resources and provide essential background for further studies in ocean and marine environment.*

Unit - I

Hydrological Cycle: Systems Approach in Hydrology, Hydrological Input and Output, Physical Process and Estimation - Anthropogenic Intervention in Hydrological cycle - Problems of Regional Hydrology

Unit - II

Water Resources Evaluation: Surface runoff, Groundwater Occurrence and Movement – Hydrograph Analysis - Watershed Approach: Watershed Modelling, Integrated Watershed Management, Water Quality

Unit - III

Oceanography: Configuration of ocean floor, temperature, salinity and density of ocean water - Circulation of oceanic waters: waves, tides and currents, Currents of the Atlantic, Pacific and Indian oceans

Unit - IV

Ocean Resources: Types and Theories of Origin and Distribution - Marine Deposits – Fishing – Conservation of Ocean Resources

Unit - V

Coastal and Marine Ecosystems: Ocean Habitats - Mangroves, Coral Reefs, Natural and Anthropogenic Impacts - Deep Sea Ecology



REFERENCES:

1. Christopherson, R. W., and Birkeland, G. H., (2012): Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education.
2. Karanth, K. R., (1988): Ground Water: Exploration, Assessment and Development, Tata- McGraw Hill.
3. Lawrence, S. D., (2008): Physical Hydrology, Waveland Press.
4. Mitchell, C.W., (1991): Land Evaluation, John Wiley & sons Inc.
5. Pinet, P. R., (2012): Invitation to Oceanography, 6th Edition, Jones & Bartlett Learning.
6. Rajora, R., (2002): Integrated Watershed Management, Rawat Publications.
7. Sharma, R. C., and Vatal, M., (1970): Oceanography for Geographers, Chaitanya Publishing House.
8. Stewart, R., (2009): Introduction to Physical Oceanography, Orange Grove Books.
9. Strahler, A. H., and Strahler, A. N., (2001): Modern Physical Geography (4th Edition), John Wiley and Sons, Inc.
10. Tideman, E. M., (1999): Watershed management – Guidelines for Indian Conditions, Omega Scientific Publishers.
11. Todd, D. K., (1959): Groundwater Hydrology, McGraw Hill Book Company.
12. Ward, and Trimble, (2004): Environmental Hydrology, Lewis Publishers, CRC Press.
13. Waugh, D., (2005): Geography: An Integrated Approach, Nelson Thornes.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 3

Course Code: GEO2013

GEOGRAPHICAL THOUGHT

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. get an insight into the historical evolution of the subject of geography. It will help in creating the philosophical foundation of the subject.*
- 2. understand contemporary modern views incorporated will inculcate critical thinking.*
- 3. develop both inductive and deductive reasoning to attain holistic thinking about geographic systems.*
- 4. critically evaluate the nature of geography as spatial science with changing space and time.*

Unit - I

Evolution of Geographic Thought: Changing Paradigms in Geography: Environmentalism, Possibilism, Areal differentiation, spatial organization

Unit - II

Pre-Modern – Early Origins of Geographical Thinking with reference to the Classical and Medieval Philosophies (Greek, Roman and Arab Geographers), Development of geographical thought during Dark Age.

Unit - III

Modern – Evolution of Geographical Thinking and Disciplinary Trends in Germany, France, Britain, United States of America.

Indian Geography: Evolution of Geography in India, Progress and Contributions in Indian Geography, Life and works of Indian Geographers, Geographical Societies

Unit - IV

Philosophical Debates in Contemporary Geography: Dichotomy between Environmental Determinism and Possibilism, Systematic and Regional, Digital vs. Analog and Ideographic and Nomeothetic.

Unit - V

Recent Trends - Quantitative Revolution and its impact, Behaviourism, Systems Approach, Radicalism, Feminism; Towards Post Modernism – Changing Concept of Space in Geography, Future of Geography. Critical understanding of positivism, Marxism and Postmodernism.



REFERENCES:

1. Arentsen M., Stam R. and Thuijjs R., 2000: Post-modern Approaches to Space, ebook
2. Bhat, L.S., (2009): Geography in India (Selected Themes), Pearson
3. Black, J., (2003). Visions of the World: A History of Maps, Mitchell Beazley.
4. Bonnett A., (2008): What is Geography? Sage.
5. Castree, R., Rogers A. and Sherman D. (2005): Questioning Geography: Fundamental Debates. Blackwell, Oxford.
6. Clifford, N.J. (2002): The Future of Geography: when the whole is less than the sum of its parts, Geoforum, Vol. 33, 431-436
7. Cresswell, T., (2013). Geographic Thought: A Critical Introduction, Wiley-Blackwell.
8. Dikshit R. D., (1997): Geographical Thought: A Contextual History of Ideas, Prentice–Hall India.
9. Haggett, P., and A. D. Cliff and Frey (1977): Locational Analysis in Human Geography.
10. Hartshorne R., (1959): Perspectives of Nature of Geography, Rand Mac Nally and Co.
11. Harvey, D., (1969): Explanation in Geography. Edward Arnold Publishers Ltd.
12. Holt-Jensen A., (2011): Geography: History and Concepts: A Students Guide, SAGE.
13. Johnston R. J., (Ed.): Dictionary of Human Geography, Routledge.
14. Martin Geoffrey J., (2005): All Possible Worlds: A History of Geographical Ideas, Oxford.
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16. Singh, R. B., (2016): Progress in Indian Geography, Indian National Science Academy.
17. Soja, Edward (1989): Post-modern Geographies, Verso, London. Reprinted 1997: Rawat Publications.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEO2014

POPULATION AND SETTLEMENT GEOGRAPHY

Learning Outcomes

Upon completing this course, the students will be able to:

- 1. get the knowledge of human aspects of geography.*
- 2. learn concepts of population geography, settlement geography, economic geography, and contemporary issues that are relevant in the present context.*
- 3. think in spatial terms to explain what has occurred in the past as well as using geographic principles to understand the present and plan for the future.*
- 4. critically evaluate the contemporary issues for achieving the sustainable development goals.*

Unit - I

Nature, scope and significance of Population and Settlement Geography, Different Schools of Thoughts in Population Studies, Approaches to study Settlement Geography

Unit – II

Sources of Data with reference to India; Population Size, Distribution and Growth – Spatial Patterns; Population Dynamics: Fertility, Mortality and Migration – Measures, Determinants and Implications - Age Sex Pyramid - World Population Growth (prehistoric to modern period), Population Composition and Characteristics, Population Policies in Developed and Developing Countries.

Unit - III

Types of Rural Settlements (types, patterns, and distribution) – Classification of Urban Settlements; Trends and Patterns of Urbanization, Changing Urban Forms, Concepts of Megacities, Global Cities and Edge Cities,; settlement planning with reference to India

Unit - IV

Theories of Origin of Towns (Gordon Childe, Henri Pirenne, Lewis Mumford), Urban Systems - Primate city, Rank-size rule, Models of Urban Land Use Models - Central Place Theories (Christaller and Losch) - Theories of Growth – Malthusian theory - Demographic Transition models - Law of Migration, Optimum Theory of Population

Unit - V

Contemporary Issues - Aging of population - Declining sex ratio – Demographic transition in India- Demographic Dividend - Refugee crisis in India, National Population Policy 2000 - Contemporary Problems of Rural Settlements, Problems of urbanisation and remedies, Social Segregation in the City, Manifestation of Poverty in Cities, Sustainable development of cities.



REFERENCES:

1. Ambrose P. (1970): Concepts in Geography Vol.-I Settlement Pattern, Longman.
2. Barrett H. R., (1995): Population Geography, Oliver and Boyd.
3. Bhende A. and Kanitkar T., (2000): Principles of Population Studies, Himalaya Publishing House.
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5. Clarke J. I., (1965): Population Geography, Pergamon Press, Oxford.
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11. Johnston, R. J., (1991): A Question of Place: Exploring the Practice of Human Geography. Blackwell Publishers.
12. Johnston R; Gregory D, Pratt G. et al. (2008): The Dictionary of Human Geography, Blackwell Publication.
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15. Newbold K. B., (2009): Population Geography: Tools and Issues, Rowman and Littlefield Publishers.
16. Pacione M., (1986): Population Geography: Progress and Prospect, Taylor and Francis.
17. Ramachandran, R. (1992): Urbanisation and Urban Systems in India, Oxford University Press, New Delhi.
18. Singh, R.Y., (2000): Geography of Settlements, Rawat Publication.

Mapping of Program Outcomes with Course Outcomes

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



Credits: 4

Course Code: GEO2015

GEOGRAPHY OF HEALTH

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. Understand the sub-discipline of geography which encompasses human health and environment*
- 2. acquire knowledge on integrated geographical approaches to attain health and wellbeing*
- 3. evaluate spatial health data as well as analyse information to acquire information on health and environment*

Unit - I

Introduction and Evolution of health geography, Approach of health geography, Measures of health, Health and happiness, Driving forces of health, ICSU programme: Health and wellbeing in the changing urban environment

Unit – II

Global burden of Diseases - communicable, non-communicable and infectious diseases, Population distribution and health problem, Technological development, Epidemiological transition model: India

Unit - III

Exposure and health risks - Lifestyle, Climate change and human health, Food, diet and nutrition, Population exposure model: population density (microenvironment), time spend (various microenvironment), indoor-outdoor relation (various microenvironment), Geographical understanding of epidemics

Unit – IV

Wellbeing in health perspective - Physical wellbeing, Social wellbeing, Psychological wellbeing, Spiritual wellbeing

Unit - V

Spatial techniques, Application of GIS and remote sensing for monitoring and analysis, Scope: Health benefit, Landscape development



REFERENCES:

1. Akhtar, R., (Ed.), (1990): Environment and Health Themes in Medical Geography, Ashish Publishing House.
2. Meade, M., and Emch, A., (2010): Medical Geography, 3rd Edition, Guilford Press.
3. Joan A. L., and Patzed J. A., (2001): Ecosystem Changes and Public Health, Baltimin, John Hopking Unit Press.
4. Bradley, D., (1977): Water, Wastes and Health in Hot Climates, John Wiley.
5. Christaler, G., and Hristopoles D., (1998): Spatio Temporal Environment Health Modelling, Boston Kluwer Academic Press.
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14. Rao, M. et. al., (2015): Draft National Health Policy 2015, Economic and Political Weekly, Vol 1, no. 17, pp. 94 - 101.

Mapping of Program outcomes with course outcomes

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



Credits: 2

Course Code: GEO2016

CARTOGRAPHIC TECHNIQUES - PRACTICAL

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. develop the basic skills of mapmaking and map interpretation*
- 2. acquire knowledge about scale, projections, topographical maps, and slope analysis.*
- 3. represent geographic data as well as analyse information from a spatio-temporal perspective.*

Ex. 1: Maps and Scales

- Classification of Maps
- Types of Scales
- Construction and Conversion of Scales

Ex. 2: Map Projections

- Classification of Projections
- Cylindrical Projection
- Conical Projection
- Zenithal Projection
- Coordinate systems

Ex. 3: Construction of Profiles

- Cross Profile of selected landforms
- Longitudinal profile
- Slope Analysis

Ex. 4: Settlement Analysis

- Identification of settlement types
- Settlement pattern
- Network density analysis

Ex. 5: Interpretation of Maps

- Weather maps, SOI maps, NATMO maps, Hydrographic charts
- Marginal and extra-marginal information
- Interpretation of Physical and Cultural features

Practical Record: A Project File in pencil, comprising one exercise each on projections, topographical sheet interpretation.



REFERENCES:

1. Anson R. and Ormelling F. J., (1994): International Cartographic Association: Basic Cartographic, Pregmen Press.
2. Gupta K.K. and Tyagi, V. C., (1992): Working with Map, Survey of India, DST.
3. Kennedy, M., Kopp, S., (2001): Understanding Map Projections, ESRI Press.
4. Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O., (2011): Map Use: Reading, Analysis, Interpretation, 7th Edition, ESRI Press.
5. Mishra, R.P., (2014): Fundamentals of Cartography (Second Revised and Enlarged Edition), Concept publication.
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13. Singh, R. L., Singh, R. P. B., (2008): Elements of Practical Geography, Kalyani Publishers.
14. Vaidyanadhan, R., Subbarao, K.V., (2014): Landforms of India from Topomaps and Images, Geological Society of India.

Websites:

- Geological Survey of India: www.gsi.gov.in
- Indian National Cartographic Association: www.incaindia.org
- Indian Naval Hydrographic Department: www.hydrobharat.nic.in
- National Bureau of Soil Survey and Land Use planning: www.nbsslup.in
- Survey of India: www.surveyofindia.gov.in

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 2

Course Code: GEO2017

SURVEY METHODS - PRACTICAL

Learning Outcomes:

Upon successful completion of the course,

- 1. Students will acquire knowledge to handle a range of surveying instruments from traditional chains to modern DGPS and total stations.*
- 2. Students will be able to prepare base map of the study area*
- 3. Students will be able to identify physical features on the ground, understand the socioeconomic characteristics of village/town/households.*

Ex.1: Chain Survey

- Distance measurement
- Traversing
- Area calculation

Ex.2: Plane Table Survey

- Open survey
- Closed Survey
- Triangulation and Traversing

Ex.3: Prismatic Compass Survey

- Prismatic Compass
- Errors in compass survey
- Clinometer

Ex.4: Total Station survey

- Station setup –Levelling and Resection
- Angle and Distance measurement
- Area and Volume calculation
- Triangulation and Traversing

Ex.5: GNSS survey

- Point features with attributes
- Line features with attributes
- Polygon features with attributes



REFERENCES:

1. Ghilani, C.D. and Wolf, P.R. (2012) Elementary Surveying :An Introduction to Geomatics, 13th ed., Pearson Education, Inc., New Jersey.
2. Hanwell, J.D. and Newson, M.D. (1973) Techniques in Physical Geography, MacMillan, London.
3. Mitchell, C.W. (1991) Terrain Evaluation, London Scientific and Technical Co., John Wiley & Sons Inc. New York.
4. Punmia, B.C., Ashok, J.K. and Arun, K.J. (2005) Surveying-1, Vol. 1, Laxmi Publications, New Delhi.
5. Rabenhorst, T.D. and McDermott, P.D. (1989) Applied Cartography: Source Materials for Map Making, Merrill Publishing Company, London.
6. Rampal, K.K (2011) Surveying, Pragati Prakashan, Meerut.
7. Worthinton, B.D.R. and Gant, R. (1975) Techniques in Map Analysis, Macmillan, London.

Mapping of Program Outcomes with Course Outcomes:

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



SEMESTER – II



Credits: 4

Course Code: GEO2021

CLIMATOLOGY

Learning Outcomes:

After completion of this course, students will be able to

- 1. understand the basic concepts and provide essential background for further studies in weather and climate.*
- 2. explain the weather patterns, causes of atmospheric instability and disturbances, and climate variability*
- 3. analyse atmospheric circulation systems as well as their interconnections and driving forces*

Unit - I

Introduction to Climatology: Atmospheric composition, mass and structure - Solar radiation and the global energy budget - Atmospheric moisture budget: humidity, evaporation, condensation and precipitation

Unit - II

Atmospheric Instability: adiabatic temperature changes, condensation level, air stability and instability - Cloud formation - Precipitation processes - Thunderstorms

Unit - III

Atmospheric motion: principles and local winds - Global pressure and wind belts - General Circulation - Atmospheric general circulation models

Unit - IV

Tropical systems: Intertropical convergence, tropical disturbances, Asian monsoon, El Niño–Southern Oscillation

Unit - V

Mid-latitude systems: air masses - frontogenesis and frontal characteristics, Mesoscale convective systems - Climate classification - Climatic change



REFERENCES:

1. Barry, R.G. & Chorley, R.J., (2003) Atmosphere, Weather and Climate, 11th Edition, Routledge.
2. Christopherson, R. W. and Birkeland, G. H., (2012) Geosystems: An Introduction to Physical Geography (8th edition), Pearson Education, New Jersey.
3. Lal, D.S., (2005) Climatology, Sharda Pustak Bhawan, Allahabad.
4. Lutgens, F.K., Tarbuck E.J. and Tasa D., (2009) The Atmosphere: An Introduction to Meteorology, 11th Edition, Prentice Hall.
5. Strahler, A. H. and Strahler, A N., (2001) Modern Physical Geography (4/E), John Wiley and Sons, Inc., New York.
6. Trewartha, G.T. (1954). An Introduction to Climate, McGraw-Hill.
7. Waugh D. (2005) Geography: An Integrated Approach, Nelson Thornes, Cheltenham.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEO2022

SOCIAL, CULTURAL AND POLITICAL GEOGRAPHY

Learning Outcomes:

Upon completing this course, the students will able to:

1. understand human values, social ethics, welfare, wellbeing, inclusion & exclusion and other important concepts
2. identify the neutrality in social and cultural issues and demonstrate sense of appreciation and respect for the diversity of perspectives, world-views, and cultures
3. explain the evolution and emergence of Nation State by tracing the changes in politics over time and geopolitics based on the struggle for resources and power
4. evaluate and correlate different theories with contemporary geopolitical and geo-strategic issues.

Unit - I

Social Geography: Nature and Scope - Concept of Social Space: First, Second and third Space; Geographies of Welfare and Wellbeing - Concept of Social wellbeing, Human Development Index, Social Geographies of Inclusion and Exclusion: Slums, Gated Communities with special reference to India.

Unit II

Cultural Geography: Nature and Scope; Concept of Culture; Cultural Theory; Cultural Landscape, Integration and Globalisation of Culture - Cultural regions of India: Defining Caste, Class, Religion, Gender, Language and their Spatial Underpinnings with reference to India

Unit III

Political Geography: Nature, Scope and Development; Concept of Nation and State, Attributes of State – Federalism and Multilevel Governance, Electoral Reforms in India, Determinants of Electoral Behaviour, Geography of Resource Conflicts – Politics of displacement, Regional Organisations of Cooperation (SAARC, ASEAN, OPEC, EU, NATO, BRICS, SCO, QUAD)

Unit IV

Theories and Laws: Agricultural Systems of the World and Agricultural Land use model - Laws of international boundaries and frontiers Geographical Pivot and Heartland Theory. Rim Land Theory and their Relevance to World's Geopolitics.

Unit V

Recent trends in social and cultural geographical studies, social change with special reference to caste and tribal groups, and social change - Racial linguistic and ethnic diversities; religious minorities - impact of globalization on culture related to India - International boundary of India and related issues - India's role in world affairs; Geopolitics of South Asia and Indian Ocean realm



REFERENCES:

1. Adhikari, S., (1997): Political Geography, Rawat publications.
2. Agnew, J., Mitchell, K., and Toal, G., (2003): A Companion to Political Geography, Blackwell.
3. Ahmed, A., (1999): Social Geography, Rawat Publications.
4. Anderson, K., Domosh, M., Pile, S. and Thrift, N. (2003): Handbook of Cultural Geography, SAGE Publications.
5. Casino, V. J. D., Jr., (2009) Social Geography: A Critical Introduction, Wiley Blackwell.
6. Cater, J. and Jones, T., (2000): Social Geography: An Introduction to Contemporary Issues, Hodder Arnold.
7. Cox, K., (2002): Political Geography: Territory, State and Society, Wiley-Blackwell.
8. Cox, K. R., Low, M., & Robinson, J. (2008). The SAGE handbook of political geography. SAGE Publications Ltd.
9. Erin H. Fouberg, Alexander B. Murphy, Harm J. de Blij, (2012): Human Geography: People, Place, and Culture. John Wiley, New York.
10. Jordon, G., (1995): Cultural Politics, Blackwell, Oxford.
11. Mike, C., (1998): Cultural Geography, Routledge.
12. Panelli R., (2004): Social Geographies: From Difference to Action, Sage.
13. Planning Commission (1981): Report on Development of Tribal areas. Government of India, New Delhi
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15. Smith, D. M., (1994): Geography and Social Justice, Blackwell, Oxford.
16. Sopher, D., (1980): An Exploration of India, Cornell University Press.
17. Spencer, J. E., and Thomas W. L. (1978): Introducing Cultural Geography (2nd Edition), John Wiley & Sons.
18. Waugh, D. (2005) Geography: An Integrated Approach, Nelson Thornes, Cheltenham.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 3

Course Code: GEO2023

REMOTE SENSING

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the basic concepts of electromagnetic radiation, its interaction with the earth's surface and atmosphere.*
- 2. understand resolution properties to interpret, process, and evaluate remotely sensed images.*
- 3. apply knowledge of image processing principles strategically to new problems.*
- 4. evaluate the applicability of remote sensing technologies as a monitoring tool for studying certain landscape phenomenon and spatial problems.*

Unit I

Introduction to Remote Sensing: Concepts, Components, Electro Magnetic Radiation & Spectrum, Theories of EMR; Types of Remote Sensing: Based on Energy source and Electro-Magnetic Spectrum.

Unit II

Energy Interaction with Atmosphere & Earth Surface: Reflection, Absorption, Transmission, Scattering: Rayleigh, Mie and Non-selective; Absorption, and Refraction; Atmospheric Windows. Spectral Signature: Interaction with soil, water, and vegetation, and other features;

Unit III

Platforms, Sensors, Orbits: Types of platform - Types of sensors: FOV, IFOV, Active and Passive, Satellite orbits - Resolution and its types: Spatial, Spectral, Radiometric, and Temporal.

Unit IV

Image Colour Composites: False Colour Composite; Natural Colour Composite; Vegetation Indices; Elements of Image Interpretation. Remote Sensing Data Products: Legacy and Recent Developments.

Unit V

Advanced Sensing: Principles and Applications of Hyperspectral Remote Sensing, Field and Imaging Spectrometry, UAV Remote Sensing.

Project: Image interpretation and applications



REFERENCES:

1. Borengasser, M. and Hungate, W. S., and Watkins, R., (2008). Hyperspectral remote sensing: principles and applications, 1st Edition, CRC Press, Boca Raton, FL.
2. Lillesand, T. M., Kiefer, R. W., and Chipman, J. W., (2008): Remote Sensing and Image Interpretation, John Wiley & Sons
3. Jensen, J. R., (2005): Introductory Digital Image Processing, Prentice Hall
4. Jensen, J. R., (2004): Remote Sensing of the Environment: An Earth Resource Perspective, Pearson Education.
5. Reddy, A. M., (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication.
6. Campbell, J., (2002): Introduction to Remote Sensing, Taylor & Francis.
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10. Joseph, G., (2004): Fundamentals of Remote Sensing, Universities Press.
11. Rees, W. G., (2012): Physical Principles of Remote Sensing, Cambridge University Press.
12. Konecny G., (2014): Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems (2nd Edition), CRC Press.
13. Sabins, Floyd F. Jr., (1997): Remote Sensing: Principles and Interpretation, W.H. Freeman and Co. Ltd.
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Mapping of Program Outcomes with Course Outcomes:

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



Credits: 3

Course Code: GEO2024

GEOGRAPHIC INFORMATION SCIENCE

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the fundamental concepts of geographic information systems.*
- 2. apply the concept of spatial data and underlying principles to identify spatial problems.*
- 3. analysing the spatial datasets and produce map output.*
- 4. design and develop research projects involving geospatial processes and data.*

Unit - I

Introduction to GIS: Definition, and Elements of GIS; Spatial Data and its organization, Components, Spatial Data Infrastructure; Development of GIS technology; theoretical models and framework for GIS, representation of geographic data.

Unit - II

Coordinate systems, Datum, Scale, Resolution, Map projection; Data Input, Storage and Editing: Nature of geographic data: Spatial and Attribute Digitization; GIS databases - Storage and manipulation; Data Quality – Errors in geospatial data, Accuracy and Precision.

Unit - III

Concept of vector and raster based models; Tessellations, Topology – Elements, Planar and Non-Planar topology; Geodatabase – Components and types; Representation of composite features, DEM, Raster Data Structure, Compression and Conversion.

Unit - IV

Basic Spatial Analysis: Spatial Queries, Map algebra, Neighbourhood analysis; Proximity analysis and buffers; Overlays Analysis – raster and vector based overlay and their applications; Interpolation, Network Analysis.

Unit - V

Web GIS - Practical Report: Presentation of GIS output - Prepare a report consisting of five exercises using any GIS Software on above mentioned themes.



REFERENCES:

1. Burrough, P.A., and McDonnell, R.A., (1998): Principles of Geographic Information Systems, Oxford University Press.
2. Chang, K. T., (2006): Introduction to Geographic Information Systems, Tata McGraw-Hill.
3. De Mers, Michael N., (1999): Fundamentals of Geographic Information Systems, John Wiley & Sons.
4. Environmental Systems Research Institute (ESRI), (1997): Getting to know Arc View GIS, Cambridge: Geoinformation International.
5. Heywood, I. et al., (2004): An Introduction to Geographic Information Systems, Pearson Education.
6. Huisman O., and de by R. A., (2009): Principles of Geographic Information Systems – An Introductory Textbook, The International Institute for Geo-Information Science and Earth Observation (ITC).
7. Konecny, G., (2014): Geoinformation: Remote Sensing, Photogrammetry, and Geographic Information Systems (2nd Edition), CRC Press.
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11. Sarkar, A., (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd.
12. Singh, R. B. and Murai, S., (1998): Space-informatics for Sustainable Development, Oxford and IBH Publications.
13. Wolf, P. R., and Dewitt, B. A., (2000): Elements of Photogrammetry: With Applications in GIS, McGraw-Hill.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 2

Course Code: GEO2025

IMAGE ANALYSIS - PRACTICAL

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. augment knowledge and skills of image interpretation and mapping, and have experience with image processing software.*
- 2. develop analytical workflows to derive products and extract information from remote sensing images for a broad range of applications.*
- 3. apply image processing and interpretation skills independently to a real-world situation.*
- 4. develop satellite data processing and analysis skills which is helpful for the employability of the students.*

Ex. 1: Image Visualization and Interpretation

- Visual Interpretation Keys
- Visual interpretation of satellite images
- Introduction to stereo images
- Image interpretation using mirror stereoscope

Ex. 2: Digital Image Analysis

- Introduction to ENVI software
- Satellite Data Visualization
- Exploring Metadata

Ex. 3: Image Pre-processing

- Radiometric correction
- Atmospheric correction
- Geometric correction

Ex. 4: Image Enhancement

- Contrast Enhancement
- Image Sharpening
- Density Slicing
- Low pass and High pass filtering

Ex. 5: Image Classification

- Unsupervised Classification
- Supervised classification
- Accuracy Assessment



REFERENCES:

1. Campbell, J. B. and Wynne, R. H., (2011): Introduction to Remote Sensing, 5th Edition, The Guilford Press.
2. Gibson, P., and Power, C. H., (2000): Introductory Remote Sensing: Digital Image Processing and Applications, Routledge Publisher.
3. Gonzalez, R. C. and Woods, R. E., (2007): Digital Image Processing, 3rd Edition, Prentice-Hall Inc.
4. Imagine, (2009): Tour Guide Imagine, Leica Geosystem GIS & Mapping, Atlanta.
5. Jensen, J. R., (2006): Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc.
6. Lillisand, T. M., and Kiefer, P. W., (2007): Remote Sensing and Image Interpretation, 6th Edition, John Wiley & Sons.
7. Richards, J. A. and Jia X., (2005): Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 2

Course Code: GEO2026

GIS - PRACTICAL

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the scale, projection, and coordinate systems, appropriate use of vector and raster data structures and basics of data capture, storage, analysis, and output in a GIS.*
- 2. use GIS software to do georeferencing, digitization, symbolization, layout of map and spatial analysis.*
- 3. critically think and evaluate the physical, social, and environment-related research problems through the acquired geospatial practical knowledge.*
- 4. acquire GIS practical skills which is helpful for them to fetch good employment opportunities.*

Ex. 1: Structuring geographic data

- Vector and raster data formats
- Building Geodatabase
- Create feature class
- Adding fields and domains

Ex. 2: Explore spatial and attribute data

- RDBMS - Primary key and foreign key
- Joining and Relating the attributes
- Exploring Field calculator and Feature geometry tools
- Aggregating spatial and attribute data

Ex. 3: Spatial referencing

- Change a projection
- Set-up a custom coordinate system
- Coordinate transformations
- Georeference a raster image

Ex. 4: Digitizing and editing geographic data

- Digitize point, line and polygon features
- Use advanced edit tools
- Spatially adjust features

Ex. 5: Map symbolization and layouting

- Symbolizing geographic data
- Creating choropleth maps, point maps
- Create map layouts



REFERENCES:

1. Allen, D. W., (2011): GIS Tutorial 2: Spatial Analysis Workbook for ArcGIS10, ESRI Press.
2. Allen D. W., and Coffey, J. M., (2011): GIS Tutorial 3: Advanced Workbook for ArcGIS10, ESRI Press.
3. Chang, K. T., (2006): Introduction to Geographic Information Systems. 3rd Edition, McGraw Hill.
4. Mitchell, A., (1999): GIS Analysis – Volume 1: Geographic Patterns and Relationships, ESRI Press.
5. Mitchell, A., (2009): GIS Analysis – Volume 2: Spatial measurements and Statistics, ESRI Press.
6. Willpen L. G., and Kurland, K. S., (2011): GIS Tutorial 1: Basic Workbook for ArcGIS10, ESRI Press.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 2

Course Code: GEOSE01

FIELD WORK

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. identify geographical problems and understand the linkage between lab and field.*
- 2. conduct field oriented research and demonstrate field data collection.*

After completing the first two semesters, students need to undergo a field work and prepare a report. The duration, location and purpose of the visit will be decided by concerned faculty members.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 2

Course Code: GEOSE02

INTERNSHIP

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the organizational concepts and working culture.*
- 2. acquire practical skills and offers opportunities to meet people and build a network that will help with future education or employment.*
- 3. adapt effectively to changing conditions and demonstrate effective management of personal behaviour, ethics and attitudes.*

After completing the first two semesters, students need to undergo an internship in a reputed institution or industry with a mandate to work as a member of a research group in a project in close association with the subject matter experts. The period of internship should be two to three weeks. The students need to submit a report (minimum of 10 pages) covering the aspects of a) industry/organization background, customs and practices b) intern duties and individual responsibility c) professional skills gathered and d) usefulness and career networking.

Getting Attendance/ Internship completion Certificate from the host institution is mandatory.

Mapping of Program Outcomes with Course Outcomes

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



Credits: 2

Course Code: GEOVA01

CONSERVATION OF NATURAL RESOURCES

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand important aspects of natural resource and its conservation.*
- 2. develop knowledge on the concept of sustainable resources management for better future*
- 3. critically evaluate the prevailing acts and policies for sustainable resources management*

Unit - I

Introduction to Natural Resources: Concept, and Availability - Classification of Natural Resources - Natural Resources Distribution and Uses

Unit - II

Resource Management Paradigms – Ecological, Social, and Economic - Approaches in Resource Management: Integrated Resource Management

Unit - III

Natural Resources Governance: Social and Political Perspectives in Resource Management - Challenges - Legal frameworks for Organizational Structure and Stakeholders in Conservation of Resources and Livelihood

Unit – IV

Role of National Policies and Acts: Biological Diversity Act of 2002, National Environment Policy of 2004, National Conservation Policy, National Action Plan on Climate Change of 2008, Green Tribunal Act, 2009

Unit – V

Recent Trends in Sustainable Resource Management: National and International Efforts and Policies - Institutional Regulatory Bodies and Authorities – Community Based Natural Resources Management



REFERENCES:

1. Dash, M. C. (2013): Concepts of Environmental Management for Sustainable Development Publisher: I K International Publishing House Pvt. Ltd.
2. Lynch, D. R. (2009): Sustainable Natural Resource Management: For Scientists and Engineers, Publisher: Cambridge University Press.
3. Martin J. O., (2018): Introduction to Sustainable Development, SAGE Publications India Pvt Ltd.
4. Miller, G. T., (2004): Environmental Science: Working with the Earth, Thomson Brooks Cole.
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Mapping of Program Outcomes with Course Outcomes:

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



SEMESTER – III



Credits: 4

Course Code: GEO2031

GEOGRAPHY OF INDIA

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand the physical, cultural, economic, and demographic aspects with reference to India and pursue it for further research.*
- 2. acquaint with the distinctiveness of geographic regions as the field of learning in Geographical studies.*
- 3. Investigate the historical and recent structure and distribution of population in India and explore future scenarios.*

Unit - I

Physical Setting: Physiographic structure and divisions - drainage systems – soils – vegetation - climate (characteristics and classification) - origin of Indian monsoons.

Unit - II

Resource Distribution: Types of resources, distribution and their utilization in India, minerals, energy resources; fossil, nuclear fuels and other non-conventional energy resources

Unit - III

Agriculture and Economy: Agricultural production, and distribution of major crops, growth of economic sectors, industrial development, automobiles and information technology.

Unit - IV

Population and Settlements: Historical and recent structure and distribution of population; population, density, literacy, sex-ratio, language, tribes, rural urban morphology, trends of urbanization, metro and mega cities - problems of urbanization - Smart Cities - future scenarios.

Unit - V

Geopolitics of India: Internal political geography of India - conflicts and strategic alliance with neighboring countries – India, the South Asian Country, as an emerging political and economic power, strategic partner - prospects and challenges, recent developments.



REFERENCES:

1. Aliberti, M., (2018): India in Space: Between Utility and Geopolitics, Springer International Publishing.
2. Ayres, A., (2018): Our Time Has Come, How India is Making Its Place in the World.
3. Chapman, G. P., (2012): The Geopolitics of South Asia, From Early Empires to the Nuclear Age, Ashgate Publishing Limited.
4. Deshpande, C. D., (1992): India: A Regional Interpretation, ICSSR.
5. Galina, S., and Sengupta, P., (1967): Economic Regionalisation of India, Census of India.
6. Johnson, B. L. C., Ed. (2001). Geographical Dictionary of India. Vision Books.
7. Khullar, D. R. (2018): India A Comprehensive Geography, Kalyani Publications.
8. Mandal R. B., (Ed.), (1990): Patterns of Regional Geography – An International Perspective. Vol. 3 – Indian Perspective.
9. Menon, S., (2018): Inside the Making of India's Foreign Policy, Penguin Random House India Private Limited.
10. Sharma, T.C., (2013): Economic Geography of India. Rawat Publication.
11. Singh, A., Kaushiva, P., (2014): Geopolitics of the Indo-Pacific, KW Publishers.
12. Singh, R. L., (1971): India: A Regional Geography, National Geographical Society of India.
13. Singh, J., (2003): India - A Comprehensive & Systematic Geography, Gyanodaya Prakashan.
14. Singh, R. B., Schickhoff, U., and Suraj M., (Eds.) (2016): Climate Change, Glacier Response, and Vegetation Dynamics in the Himalaya, Springer.
15. Singh, R. B., (2014): Urban Development Challenges, Risk & Resilience in Asian Mega Cities, Springer.
16. Spate, O. H. K., and Learmonth A. T. A., (1967): India and Pakistan: A General and Regional Geography, Methuen.
17. Tirtha, R., (2002): Geography of India, Rawat Publications.
18. Tiwari, R.C., (2007): Geography of India. Prayag Pustak Bhawan.

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEO2032

REGIONAL PLANNING AND DEVELOPMENT

Learning Outcomes

Upon completing this course, the students will be able to:

1. *understand the concept, nature and need of planning and development.*
2. *gain knowledge on methods and techniques used in planning and development.*
3. *apply the spatial dimension of planning and development to study spatial problems.*

Unit - I

Introduction: Types and Methods of Classification of Region –Regionalization - Need for regional planning, Rapid Urbanization, Formal and functional: uniform and nodal, single purpose and composite regions

Unit - II

Historical Factor, Geographical factor, Location specific advantages, Early mover advantages, Failure of planning, Planning mechanism, Restricted success of green revolution, Indicators to measure development and under development.

Unit - III

Spatial planning and development, Liveable city, environmental quality and human health, Objectives: Goal and impact, Growth pole, core-periphery, basic needs strategy, Types of specific spatial planning, Sustainable town planning, Factors determining regional planning, Integrated Area Development Planning (IADP).

Unit - IV

Regional planning strategies & techniques, Ecological dimension – strategy for future, Regional development & efficiency, Regional planning example for macro, meso and micro regions Tribal - Development Plans, Scope: Survey Techniques and Mapping (GIS and Remote Sensing), satellite town, urban green belts

Unit - V

Regional Problem in India- varying levels of development, causative factors, Problems characterizing development-potential, declining, Backward and ecologically sensitive regions examples Inter related nature of regional problem, Types of regional planning, Approaches in regional planning, Regional Policy & Planning.



REFERENCES:

1. Abler, R., Adams, J. S., and Gould, P., (1971): Spatial Organization: The Geographer's View of the World, Prentice-Hall Inc.
2. B.I.S.R (1978): 'The Role of Fiscal Incentives in Reducing Regional Imbalances: Some Comparison', New Delhi.
3. Choudhary, B. (2014): Regional Development and Planning in India. Geography and You.
4. Glasson, J. (1974): 'An Introduction to Regional planning, Hutchinson & Co., London.
5. Harvey, D., (1969): Explanation in Geography, Edward Arnold Publishers Ltd.
6. Minahull, R. (1968): Regional Geography. Hutchinson. Co., Ltd., London.
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Mapping of Program outcomes with course outcomes:

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



Credits: 4

Course Code: GEOON01

RESEARCH METHODOLOGY

(Optional MOOC)

Learning Outcomes:

Upon completing this course, students will be able to:

- 1. Acquaint with the basic knowledge about research in terms of; research design, data collection, analysis, and report writing.*
- 2. Get an idea about the scientific processes and ethics of quality research.*
- 3. Develop a keen interest in research and use the knowledge for future research.*

Unit – I

Research Methodology overview - Procedure of Scientific research – Classification of Research - Review of Literature, Logical Reasoning, Defining a Research Problem

Unit - II

Formulating Hypothesis, Research Design, Measurement of Scales, Sampling - Need for Sampling, Methods of sampling and Size of Sampling

Unit – III

Methods of Primary and Secondary Data collection; Conducting questionnaire surveys and Pilot Study; Mobile and GNSS based surveys - Processing of Data - Jurimetrics - Data Display: tables, graphs, maps, visualizations - Reliability and validity of data

Unit – IV

Report Writing - Preparation of Research Reports - Layout, Structure and Language of typical reports, Story maps - Citation methods: Foot note, Text note, End note.

Unit - V

Bibliography – Citation rules: Blue book, OSCOLA, MLA, APA and Chicago - Scientometrics - Reference Management Software; Research Ethics - Plagiarism.



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Mapping of Program Outcomes with Course Outcomes:

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



Credits: 3

Course Code: GEOON02

DISASTER RISK REDUCTION

(Optional MOOC)

Learning Outcomes:

Upon the completion of the course, the students would be able to:

- 1. Understand the conceptual aspects of disaster risk reduction*
- 2. Apply various approaches and models in disaster risk reduction*
- 3. Acquire knowledge on specific actions for disaster risk reduction and develop analytical skills in decision making*
- 4. Evaluate the disaster management strategies and facilitate the action plans using geospatial tools and techniques*

Unit - I

Understanding Disasters - Concepts and Types of disasters (natural and man-made), Factors and Significance of disasters – Trends in disasters - Physical, social, economic and environment impacts of disaster

Unit - II

Vulnerability - Concepts and Types of vulnerabilities - Factors and Significance of Vulnerability — Methods and approaches in vulnerability assessment – Coping Capacity – Resilience

Unit – III

Risk Assessment – Risk Analysis techniques – Problems in Risk Assessment –Assessment of Risks for different types of disasters – Participatory Risk Assessment - Community based approaches

Unit - IV

Disaster Risk Management – Prediction and Warning - Early warning systems – Response and Recovery – Mitigation and Prevention - Preparedness and Planning - Role of Geoinformatics in disaster risk reduction

Unit - V

National and International efforts on disaster risk reduction - National Disaster Management Policy - Institutional efforts for disaster management in India – Sendai Framework for Disaster Risk Reduction - Targets, Priorities for Action, and Guiding Principles



REFERENCES:

1. Bhattacharya, T., (2012): Disaster Science and Management, McGraw Hill India Education Pvt. Ltd.
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3. Damon, P. Copola, (2006): Introduction to International Disaster Management, Butterworth Heineman.
4. Government of India, (1997): Vulnerability Atlas of India, revised ed., building materials & technology promotion council, ministry of urban development.
5. Gupta, A. K., and Nair, S. S. (2011). Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi.
6. Kapur, A. (2010): Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi.
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9. Singhal, J. P. (2010): Disaster Management, Lakshmi Publications.
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Policy Documents:

1. Government of India: Disaster Management Act, Govt. of India, New Delhi 2005
2. Government of India: National Disaster Management Policy, 2009

Mapping of Program outcomes with course outcomes:

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



Credits: 2

Course Code: GEO2033

QUANTITATIVE TECHNIQUES - PRACTICAL

Learning Outcomes

Upon completing this course, the students will be able to:

1. *acquaint themselves with the distinctiveness of quantitative techniques in geography.*
2. *gain knowledge about frequency distribution, uni-variate, bi-variate, and multi-variate analysis*
3. *understand software tools such as MS Excel, SPSS etc. which are essential for the analysis of spatial statistics.*
4. *identify specific statistical techniques where they can be used for data analysis.*

Unit - I

Introduction to statistical Techniques and Uni-variate analysis: Frequency Distribution, types, Measures of Central Tendency, Measures of Dispersion, Skewness, and Kurtosis.

Unit - II

Bi-Variate: Correlation – linear correlation, Karl Pearson's correlation coefficient and Spearman's rank correlation, regression analysis, measures of inequality; Lorenz curve and Gini's coefficient.

Unit - III

Multi-Variate Analysis: Multiple correlation, multiple regression, principal component analysis, factor analysis, cluster analysis.

Unit - IV

Statistical Tests of Significance: Introduction to hypothesis testing, 't' test, 'f' test, z test, sign test, Chi square (X²) test, and ANOVA test.

Unit - V

Statistical Software: MS Excel, SPSS and R - Geographic data entry, storing and data file handling, generating new variables, running statistical procedures, constructing graphical displays, output viewer; recent trends in quantitative techniques.



REFERENCES:

1. Cressie, N. A. C., (1991): Statistics for Spatial Analysis, Wiley.
2. Eldon, D., (1983): Statistics in Geography: A Practical Approach, Blackwell.
3. Gregory, S., (1978): Statistical Methods and the Geographer (4th Edition), Longman.
4. Haining, R. P., (1990): Spatial Data Analysis in the Social and Environmental Science, Cambridge University Press.
5. Hammond R., and McCullagh, P. S., (1978): Quantitative Techniques in Geography, Oxford University Press
6. Jain, R., (2018): Statistical Analysis in Microsoft Excel and SPSS, Universal Academic Books Publishers and Distributors.
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17. Yeates, M., (1974): An Introduction to Quantitative Analysis in Human Geography, Mc Grawhill.

Mapping of Program Outcomes with Course Outcomes

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



Credits: 2

Course Code: GEO2034

ADVANCED GEOSPATIAL TECHNIQUES - PRACTICAL

Learning Outcomes

Upon completing this course, the students will be able to:

- 1. gain knowledge on theoretical background involved in contemporary remote sensing data processing techniques*
- 2. proficiently interpret high resolution multi-source remote sensing data and critically evaluate the extracted information*
- 3. critically think and evaluate spatial research problems through the acquired geospatial practical knowledge.*
- 4. acquire proficiency in remote sensing and GIS practical skills using both open-source and commercial software which is helpful for them to fetch good employment opportunities.*
- 5. formulate the research objective which requires robust data for the better understanding of environment related problems*

Ex. 1: Introduction to SAGA GIS Image processing software

- Exploring tools in SAGA GIS
- Mosaicking and subsetting images
- Conversion tools

Ex. 2: Multispectral Image Analysis

- Image Indices
- Band Math
- Change Detection
- Textural parameters

Ex. 3: Image Classification

- Classification using Machine Learning Algorithms
- Random Forest, SVM

Ex. 4: Hyperspectral Image Analysis

- Preprocessing
- Feature Reduction
- Hyperspectral indices
- Classification – Multiple Classifiers, Boosting

Ex. 5: Introduction to QGIS software

- Exploring spatial tools in QGIS
- Exploring map document
- Conversion tools



Ex.6: *Spatial interpolation*

- Thiessen Polygons
- IDW
- Kriging

Ex. 7: *Vector analysis*

- Spatial Vector operations (Extract, Overlay, Proximity, Generalization)
- Model Builder

Ex. 8: *Raster analysis*

- Local Operations
- Focal Operations
- Raster calculator

Ex. 9: *Web based Geospatial Tools*

- Web GIS Services
- Exploring Bhuvan
- Publish the spatial data using ArcGIS Server
- Google Earth Engine

Ex. 10: *Differential GNSS*

- Static Survey (Baseline processing, Network adjustment and Loop-closure)
- Kinematic Survey (Post process and Real time)



REFERENCES:

1. Borengasser, M. and Hungate, W. S., and Watkins, R., (2008). Hyperspectral remote sensing: principles and applications, 1st Edition, CRC Press, Boca Raton, FL.
2. Eismann, Michael T., (2012). Hyperspectral Remote Sensing, SPIE Press Monograph Vol. PM210. ISBN: 9780819487872.
3. Hanssen, R. F. (2001). Radar Interferometry: Data Interpretation and Error Analysis, 1st Edition, Springer Netherlands.
4. Jensen, J. R., (2006). Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd Edition, Prentice-Hall Inc., New Jersey.
5. Richards, J. A. (2009). Remote Sensing with Imaging Radar, Springer-Verlag Berlin Heidelberg.
6. Richards, J. A. and Xiuping, J., (2005). Remote Sensing Digital Image Analysis: An Introduction, 4th Edition, Springer –Verlag, Berlin.
7. Tso, B. and Mather, P. M. (2012). Classification Methods for Remotely Sensed Data, 2nd Edition, CRC Press, Boca Raton, FL.
8. Thenkabail, P. S., Lyon, J. G., and Huete, A. (2011). Hyperspectral Remote Sensing of Vegetation. CRC Press, Boca Raton, FL.
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10. Van Der Meer, F. D. and De Jong, S. M., (2002). Imaging Spectrometry: Basic Principles and Prospective Applications, Kluwer Academic Publishers, New York.
11. Varshney, P. K. and Arora, M. K. (2004). Advanced Image Processing Techniques for Remotely Sensed Hyperspectral Data, 1st Edition, Springer-Verlag Berlin Heidelberg.
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Mapping of Program Outcomes with Course Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	x				x
CO2			x	x	x
CO3	x		x	x	x
CO4	x	x	x	x	x
CO5	x	x	x	x	x



Credits: 4

Course Code: GEOEC01

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. Understand the distinctiveness of geographic environment as a field of learning.*
- 2. Develop a keen interest in the subject in terms of the key components and functions, and processes of different aspects of the environment and pursue it for further research.*
- 3. Develop sustainable management strategies for different ecosystems, to address environmental challenges and promote conservation.*

Unit - I

Concepts of Environment and Sustainable Development: Meaning, multi-disciplinary nature, components, functions, and processes of geographic environment. resources, development and concept of sustainability, sustainable development and its significance.

Unit - II

Forest and Mountain Ecosystems: Types, processes, patterns and biodiversity - problems and sustainable management of forest and mountain ecosystems.

Desert Ecosystem: Processes, patterns, desertification and sustainable management strategies for desert ecosystems.

Unit - III

Sustainable Coastal Ecosystem: Processes, problems and management of coastal areas; mangroves, coastal pollution, sea-ground water interaction in coastal zones, integrated coastal zone management (ICZM).

Sustainable Urban Ecosystems: Urban environments, problems, urban micro climates, urban heat islands, role of urban green & blue spaces and their management.

Unit - IV

Climate change and Global warming: Trends and patterns of global temperatures, their implications, UNFCCC reports, global and national action plans to counter climate change and adaptations.

Unit - V

Global, National Legislation and recent developments: Environment and sustainable development legislation in India and the world; global conventions, policies and flagship programmes, goals, targets, achievements and the future scenarios, recent advancements.



REFERENCES:

1. Chandana, R. C., (2002): Environmental Geography, Kalyani Publishers.
2. Cloudsley, J. L. T., (2001): Ecology of Desert Environments, Scientific Publishers.
3. Cunningham, W. P., and Cunningham, M. A., (2004): Principles of Environmental Science: Inquiry and Applications, Tata McGraw Hill.
4. Das, R.C., et. al., (1998): The Environmental Divide: The Dilemma of Developing Countries, A.P.H. Publications.
5. Goudie A., (2001): The Nature of the Environment, Blackwell.
6. Mal, S., and Singh, R. B. (Eds.) (2009): Biogeography and Biodiversity. Rawat Publication.
7. Martin J. O., (2018): Introduction to Sustainable Development, SAGE Publications India Pvt Ltd.
8. Miller, G. T., (2004): Environmental Science: Working with the Earth, Thomson Brooks Cole.
9. Munn, T., (Ed.) (2001): Encyclopedia of Global Environmental Change, John Wiley & Sons.
10. Odum, E. P. et. al, (2005): Fundamentals of Ecology, Ceneage Learning India.
11. Saxena, H. M., (1999): Environmental Geography, Rawat Publications.
12. Singh, R. B., and Prokop, P. (Eds.) (2015): Environmental Geography of South Asia, Springer.
13. Singh, S., (1997): Environmental Geography, Prayag Pustak Bhawan.
14. Smith, T. M., and Smith, R. L., (2012): Elements of Ecology (8th Edition), Pearson Education Inc.
15. Yadav S., Bharati, R. P., (2013): Forest Management and Conservation, D.P.S. Publishing House.
16. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEOEC02

MODELS IN GEOGRAPHY

Learning Outcomes

Upon completing this course, the students will be able to:

- 1. understand fundamental concept and function of models, and four traditions in geography.*
- 2. gain knowledge on measurement and classification models and their applications.*
- 3. apply the spatial interaction and spatial diffusion models to study spatial problems.*

Unit - I

Introduction to models: Function of models, Procedural problems of use of models, Types of model, Models and Paradigms in Geography

Unit - II

Four Traditions in geography: Spatial tradition, Area Studies tradition, Man-Land tradition, and Earth Science tradition – Criticisms

Unit - III

Observation Models: Measurement Models - Nominal, Ordinal, Interval and multidimensional, application and validation, Measurements in geography – Classification: logic and purpose, properties and procedure for classification, quantitative techniques.

Unit - IV

Spatial interaction models: Complementarity, Intervening opportunity, and Transferability - Potential models and Gravity models – Network and Flow Models

Unit - V

Spatial Diffusion: Dynamics of Spatial Pattern, Levels, Scales, and Cones of Resolution. Location Allocation problems, Recent trends in spatial organization



REFERENCES:

1. Abler, R., Adams, J. S., and Gould, P., (1971): Spatial Organization: The Geographer’s View of the World, Prentice-Hall Inc.
2. Chorley, R. J., and Haggett, P. (Eds.) (2013): Socio-Economic Models in Geography, Routledge.
3. Chorley, R. J., and Haggett, P. (Eds.) (2013): Integrated Models in Geography, Routledge.
4. Harvey, D., (1969): Explanation in Geography, Edward Arnold Publishers Ltd.
5. Husain, M. (2016): Models in Geography, Rawat Publications.
6. Pattison, W. D., (1964): The Four Traditions of Geography, Journal of Geography, Vol. 63 (5), pp. 211–216.
7. Peet, R. (1998): Modern Geographical Thought, Blackwell Publishers Ltd.
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Mapping of Program Outcomes with Course Outcomes

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



Credits: 4

Course Code: GEOEC03

APPLIED GEOMORPHOLOGY

Learning Outcomes:

After completion of this course, the research scholar will be able to

- 1. Understand basics of fluvial-coastal forms and processes and likely changes resulting from those processes*
- 2. Assess geomorphic dynamics for better landscape and environmental management*
- 3. Apply advanced methods and techniques in analysis of geomorphic data*

UNIT - I

River basin analysis: Drainage patterns - Channel types and morphological classification - Longitudinal profiles, baselevel and grade – Tutorials: Strahler's method of stream ordering, Hypsometric curve and longitudinal profiles

UNIT - II

Coastal processes: destructional and constructional - Coastal sediments: textural parameters, magnetic susceptibility and geochemistry - Tutorials: Field mapping of coastal landforms

UNIT - III

Delta systems: types, morphology and dynamics - Estuaries: formation, types, estuarine circulation and mixing - Tutorials: Extraction of delta features from DEM

UNIT – IV

Sediment dynamics: Dams, river flow and flood - Dynamics of river confluences - Tutorials: Granulometric analysis

UNIT – V

Anthropogeomorphology: Dating techniques - Record of climatic and sea-level change - Relict landforms - Human impacts on the fluvial system - Tutorials: Flood hazard mapping

FIELD TRIP

There will be a field trip during which student will expose to a geomorphic system and techniques of field data collection. A report should be submitted after the field trip.



REFERENCES:

1. Gupta, A. (2011). Tropical Geomorphology. Cambridge University Press.
2. Huggett, R.J. (2007). Fundamentals of Geomorphology, Routledge.
3. Lyon, J.G., (2003) GIS for Water Resource and Watershed Management, Taylor and Francis, New York.
4. Rhoads, L. Bruce. (2020). River Dynamics-Geomorphology to Support Management. Cambridge University Press.
5. Summerfield, M. A. (1991). Global Geomorphology – An introduction to study of landforms. Pearson Education Limited.
6. Thornbury, W. D. (2019). Principles of Geomorphology, Third Edition, New Age International Publishers.
7. <https://www.tulane.edu/~sanelson/eens1110/streams.htm>
8. <https://www.sciencedirect.com/science/article/abs/pii/S0070457107100054>

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEOEC04

URBAN GIS

Learning Outcomes

Upon completing this course, the students will be able to:

- 1. gain knowledge of the basic characteristics of urban environments, their common social and physical structures, and issues.*
- 2. design a professional-grade, visually-balanced, cartographically complete maps*
- 3. analyze the spatial processes and explore the spatial relationships in urban areas.*
- 4. apply geospatial techniques in the urban environment.*
- 5. create a spatial decision support system for sustainable urban management.*

Unit - I

Urban definition, Urban terminology, Site and Situation with examples, Structure of cities- Classic land use models, Size and scale of cities, Urban Growth, Urban environmental problems, and issues

Unit - II

Urban as a system of systems, Urban infrastructure, Urban green space and blue space, Urban governance, Urban planning and Smart Cities, Sustainable Urban Development

Unit - III

Urban remote sensing, Urban GIS, Spatial Data: Raster and Vector, Attributes and metadata, Sources of data, Spatial Analysis, and Spatial Decision Support System. Recent Trends in Urban GIS

Unit - IV

Applications of GIS in the urban environment: Time enabled geospatial analysis, Network analysis, Site suitability analysis, Poverty and Crime analysis, Urban health, Conservation of green space, water resources, Urban modelling, and Urban disasters

Unit - V

Case Studies: Field trip to expose different land use structures in urban areas, Group Project work on any one of the GIS applications in selected cities, Systematic review of Urban GIS research papers on various themes



REFERENCES:

1. Burrough, P. A., and Mc Donnell, R. A., (1998): Principles of Geographic Information Systems, Oxford University Press.
2. Census Handbooks, Census of India.
3. Chang, K. T., (2006): Introduction to Geographic Information Systems, Tata McGraw-Hill.
4. De Mers, M. N., (1999): Fundamentals of Geographic Information Systems, John Wiley & Sons.
5. Environmental Systems Research Institute (ESRI), (1997): Getting to know Arc View GIS, Cambridge: Geoinformation International.
6. Ghosh, S. (1998): Introduction to Settlement Geography by, Orient Longman, 1998
7. Heywood, I. et. al., (2004): An Introduction to Geographic Information Systems, Pearson Education.
8. Johnson, J. H., (2013): Urban Geography: An Introductory Analysis, 2nd Edition, Fisher W. B. (Ed.), Pergamon Oxford Geographies.
9. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W., (2001): Geographic Information Systems and Science, Wiley.
10. Maantay J., and Ziegler J., (2006): GIS for the Urban Environment, ESRI press.
11. Singh, R.B. (Ed.), (1991): Environmental Monitoring: Application of Remote Sensing and GIS, Geocarto Int. Centre.
12. Singh, R.B. and Murai, S. (Eds.), (1998): Space Informatics for Sustainable Development, Oxford & IBH Publications.
13. Sulochana S., Kumar D. (Eds.) (2023): Geoinformatics for Sustainable Urban Development. ISBN 9781003331001, Taylor and Francis Publishers.

Mapping of Program Outcomes with Course Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	x	x	x	x	
CO2	x	x	x	x	x
CO3		x	x	x	x
CO4		x	x	x	x
CO5		x	x	x	x



Credits: 2

Course Code: GEO2035

ACADEMIC WRITING

Learning Outcomes:

Upon completing this course, the students will be able to:

- 1. understand important aspects of academic culture and communication.*
- 2. develop more productive, effective writing with healthier, more positive approaches.*

Unit - I

Defining and understanding academic writing – organizing the materials – construction of thesis statement;

Unit - II

Usage of appropriate words in academic essay – use of formal vocabulary - Scientific CV writing

Unit - III

Reporting research findings – Result interpretation; Proofreading an essay or report – typographical errors – grammatical errors – Academic integrity – Citations and plagiarism

Unit - IV

Preparation of presentation – Oral and poster presentations; Working in groups – respect other people's writing styles and decisions – use of common language

Unit – V

Preparation of academic essay – monographs – Project proposal in any related Research Area in proper formatting and citation



REFERENCES:

1. Bailey, S. (2015): Academic Writing for International Students of Business (Second Edition), Routledge Publications.
2. Becker, H. S., (1986): Writing for Social Scientists: How to Start and Finish Your Thesis, Book or Article, University of Chicago Press.
3. Lee, K.C., Goh, H., Chan, J., and Yang, Y. (2007): Effective college writing: A process genre approach, McGraw-Hill Publications.
4. Murray, R. and Moore, S. (2006): The Handbook of Academic Writing: A Fresh Approach, McGraw-Hill Publications.
5. Oshima, A., and Hogue, A. (2006): Writing academic English, Pearson Publications.
6. Tupas, T. R. F., Cook, C., and Ismail, N. B. T., (2009): Communicating in the University Culture, Centre for English Language Communication, National University of Singapore.
7. Zemach, D. E. and Rumisek, L. A. (2005): Academic Writing: from Paragraph to Essay, Macmillan Publications.
8. Wesiman, H., (1996): Basic technical reporting, Prentice Hall Publications.

Mapping of Program Outcomes with Course Outcomes:

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



SEMESTER – IV



Credits: 14

Course Code: GEO2041

DISSERTATION

Learning Outcomes

Upon completing this course, the students will be able to:

1. *identify and define research problem and parameters.*
2. *collect and analyse the data in a systematic and scientific manner.*
3. *formulate and carry out independent research in the general field of geography.*
4. *write a scientific research report, thesis, and research proposal.*

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

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

The thesis should be between 80 and 100 pages including maps, tables, diagrams and graphs. The ideal structure of thesis is a) Introduction, b) Objectives c) Study Area, d) Materials and Methods, e) Results and Discussion, f) Summary and Conclusion, g) References, and h) Appendices.

Mapping of Program Outcomes with Course Outcomes

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



Credits: 3

Course Code: GEOON03

RESEARCH ETHICS
(Optional MOOC)

Learning Outcomes

After completion of this course, the research scholar will able to

- 1. understand the basics of philosophy of science and ethics, research integrity, and publication ethics*
- 2. identify research misconduct and predatory publications*
- 3. demonstrate indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor, etc.) and plagiarism tools*

Unit – I

Introduction to Research Ethics: Definition, moral philosophy, nature of moral judgments and reactions.

Unit – II

Ethics with respect to science and research - Intellectual honesty and research integrity - Scientific misconducts - Selective reporting and misrepresentation of data

Unit – III

Publication ethics - Best practices/standards setting initiatives and guidelines - Conflicts of interest - Publication misconduct

Unit – IV

Open access publications and initiatives - Software tool to identify predatory publications developed

Unit – V

Indexing databases - Citation databases - Reference management software like Mendeley, Zotero etc. and anti-plagiarism software



REFERENCES

1. Alexander Bird (2006). Philosophy of Science. Routledge
2. Chaddah, P. (2019). Ethics in Competitive Research: Do not get scooped, do not get plagiarized.
https://www.researchgate.net/publication/331470963_Ethics_in_Competitive_Research_Do_not_get_scooped_do_not_get_plagiarized
3. David B. Resnik (2020). What Is Ethics in Research & Why Is It Important?
<https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm>
4. INSA, Ethics in Science Education, Research and Governance.
https://www.insaindia.res.in/pdf/Ethics_Book.pdf
5. Jeffrey Beall (2012). Predatory publishers are corrupting open access. Nature, 489, 179. <https://www.nature.com/news/predatory-publishers-are-corrupting-open-access-1.11385>
6. Resnik DB (2005). The Ethics of Science–An Introduction. Taylor & Francis-elibrary

Mapping of Program Outcomes with Course Outcomes:

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



Credits: 4

Course Code: GEOON04

ONLINE EDUCATIONAL RESOURCES (OER) BASED COURSE

Students can choose any of the dissertation relevant courses in consultation with the internal supervisor and with the due approval of BoS committee. The courses shall be selected from the UGC recognised online educational platforms. The course should have four credits and should be of Post-Graduate learning path. The concerned supervisor shall conduct the internal and end semester examination. The students are also allowed to undertake UGC SWAYAM exam and transfer the marks and credits earned upon successful completion of the course.