



PRESIDENCY UNIVERSITY
KOLKATA

SYLLABUS

Four-Years Bachelors Programme
Under CHOICE BASED CREDIT SYSTEM
For B.Sc. Honours with Research in Geography

(Total Credits: 194)

Effective from 2023-2024 Academic Session



Department of Geography
(Faculty of Natural and Mathematical Sciences)

Presidency University
Hindoo College (1817-1855), Presidency College (1855-2010)
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**Semester-wise Modules of the Four-Years Bachelors Programme (B.Sc. Honours with Research)
of the Department of Geography, Presidency University, Kolkata**

SEM	MAJOR / CORE COURSE (CC)	ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)	SKILL ENHANCEMENT COURSE (SEC)	VALUE ADDED COURSE (VAC)	MINOR COURSE (MC)	MULTI DISCIPLINARY COURSE (MDC)
I	C 1 - Geotectonics and Geomorphology	AECC 1 - English Communication /MIL			MC 1 - Geography in Daily Life	MDC 1 - Soil and Water Analysis
	C 2 - Maps and Surveying					
II	C 3 - Population and Settlement Geography	AECC 2 - English Communication/ MIL			MC 2 - Natural Hazards and Environmental Pollution	MDC 2 - Basic Python Programming MDC 3 - Rural Development
	C 4 - Statistical Techniques in Geography					
III	C 5 - Economic Geography		SEC 1 - GIS and GNSS	VAC 1 - Environmental Science	MC 3 - Geography of Tourism	
	C 6 - Analytical Cartography					
IV	C 7 - Climatology		SEC 2 - Field Work	VAC 2 - Survey and Data Analysis	MC 4 - Sustainable Development	
	C 8 - Remote Sensing					
V	C 9 - Regional Geography of India		Summer Internship			
	C 10 - Soil Geography					
	C 11 - Political Geography and Geopolitical Issues					
VI	C 12 - Nature and Natural Disaster					
	C 13 - Environmental Geography					
	C 14 - Geographical Thought					
	C 15 - Regional Planning and Development					
VII	C 16A - Hydrology				MC 5 - Research Methodology: Advanced Geoinformatics	
	C 16B - Agricultural Geography					
	C 17A - Advanced Climatology and Oceanography					
	C 17B - Social Geography with special reference to India					
	C 18 - Approaches to Modelling and Qualitative Methods					
	C 19 – Project / Dissertation					
VIII	C 20A - Advanced Geomorphology				MC 6 - Research Methodology and Publication Ethics	
	C 20B - Development Geographies					
	C 21A - Techniques in Environmental Geography					
	C 21B - Planning for Sustainable Cities					
	C 22 - Advanced Analytical Techniques					
	C 23 – Project / Dissertation					

- **Academic Session:** Each Semester shall contain at least 15 Teaching Weeks
- **Odd Semesters:** Semesters One and Three - July to December; **Even Semesters:** Semesters Two and Four - January to June
- Students will have to opt for either **Optional Core Course Modules 16A & 17A** in Semester VII **together with Modules C20A & C21A** in Semester VIII or they will opt for **Modules 16B & 17B** in Semester VII **along with Modules C20B & C21B** in Semester VIII.
- The MC modules in Semesters VII and VIII are offered **only for students of the Department of Geography.**



Semester Course Modules, Evaluation Methods and Marks Distribution for Four-Years Bachelors Programme (B.Sc. Honours with Research) in Geography

Department of Geography, Presidency University, Kolkata

Semester	Course Code	Course Name	Course Type	Total Credits	Total Marks	Course Type	Evaluation Method	Totals
I	GEOG101C01	Geotectonics and Geomorphology	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	Courses: 5 Credits: 25 Marks: 400
	GEOG141C02	Maps and Surveying	Major	6	100	Sessional	Continuous Evaluation	
	103AECC01	English Communication / MIL	AECC	4 (Th) + 0 (Prc) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG104MC01	Geography in Daily Life	MC	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
	GEOG105MDC01	Soil and Water Analysis	MDC	3 (Th) + 0 (Tut) = 3	50	Taught	IA: 15 and End Semester: 35	
II	GEOG151C03	Population and Settlement Geography	Major	5 (Th) + 1 (Tut) = 6	100	Taught	IA: 20 and End Semester: 80	Courses: 6 Credits: 28 Marks: 450
	GEOG152C04	Statistical Techniques in Geography	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
	153AECC02	English Communication / MIL	AECC	4 (Th) + 0 (Prc) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG154MC02	Natural Hazards and Environmental Pollution	MC	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
	GEOG155MDC02	Basic Python Programming	MDC	3 (Th) + 0 (Tut) = 3	50	Taught	IA: 15 and End Semester: 35	
	GEOG156MDC03	Rural Development	MDC	3 (Th) + 0 (Tut) = 3	50	Taught	IA: 15 and End Semester: 35	
III	GEOG201C05	Economic Geography	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	Courses: 5 Credits: 25 Marks: 450
	GEOG241C06	Analytical Cartography	Major	6	100	Sessional	Continuous Evaluation	
	GEOG242SEC01	GIS and GNSS	SEC (Major)	4	100	Sessional	Continuous Evaluation	
	ENVS204VAC01	Environmental Science	VAC	3 (Th) + 0 (Tut) = 3	50	Taught	IA: 15 and End Semester: 35	
	GEOG205MC03	Geography of Tourism	MC	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
IV	GEOG251C07	Climatology	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	Courses: 5 Credits: 26 Marks: 400
	GEOG291C08	Remote Sensing	Major	6	100	Sessional	Continuous Evaluation	
	GEOG292SEC02	Field Work	SEC (Major)	5	50	Sessional	Report and presentation	
	GEOG293VAC02	Survey and Data Analysis	VAC	3	50	Sessional	Continuous Evaluation	
	GEOG255MC04	Sustainable Development	MC	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
V	GEOG301C09	Regional Geography of India	Major	5 (Th) + 1 (Tut) = 6	100	Taught	IA: 20 and End Semester: 80	Courses: 4 Credits: 22 Marks: 350
	GEOG302C10	Soil Geography	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
	GEOG303C11	Political Geography and Geopolitical Issues	Major	5 (Th) + 1 (Tut) = 6	100	Taught	IA: 20 and End Semester: 80	
	GEOG341SI01	Summer Internship	SI (Major)	4	50	Sessional	Report and presentation	
VI	GEOG351C12	Nature and Natural Disaster	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	Courses: 4 Credits: 24 Marks: 400
	GEOG352C13	Environmental Geography	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
	GEOG353C14	Geographical Thought	Major	5 (Th) + 1 (Tut) = 6	100	Taught	IA: 20 and End Semester: 80	
	GEOG354C15	Regional Planning and Development	Major	4 (Th) + 2 (Prc) = 6	100	Taught	IA: 30 and End Semester: 70	
VII	GEOG401C16A	Hydrology	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	Courses: 5 Credits: 20 Marks: 250
	GEOG401C16B	Agricultural Geography	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG402C17A	Advanced Climatology and Oceanography	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG402C17B	Social Geography with special reference to India	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG441C18	Approaches to Modelling and Qualitative Methods	Major	4	50	Sessional	Continuous Evaluation	
	GEOG442C19	Project / Dissertation	Major	4	50	Sessional	Report and presentation	
	GEOG443MC05	Research Methodology: Advanced Geoinformatics	MC	4	50	Sessional	Continuous Evaluation	
VIII	GEOG451C20A	Advanced Geomorphology	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	Courses: 5 Credits: 24 Marks: 300
	GEOG451C20B	Development Geographies	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG452C21A	Techniques in Environmental Geography	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG452C21B	Planning for Sustainable Cities	Major (Optional)	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	
	GEOG491C22	Advanced Analytical Techniques	Major	4	50	Sessional	Continuous Evaluation	
	GEOG492C23	Project / Dissertation	Major	8	100	Sessional	Report and presentation	
	GEOG455MC06	Research Methodology and Publication Ethics	MC	4 (Th) + 0 (Tut) = 4	50	Taught	IA: 15 and End Semester: 35	

Detailed Syllabus for 4-Year Undergraduate Course in Geography with Research (First Semester)

Course Name: *Geotectonics and Geomorphology*

Course Type: Core Course

Course Code: *GEOG101C01*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination- *Written examination of 3 hours duration will be held at semester end.*

Question Pattern- *Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.*

Internal Assessment- *IA (30 marks) to be conducted via class test, viva-voce, presentation, assignments or any other suitable evaluation method.*

- Course Objective:**
- To inculcate fundamental knowledge of the different aspects of Physical Geology and Geomorphology, along with the ability to objectively identify and characterise the different Earth surface / subsurface processes that have influenced its evolution, their typical behaviour, landscape expressions and landform assemblages and vital roles in the occurrence of several natural hazards.
- Learning Outcome:**
- Student shall obtain an overview of the various endogenic and exogenic processes that shape the planet, their behavioural characteristics and resultant topography, along with the ability to read a landscape and identify the causative factors of its creation and evolution, while discerning the occurrence and impact of the different ambient geophysical hazards on human societies.
- Professional Skill Development:**
- The obtained knowledge is crucial to providing a foundation for future studies in Earth Science and Disaster Management, while providing inputs on the basic concepts that underlie much of the United Nations Sustainable Development Goals on clean water, land, natural resources and geological hazard management and human impacts on the physical environment.

GEOG101C01 (Theory) [Credits: 4 Marks: 70]

Unit 1: Outline of Geotectonics

- | | | |
|-----|---|------|
| 1.1 | Earth's major tectonic events, physiographic changes and life evolution through geological timescales | [5] |
| 1.2 | Earth's interior structure from seismic tomography; Major discontinuities | [5] |
| 1.3 | Isostasy hypotheses of Airy and Pratt; Isostatic adjustments and distribution of gravity anomalies | [4] |
| 1.4 | <i>Plate Tectonics:</i> Early contributions of Wegener and Holmes; Later evidences from sea-floor spreading and palaeomagnetism; Case studies of Plate margin interactions – the Himalayas, Andes, Mid-Atlantic Ridge, East African Rift, Hawaiian Chain, San Andreas; Neotectonic movement signatures in the landscape | [12] |
| 1.5 | <i>Structural Geology:</i> Rock deformation; Classifications of folds and faults and their field recognition; Folded, Faulted and Homoclinal Landscapes – topographic attributes, structural landforms and related drainage development | [10] |

Unit 2: Tenets of Landscape Denudation

- | | | |
|-----|--|-----|
| 2.1 | <i>Fundamental Concepts:</i> Thornbury and Brunnsden; Geomorphic timescales and landscape hierarchy; Geomorphic Systems – classification, thresholds and feedbacks; Morphogenetic regions of Peltier and Budel | [4] |
| 2.2 | <i>Weathering processes:</i> regional variations in processes, rates and landforms; Supergene ores, placers and laterites | [3] |
| 2.3 | <i>Hill slope processes:</i> types and rates; Slope recession, Factor of Safety, Processes and mechanisms of rock failure | [3] |
| 2.4 | <i>Landscape evolution:</i> Models by Davis, Penck and Hack and their applicability; Slope development models of Dalrymple, King and Young | [5] |

Unit 3: Erosional Processes and Landforms

- 3.1 *Fluvial processes and forms*: Schumm's Idealized Fluvial System, Brice's Fluvial Channel System, Basin-hydro system and channel geomorphic units; *Hydraulics of fluid flow*: Concepts of- Channel parameters (Velocity, Discharge, Hydraulic radius, Wetted perimeter), Longitudinal profile, Base level, Stream capture, Riffle-pool sequence, Hydraulic geometry; Understanding few key terms: Uniform and Non-uniform flow; Steady and Unsteady flow, Sub-critical and Super-critical flow, Laminar and Turbulent flow, Hydraulic jump, Sediment entrainment [12]
- 3.2 *Coastal environments*: The coastal system – Classification of Earth's coasts (active, passive, primary, secondary); Coastal erosion and erosional landforms: Cliff coasts and rocky platforms, Cliff retreatment process and resultant landforms; Shore and beach morphology; Wave forms, Longshore drift and Rip currents; Coastal dunes, Bars, Spits and Tombolo; Sea level change and resultant coastal landforms [9]
- 3.3 *Glacial environments*: Global distribution, types, present to past extents, Glacial and interglacial periods; Glacier Formation; Glacial mass balance and Glacial movement-glacier flow regimes; Glacier erosional processes and landforms (in high relief and low relief regions); Glacier transportation environment and mechanics of glacier deposition; Fluvio-glacial deposits and landforms [9]
- 3.4 *Aeolian processes*: Desert and coastal dune systems and loess; Combating dune advancement [5]
- 3.5 *Human activity and Geomorphology*: Goudie's Principles of Applied Geomorphology; Szabo's classification of anthropogenic landforms [4]

GEOG101C01 (Practical) [Credits: 2 Marks: 30]

Unit 4: Basic Geological and Geomorphological Exercises

- 4.1 Rocks and Minerals: Megascopic identification, properties, formation and resulting landforms; Bowen's Reaction Series; Rocks and landforms - basalt, granite, limestone [15]
- 4.2 Measurement and plotting of rock dip and strike and surface slope profiles with clinometer; Basic stratigraphic principles of outcrops and discerning geological events' sequence from strata; Examining structural formations from photographs and images [4]
- 4.3 Plotting seismic events using USGS data in Google Earth and MS-Excel; Relating earthquake foci with plate margins and volcanic zones using IRIS database; Virtual Volcano Field trip – Vesuvius, Pelee, St. Helens, Thera, Krakatoa, Toba, Erta Ale, Kilauea; Simulating volcanic eruptions in custom software; Computing volcano hypsometry and VEI [5]
- 4.4 Landform identification from Google Earth and tracking historical changes; Basics of geomorphological mapping [6]

Suggested Readings: *Introduction to Geotectonics and Geomorphology*

- Anderson, R.S. and Anderson, S.P. (2010): *Geomorphology: The Mechanics and Chemistry of Landscapes*, CUP, Cambridge
- Bierman, P.R. and Montgomery, D.R. (2014): *Key Concepts in Geomorphology*. W.H. Freeman and Co
- Charlton, R. (2007): *Fundamentals of Fluvial Geomorphology*. Routledge, USA
- Fryirs, K.A. and Brierley, G.J. (2013): *Geomorphic analysis of river systems: An approach to reading the landscape*. Wiley-Blackwell, Chichester, UK
- Goudie, A.S. (ed.) (2004): *Encyclopaedia of Geomorphology*. Routledge, London
- Gregory K.J., Goudie A.S. (eds.) (2011): *The SAGE Handbook of Geomorphology*
- Gutiérrez, F. and Gutiérrez, M. (2016): *Landforms of the Earth: An Illustrated Guide*. Springer Int. Pub.,
- Gutiérrez, M. (2013): *Geomorphology*, CRC Press, Boca Ranton, Florida
- Harvey, A. (2012): *Introducing Geomorphology: A guide to landforms and processes*. Dunedin, London.
- Huggett, R.J. (2011): *Fundamentals of Geomorphology*. Routledge, New York
- NATMO (2000): *Geomorphological Mapping*, Monograph No. 010MONO, NATMO, Kolkata
- NRC (2010): *Manual for national geomorphological and lineament mapping on 1:50,000*. A project under National Resources Census (NRC), Technical report Published by ISRO, GSI
- Scheffers, A.M., may, S.M., Kelletat, D.H. (2015): *Landforms of the world with Google Earth: Understanding our environment*. Springer
- Summerfield, M.A. (1991): *Global Geomorphology: An Introduction to the Study of Landforms*. Longman, London.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (First Semester)

Course Name: *Maps and Surveying*

Course Type: Core Course

Course Code: *GEOG141C02*

Credits: 6

Total Marks: 100

Course Evaluation: Entire Course of 100 marks to be evaluated via Continuous Assessments throughout the semester.

Pattern- *Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)*

- Course Objective:**
- Impart knowledge on maps and mapping methods, topographical assessment of maps and surveys to create them.
- Learning Outcome:**
- Ability to prepare a wide variety of maps using different datasets, analyse terrain and survey the land surface.
- Professional Skill Development:**
- These skills relate directly with fundamental knowledge required in the geospatial industry and will benefit the learning of future courses in this domain.

GEOG141C02 (Theory) [Credits: 4 Marks: 70]

Unit I: Map Scales

- | | | |
|-----|---|------|
| 1.1 | Basic concept and types of Scale; RF conversions between large scale and small scale maps | [5] |
| 1.2 | Graphical construction of scales: linear, comparative, diagonal and vernier | [10] |

Unit 2: Thematic Mapping

- | | | |
|-----|---|------|
| 2.1 | Diagrammatic representation of data: Dots, Spheres, Proportional pie-diagram, Choropleth and Isopleth, chorochromatic and choroschematic maps | [15] |
| 2.2 | Questionnaire/Schedule preparation for assessment and perception study on socio-environmental issues | [6] |
| 2.3 | Lorenz Curve and Gini Coefficient; Location Quotient; Nearest Neighbour Analysis, Rank Size Rule (Zipf and Berry), HDI and GDI | [15] |
| 2.4 | Least square method and Maximum positive deviation method of crop combination; Dominant and Distinctive Function; Ternary diagram | [9] |

Unit 3: Topographical Maps

- | | | |
|-----|--|-----|
| 3.1 | Reference scheme of Survey of India Everest and Open Series Maps; Map margin information | [5] |
| 3.2 | Construction and interpretation of relief profiles (serial, superimposed, projected and composite) | [3] |
| 3.3 | Altimetric frequency distribution; Demarcation of broad physiographic zones | [2] |
| 3.4 | Denoting drainage, geomorphic, settlement and transport attributes using sketches; Comparing landscape changes using historical and present topographical maps and Google Earth | [5] |
| 3.5 | Basic morphometric analysis: Preparation of Relative Relief (Smith), Average Slope (Wentworth), Stream Frequency and Drainage Density (Horton); Ruggedness and Dissection Index maps | [6] |
| 3.6 | Watershed analysis: Drainage basin delineation, stream ordering (Strahler) and Horton's Laws; Plotting River Long Profile and enumerating Basin Hypsometry | [5] |
| 3.7 | Correlating physical and cultural attributes using transect chart and scatter plots | [2] |
| 3.8 | Framing topographical map interpretations | [2] |

GEOG141C02 (Practical) [Credits: 2 Marks: 30]

Unit 4: Surveying Techniques

- | | | |
|-----|---|------|
| 4.1 | Open and closed traverse survey using Prismatic Compass; Bowditch correction for closing error adjustment | [8] |
| 4.2 | Profile line survey and Radial Contouring using a Dumpy Level; Plotting radial contouring data in software | [10] |
| 4.3 | Determination of heights of objects with accessible/inaccessible base by Transit Theodolite - different cases; Problems related to heights and distances calculations | [8] |
| 4.4 | Distance measurements with a laser distance measure; Mensuration math formulae and applications | [4] |

Suggested Readings: *Maps and Surveying*

1. Anson R. and Ormelling F. J., (1994): *International Cartographic Association: Basic Cartographic* Vol. Pregmen Press.
2. Arora, K.R. (2010): *Surveying (Volumes I & II)*, Standard Book House, New Delhi.
3. Basak, N.N. 2017. *Surveying and Levelling*, 2nd ed, McGraw Hill Education.
4. Gupta K.K. and Tyagi, V. C., (1992): *Working with Map*, Survey of India, DST, New Delhi.
5. Kulkarni, S.V. and Kanetkar, T.R. (1965): *Surveying and Levelling (Volumes I & II)*, A.V.G. Prakashan, New Delhi.
6. Mishra R.P. and Ramesh, A., 1989: *Fundamentals of Cartography*, Concept, New Delhi.
7. Monkhouse, F.J., Wilkinson, H.R. (1971). *Maps and Diagrams: Their Compilation and Construction*, Alphaneumera-Kolkata.
8. Rhind D. W. and Taylor D. R. F., (eds.), (1989): *Cartography: Past, Present and Future*, Elsevier, International Cartographic Association.
9. Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., Guphill, S.C. (1995). *Elements of Cartography*, 6th ed, Wiley.
10. Saha, P.K. and Basu, P. (2009): *Advanced Practical Geography*, Books and Allied (P) Ltd., Kolkata.
11. Sarkar, A. (2008): *Practical Geography: A Systematic Approach*, Orient BlackSwan, Kolkata.
12. Sen, P.K. (1989). *Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters*, University of Burdwan.
13. Singh, R.L. and Singh, P.B. (2009): *Elements of Practical Geography*, Kalyani Publishers, New Delhi.
14. Subramanian, R. (2012). *Surveying and Levelling*, 2nd ed, Oxford University Press.
15. Vaidyanadhan, R., Subbarao, K.V. (2014). *Landforms of India from Topomaps and Images*, Geological Society of India.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (First Semester)

Course Name: *Geography in Daily Life*

Course Type: Minor Course

Course Code: *GEOG104MC01*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (80 marks) and Internal Assessment (20 Marks)

Semester Examination- *Written examination of 3 hours duration will be held at semester end.*

Question Pattern- *Seven Long-answer type questions each of 11 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 6 marks, will be set for answering any six.*

Internal Assessment- *Tutorial / IA (20 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.*

- Course Objective:**
- The course aims to provide basic understanding about various geographical phenomena, processes and issues with special emphasis on their implication in our daily life.
 - It will impart geographic understanding of different global issues which impact our daily life. The course will have an interdisciplinary focus.
- Learning Outcome:**
- Students will learn about various geographical phenomena and processes and how they impact on our daily life.
 - Students will be able to contextualize this knowledge in the domain of their specialization.
- Professional Skill Development:**
- Students will become competent for collaborative interdisciplinary works with public agencies and NGOs.

GEOG104MC01 (Theory) [Credits: 5 Marks: 80]

Unit 1: Approaching Daily Life

- | | | |
|-----|--|-----|
| 1.1 | Contextualising daily life; Activities and pattern; Social reproduction and materiality | [5] |
| 1.2 | Locating everyday life in geographical realms-Landscape, society, space, place, time, body, culture, territory, region, wellbeing, and public life | [5] |
| 1.3 | Why study Geography? Origin, Nature of geography as a discipline, relationship with other branches of knowledge, major divisions | [5] |
| 1.4 | Inequalities between spaces and social groups: concept, nature, extent, reasons and consequences | [6] |
| 1.5 | Interconnectedness of the world and communities: Globalization, Culture, Consumption | [6] |

Unit 2: Natural entities in Daily Life

- | | | |
|-----|---|-----|
| 2.1 | Natural Landscape: Concept, forms and importance to Daily Life | [4] |
| 2.2 | Weather and Climate- shaping our daily life | [4] |
| 2.3 | Environment: Concept, types; environmental issues: pollution and its impact | [6] |
| 2.4 | Natural Disasters: meaning, types; hazard, risk, and vulnerability, impact | [8] |
| 2.5 | Climate change: Causes and consequences | [4] |

Unit 3: Social entities in Daily Life

- | | | |
|-----|---|-----|
| 3.1 | Population: Population explosion, demographic dividend and ageing | [6] |
| 3.2 | Daily mobility: Transport facilities and Commuting | [5] |
| 3.3 | Social institutions: Family, marriage and kinship | [5] |
| 3.4 | Economic activities: primary, secondary, tertiary, and quaternary activities | [5] |
| 3.5 | Leisure and geography: concept, importance of geography in leisure and recreation | [5] |

Unit 4: Geographies of Development and Everyday life

4.1	Concept of Human Development and its measurement	[5]
4.2	Poverty: Concepts, dimension, and measurements	[6]
4.3	Agriculture and Food Security	[4]
4.4	Urbanization: concept, processes and issues	[5]
4.5	Governance: concept, types-local, regional, national, participatory development	[6]

GEOG104MC01 (Tutorial) [Credits: 1 Marks: 20]

Unit 5: Presentation and Assignment

5.1	Approaching Daily Life	[3]
5.2	Natural entities in Daily Life	[4]
5.3	Social entities in Daily Life	[4]
5.4	Geographies of Development and Everyday life	[4]

Suggested Readings: *Geography in Daily Life*

- Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. and Jackson, C.E.O. (2012) *Meteorology Today: An Introduction to Weather, Climate and the Environment*, Boston: Cengage Learning.
- Casino, V.J.D., Jr. (2009) *Social Geography: A Critical Introduction*, Chichester: Wiley-Blackwell.
- Chandna, R. C., (2002) *Environmental Geography*, Ludhiana: Kalyani.
- Coe, N., Kelly, P., and Yeung, H. (2007) *Economic Geography: A Contemporary Introduction*, London: John Wiley & Sons.
- Gould, W.T.S. (2015) *Population and Development*, London: Routledge.
- Hardy, J. T. (2003) *Climate Change: Causes, Effects and Solutions*, West Sussex: Willey.
- Jones, A. (2010) *Human Geography: The Basics*, London: Routledge.
- Kale, V.S. (2014) *Landscapes and Landforms of India*, London: Springer.
- Kreisel, W. (2004) *Geography of Leisure and Tourism Research in the German-speaking World: Three Pillars to Progress, Tourism Geographies*, Vol. 6, No. 2, 163–185, London: Routledge.
- McIlveen, R. (2010) *Fundamentals of Weather and Climate*, New York: Oxford University Press.
- Norton, W. (2014) *Human Geography*, 8th ed. Canada: Oxford University Press.
- Pacione, M. (2009) *Urban Geography: A Global Perspective*, London: Routledge.
- Ramachandran, R. (2010) *Urbanisation and Urban Systems of India*, New Delhi: Oxford University Press
- Rubenstein, J. M. (2005) *The Cultural Landscape*, Delhi: Prentice Hall.
- Smith, K. (2011) *Natural Hazards*, London: Routledge.
- Strahler, A. (1999) *Introducing Physical Geography*, New Delhi: Wiley.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (First Semester)

Course Name: *Soil and Water Analysis*

Course Type: Multi-Disciplinary Course

Course Code: *GEOG105MDC01*

Credits: 3

Total Marks: 50

Course Evaluation - Semester Examination (35 marks) and Internal Assessment (15 Marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- Comprehensive knowledge on soil and water testing procedures.
- Learning Outcome:**
- Detail study on soil sample collection processes, testing and water quality analysis.
- Professional Skill Development:**
- Hands-on training of soil and water sample testing.

Unit 1: Soil Sample Analysis

- | | | |
|-----|---|------|
| 1.1 | Sample Collection Methods and Techniques | [3] |
| 1.2 | Concepts of soil acidity, alkalinity, Buffering capacity and Saline soil reclamation | [5] |
| 1.3 | Process of soil Degradation: Soil erosional agents; Causes of soil Fertility Decline | [6] |
| 1.4 | Plant nutrients; Roles of NPK in plant's growth; Processes of soil nutrient loss | [6] |
| 1.5 | Determination of N, P, K status, soil pH and organic carbon (OC) from collected soil Samples (using soil kit) | [10] |

Unit 2: Water Quality Assessment

- | | | |
|-----|--|------|
| 2.1 | Water Sample Collection Methods and Techniques | [4] |
| 2.2 | Water pollution: sources, pollution of surface water bodies and sub-surface water, Effects of pollution | [6] |
| 2.3 | Determination of pH, DO, TDS, Turbidity, Salinity, Conductivity, Iron, Hardness of collected drinking water samples from households and tube wells | [13] |
| 2.4 | Application of Water Quality Index (WQI) to determine the suitability of the water samples | [7] |

Suggested Readings: Soil and Water Analysis

1. Ahuja, S. ed., 2013. *Monitoring water quality: Pollution assessment, analysis, and remediation*. Newnes.
2. Burt, R. (ed.), 2004. *Soil Survey Laboratory Methods Manual: Soil Survey Investigations Report No. 42 Version 4.0*, USDA, USA.
3. Haluschak, P., 2006. *Laboratory methods of soil analysis. Canada-Manitoba soil survey*, pp.3-133.
3. McKenzie, N.J., Grundy, M.J., Webster, R. and Ringrose-Voase, A.J. eds., (2008). *Guidelines for surveying soil and Land resources*. CSIRO publishing.
4. Rowell, D.L. (2014). *Soil science: Methods & applications*. Routledge.
5. Schneider, W. ed., (1988). *Water analysis: A practical guide to physico-chemical, chemical, and microbiological water examination and quality assurance* (No. 628.161 W3). Berlin: Springer-Verlag.
6. United States. Bureau of Plant Industry, Soils, Agricultural Engineering, United States. Science and Education Administration, (1951). *Soil Survey Manual (No. 18)*. US Department of Agriculture.
7. United States. Division of Soil Survey, (1993). *Soil survey manual (No. 18)*. US Department of Agriculture.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Second Semester)

Course Name: *Population and Settlement Geography*

Course Type: Core Course

Course Code: *GEOG151C03*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (80 marks) and Internal Assessment (20 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 11 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 6 marks, will be set for answering any six.

Internal Assessment - Tutorial / IA (20 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To introduce various fundamental, contemporary, and applied aspects of population and settlement geography.
- Learning Outcome:**
- At the end of this course, it is expected that students will be able to describe and evaluate spatial dimensions of population dynamics and human settlements.
- Professional Skill Development:**
- It can provide students with a wide range of professional skills applicable in various fields, and can prepare them for careers in urban planning, public policy, community development, international development, and social research.

GEOG151C03 (Theory) [Credits: 5 Marks: 80]

Unit 1: Introduction to Population Geography

- | | | |
|-----|--|-----|
| 1.1 | Nature, scope and content of Population Geography; relationship between Population Geography and other social sciences | [6] |
| 1.2 | Sources of Population Data: Census, Vital Statistics and National Sample Survey | [4] |
| 1.3 | Trends of Population Growth in the World; World Pattern of population distribution and composition of population by age and sex | [8] |
| 1.4 | Population-Resource Relationship; Optimum, Over Population, Under Population, their problem and prospects. Ackerman's Population-Resource Region | [8] |

Unit 2: Population Dynamics

- | | | |
|-----|--|------|
| 2.1 | Population Dynamics: Fertility, Mortality and Migration | [10] |
| 2.2 | Theories of Population Growth: Malthusian theory and Demographic Transition theory | [6] |
| 2.3 | Migration: types, determinant and consequences, pattern of international migration | [5] |
| 2.4 | Theories of Migration: Ravenstein and Lee's Laws | [6] |

Unit 3: Geography of Rural Settlements

- | | | |
|-----|---|-----|
| 3.1 | Site and situation; Types and patterns of rural settlements; Rural house types in India by geographical regions | [8] |
| 3.2 | Morphology and segregation of rural settlements (Case studies in India) | [6] |
| 3.3 | Hierarchy of rural settlements: Central Place Theory and its applicability in present context | [6] |
| 3.4 | Geographies of ruralization; ruralopolis; desakota; rural hollowing | [8] |

Unit 4: Geography of Urban Settlements

- | | | |
|-----|---|------|
| 4.1 | Origin and growth of urban settlements; Classification of urban settlements (Harris and Nelson) | [6] |
| 4.2 | Concepts of Metropolis, Megalopolis, Conurbation, Primacy; Morphology of cities (Models of Burgess, Hoyt, Harris-Ullman and Alonso) | [8] |
| 4.3 | Issues and challenges of third world urbanization: hidden urbanization; non-recognized urbanization; peripheral urbanization; agrarian urbanism | [10] |

GEOG151C03 (Tutorial) [Credits: 1 Marks: 20]

Unit 5: Presentation and Assignment

- 5.1 Written assignment submission and presentation on various topics. [8]
- 5.2 Reporting on in-person observations of current urbanization concerns in rural-urban transitional areas [7]

Suggested Readings: Population and Settlement Geography

1. Bhende, A.S. and Kanitkar, T. (2015) *Principles of Population Studies*. Mumbai: Himalaya Publishing House.
2. Beaujeu- Garnier, J. (1966) *Geography of Population*. London: Longman.
3. Clarke, J.I. (1972): *Population Geography*, Pergamon Press, Oxford.
4. Roy, D. (2015) *Population Geography*. Kolkata: Books & Allied (P) Ltd.
5. Ghosh, S. (1998) *Settlement Geography*. Kolkata: Orient Longman Ltd.
6. Mandal, R.B. (2001) *Introduction to Rural Settlements*. New Delhi: Concept Publishing Company.
7. Ramachandran, R. (2010) *Urbanisation and Urban Systems of India*. New Delhi: Oxford University Press.
8. Singh, R.Y. (1994) *Geography of Settlement*. Jaipur: Rawat Publications, Jaipur.
9. Denis, E., Zérah, M. H., & Mukhopadhyay, P. (2017) *Subaltern urbanisation in India*. Switzerland: Springer.
10. Brenner, N. (Ed.). (2021) *Implosions/explosions: Towards a study of planetary urbanization*. De Gruyter.
11. Tiwari, R.C. (2020) *Settlement Geography – Rural and Urban Settlement*. Allahabad: Pravalika Publications.
12. Chandana, R.C. (2021) *Geography of Population – Concept, Determinants and World Pattern*. New Delhi: Kalyani Publishers.
13. Hassan, M. I. (2007) *Population Geography*. Jaipur: Rawat Publications.
14. Maurya, S.D. (2018) *Population Geography*. Allahabad: Pravalika Publications.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Second Semester)

Course Name: *Statistical Techniques in Geography*

Course Type: Core Course

Course Code: *GEOG152C04*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination (70 Marks) of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objectives:**
- To provide understanding of basic features and representation of a data set.
 - To focus on concepts in probability theory, random variable, mathematical expectation, and different types of distributions, sampling theory and estimation theory.
 - To understand building and testing statistical hypotheses.
 - To provide conceptual understanding of regression analysis.
- Learning Outcome:**
- Ability to describe and visualize statistical data.
 - Explain probability including laws for unions, intersections and complementations and using them in problem solving situations.
 - Design statistical hypotheses about real world problems and conduct appropriate tests for drawing valid inferences about the population.
 - Produce simple linear regression equations and evaluate regression models.
- Professional Skill Development:**
- Using statistical software to a substantial extent for statistical computing and drawing statistical diagrams.
 - Computing probability of simple, compound and complementary events, and estimating statistical parameters from sample.
 - Skill of hypothesis testing for any research work.
 - Predict the value of a dependent variable based on an independent variable from regression.

GEOG152C04 (Theory) [Credits: 4 Marks: 70]

Unit 1: Descriptive Statistics

- 1.1 Types of statistical data, Preparation of Frequency Distribution Table, Graphical Description [5]
- 1.2 Frequencies (Quartiles, Quintiles, Deciles, Percentiles), Cross Tabulation, Central Tendency (Mean, Median and Mode), Centro-graphic Techniques, Dispersion (Mean Deviation, ANOVA, Quartile Deviation and Standard Deviation, Variance and Coefficient of variation) [15]
- 1.3 Description of Shapes: Skewness, Kurtosis and Moments [4]

Unit 2: Probability, Sampling and Hypothesis Testing

- 2.1 Basics: Experiment, Events and Sample Space; Union, Intersection and Complements of Events; Addition Rule, Multiplicative Rule - independent and dependent events; Conditional Probability and independence; Theorem of Total Probability - Bayes' Theorem. [10]
- 2.2 Counting rules: Permutation and Combination; Decision Table and Decision Tree [4]
- 2.3 Probability Distributions - Discrete and Continuous; Probability Mass Function and Probability Density Function; Theoretical Distributions- Normal, Binomial, Poisson and Multinomial [10]
- 2.4 Population and sample; Sampling strategies, sampling distributions; Sampling estimates for large and small samples, tests involving means and proportions [5]
- 2.5 Hypothesis Testing: Reasoning of tests of significance; Confidence Interval; Level of Significance; Type I and Type II Error; One-Tailed and Two-Tailed tests; Degrees of Freedom; Steps in Hypothesis Testing [5]

Unit 3: Correlation, Regression and Time Series

3.1	Non Parametric Tests (Chi square test, Interpretation of F table and Contingency Table)	[3]
3.2	Rank Correlation, Product Moment Correlation	[5]
3.3	Simple Regression, Residual from Regression , Omitted Variable Bias	[10]
3.4	Coefficient of determination , Test of significance of correlation and regression coefficients	[5]
3.5	Simple Curvilinear Regression, Introduction to Multivariate Analysis	[5]
3.6	Time Series Processes, Smoothing time series, Time Series Components	[4]

GEOG152C04 (Practical) [Credits: 2 Marks: 30]

Unit 4: Computations Using Statistical Software

4.1	Computations of different statistical parameters and geographical presentation of Geographical data	[6]
4.2	Computations of correlation coefficient and simple linear regression and trend lines	[6]
4.3	Simple Curvilinear and Multivariate Regression	[6]
4.4	Time Series Analysis	[6]
4.5	Computations of probability density function	[6]

Suggested Readings: *Statistical Techniques in Geography*

1. Acevedo, M. F. (2012). *Data analysis and statistics for geography, environmental science, and engineering*. CRC Press.
2. Arora, P. N. (2007). *Comprehensive Statistical Methods*. India: S. Chand Limited.
3. Berkman, E. T., Reise, S. P. (2012). *A Conceptual Guide to Statistics Using SPSS*. United Kingdom: SAGE Publications.
4. Brase, C. H., Brase, C. P. (2018). *Understanding Basic Statistics*. United States: Cengage Learning.
5. Burt, J. E., Barber, G. M., & Rigby, D. L. (2009). *Elementary statistics for geographers*. Guilford Press.
6. Chiang, C. L. (2003). *Statistical methods of analysis*. World Scientific.
7. Flora, D. B. (2017). *Statistical Methods for the Social and Behavioural Sciences: A Model-Based Approach*. United Kingdom: SAGE Publications.
8. Fotheringham, A. S., Brunsdon, C., & Charlton, M. (2000). *Quantitative geography: perspectives on spatial data analysis*. Sage.
9. Gaur, A. S., & Gaur, S. S. (2006). *Statistical methods for practice and research: A guide to data analysis using SPSS*. Sage.
10. Goswami, R. (2021). *Basic Statistics*. ELIVA Press.
11. Gregory, S. (2017). *Statistical Methods and the Geographer*. United Kingdom: Taylor & Francis Group.
12. Grekousis, G. (2020). *Spatial analysis methods and practice: describe–explore–explain through GIS*. Cambridge University Press.
13. Kremelberg, D. (2010). *Practical Statistics: A Quick and Easy Guide to IBM® SPSS® Statistics, STATA, and Other Statistical Software*. United States: SAGE Publications.
14. Marcoulides, G. A., Raykov, T. (2012). *Basic Statistics: An Introduction with R*. United States; Rowman & Littlefield Publishers.
15. Mohanty, P. K. (2019). *Basic Statistics*. India: Scientific Publishers.
16. McGrew Jr, J. C., & Monroe, C. B. (2009). *An introduction to statistical problem solving in geography*. Waveland Press.
17. Ott, R. L., & Longnecker, M. T. (2015). *An introduction to statistical methods and data analysis*. Cengage Learning.
18. Rogerson, P. (2020). *Statistical Methods for Geography: A Student's Guide*. India. SAGE Publications.
19. Walford, N. (2011). *Practical statistics for geographers and earth scientists*. John Wiley & Sons.
20. Wilcox, R. R. (2009). *Basic Statistics: Understanding Conventional Methods and Modern Insights*. Germany: Oxford University Press, USA.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Second Semester)

Course Name: *Natural Hazards and Environmental Pollution*

Course Type: Minor Course

Course Code: *GEOG154MC02*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method

Course Objective:

- The course demonstrates a broad knowledge of the different natural hazards and describes the variety and diversity of natural hazards that affects the Earth's surface environment. The course also deals with major problems of pollution of the atmosphere, water and land, and the hazards associated with different types of pollutants as well as suitable measures for addressing them.

Learning Outcome:

- To determine the risk associated with specific types of natural hazards and environmental pollution in order to deal with these issues at professional level.

Professional Skill Development:

- Numerical problem solving and hands on training in water testing

GEOG154MC02 (Theory) [Credits: 4 Marks: 70]

Unit 1: Concepts and Natural Hazards

- | | |
|--|-----|
| 1.1 Overview of Natural Hazards - definition, hazards & disaster linkages | [6] |
| 1.2 Concept of vulnerability, mitigation, prevention, preparedness, response and recovery | [6] |
| 1.3 Meteorological Hazards – cyclones and droughts: Causes, assessment, effects and control measures | [6] |
| 1.4 Geological Hazards - Earthquakes and Volcanoes: Causes, effects and control measures | [8] |
| 1.5 Sea level change: Causes, Consequences, Projections and Adaptations | [6] |

Unit 2: Quasi-Natural and Man-Made Hazards

- | | |
|---|-----|
| 2.1 Hydrological Hazards - Floods: Causes, assessment, effects and control measures | [5] |
| 2.2 Landslides: Causes, assessment, effects and control measures | [5] |
| 2.3 Soil Erosion: Causes, assessment, effects and control measures | [5] |
| 2.4 Desertification: Causes, assessment, effects and control measures | [5] |
| 2.5 Nuclear Hazards: Causes, assessment, effects and control measures | [5] |

Unit 3: Pollutions

- | | |
|--|-----|
| 3.1 Air pollution: sources, types, effects on weather and climate, control measures | [8] |
| 3.2 Water pollution: sources, pollution of surface & sub-surface water bodies, effects, control measures | [8] |
| 3.3 Solid waste pollution: sources, types and management of solid waste | [6] |
| 3.4 Soil pollution – causes and control measures | [5] |
| 3.5 Marine pollution: sources, effects and management | [6] |

GEOG154MC02 (Practical) [Credits: 2 Marks: 30]

Unit 4: Hazard Analysis

- | | |
|---|------|
| 1.1 Flood Frequency Analysis; Computation of Drought Indices; Hydrologic Flood Routing | [15] |
| 1.2 Determination of pH, DO, TDS, Turbidity, Salinity, Conductivity, Iron, Hardness of collected water samples and computation of Water Quality Index | [15] |

Suggested Readings: Natural Hazards and Environmental Pollution

1. Bobrowsky, P.T. ed., 2013. *Encyclopaedia of natural hazards* (Vol. 1135). Dordrecht: Springer.
2. Bishop, V., 2001. *Hazards and Response*. Collins Educational. London
3. Canter, L.W., 2020. *Ground water pollution control*. CRC Press.
4. Clark, R.B., Frid, C. and Attrill, M., 1997. *Marine pollution* (Vol. 4). Oxford: Clarendon press.
5. Commoner, B., Corr, M. and Stamler, P.J., 1971. The causes of pollution. *Environment: Science and Policy for Sustainable Development*, 13(3), pp.2-19.
6. Goel, P.K., 2006. *Water pollution: causes, effects and control*. New age international.
7. Harrison, R.M. ed., 2001. *Pollution: causes, effects and control*. Royal society of chemistry.
8. Holdgate, M.W., 1979. *A perspective of environmental pollution*. Cambridge University Press.
9. Hyndman, D. and Hyndman, D., 2016. *Natural hazards and disasters*. Cengage Learning.
10. Moss, B., 2008. Water pollution by agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1491), pp.659-666.
11. Stern, A.C., 1977. *Air Pollution: The effects of air pollution* (Vol. 2). Elsevier.
12. White, G.F., 1974. *Natural hazards, local, national, global*. Oxford University Press.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Second Semester)

Course Name: *Basic Python Programming*

Course Type: Multi-Disciplinary Course

Course Code: *GEOG155MDC02*

Credits: 3

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 Marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To be able to use lists, tuples, and dictionaries in Python programs and to learn core python scripting elements e.g. variables, flow control structure and others
 - To learn to write functions and pass arguments in python and to work with python standard library.
 - To understand python's object-oriented features and class inheritance for reusability.
- Learning Outcome:**
- Ability to build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.
 - Ability to handle database and exploring information from database
 - Ability to analyze python codes used in various software.
- Professional Skill Development:**
- Skills for solving problems using computer and programming capability
 - Developing small modules usable in Python based GIS software.

Unit 1: Introduction

- | | |
|---|-----|
| 1.1 Program; Programming Languages; Steps for problem solving; Algorithm; Flow chart. | [3] |
| 1.2 Installing Anaconda Python Distribution; Installing and using Jupyter Notebook; Features of Python. | [2] |
| 1.3 Number systems: Definition, Types and Conversions. | [3] |

Unit 2: Python Components

- | | |
|---|-----|
| 2.1 Identifiers, Keywords, Statement and Expression, Variables, Operators, Precedence and Associativity. | [4] |
| 2.2 Data types, indentation, comments, Reading Input and Printing Output, Type Conversions. | [6] |
| 2.3 Control Flow Statements: <i>if</i> , <i>if-else</i> , <i>if-elif-else</i> and nested <i>if</i> statements, <i>while</i> Loop, <i>for</i> Loop, Nested Loops, <i>continue</i> and <i>break</i> statements. | [6] |
| 2.4 Functions: Modules, Built-in and user defined; Parameters and Arguments; Defining and Calling a Function; <i>return</i> statement and <i>void</i> function; Scope of Variables. | [4] |

Unit 3: Data Structures

- | | |
|--|-----|
| 3.1 Strings: Creating and sorting, Basic Operations, Accessing characters, slicing and joining, string methods, formatting strings | [3] |
| 3.2 Lists: Creating, Basic operations, indexing and slicing, list methods, <i>del</i> statement | [3] |
| 3.3 Dictionaries: Creating, accessing and modifying <i>key-value</i> pairs, Built-in functions for dictionaries, Dictionary methods, <i>del</i> statement | [4] |
| 3.4 Tuples: Creating tuples, Basic tuple operations, indexing and slicing, built-in functions for tuples, tuple-vs-list, tuple-vs-dictionaries, tuple methods, <i>zip</i> function | [4] |
| 3.5 Sets: Set methods, Frozen set | [2] |

Unit 4: Object Oriented Programming

- 4.1 Classes and Objects; Creating classes and objects in Python; Constructor method; Classes with multiple objects, Class attributes and data attributes; Encapsulation; Inheritance, Polymorphism [6]
- 4.2 NumPy with Python: Array creation, Array attributes, Indexing- integers, arrays and Boolean arrays, Arithmetic operations on NumPy arrays, Changing shape, stacking and splitting of Arrays [4]
- 4.3 Pandas: Pandas series and Pandas Dataframe [6]

Suggested Readings: Basic Python Programming

1. Ascher, D., Lutz, M. (2009). Learning Python. United States: O'Reilly Media.
2. Ceder, N. (2018). *The quick Python book*. Simon and Schuster.
3. Gondaliya, V. (2019). *Programming With Python: The Comprehensive Guide to Mastering Python Programming for Beginners*. Switzerland: Vaibhav Gondaliya.
4. Gowrishankar, S. & Veena, A. (2018). Introduction to Python Programming. United Kingdom: CRC Press.
5. Langtangen, H. P. (2016). *A primer on scientific programming with Python*. Springer-Verlag Berlin Heidelberg.
6. Martelli, A., Ravenscroft, A. M., Holden, S., & McGuire, P. (2023). *Python in a Nutshell*. " O'Reilly Media, Inc."
7. Matthes, E. (2016). *Python Crash Course: A Hands-on, Project-based Introduction to Programming*. United States: No Starch Press.
8. Padmanabhan, T. R. (2018). *Programming with Python*. Singapore: Springer Nature Singapore.
9. Srividhya, E., Preetha, J., & Deepajothi, S. (2021). *Python Programming*. Darshan Publishers
10. Zelle, J. M. (2004). Python Programming: An Introduction to Computer Science. United States: Franklin, Beedle.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Second Semester)

Course Name: Rural Development

Course Type: Multi-Disciplinary Course

Course Code: GEOG156MDC03

Credits: 3

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 Marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The students who undergo this programme are able to understand the issues prevailing in rural areas.
 - The rural development programme enables students to understand the socio-economic conditions of rural folk.
 - The students will understand the importance of rural development in sustainable nation building.
- Learning Outcome:**
- Define rural areas, rural economy and development and issues of Rural Development in general and address them through various development strategies.
 - Explain rural local self-governance, namely, the Panchayati Raj Institutions and their role in the planning and development of rural areas.
 - Understand the existing policies and programmes for rural development.
- Professional Skill Development:**
- Policy advisor related to rural development.
 - Researcher in development institutes and NGOs.

Unit 1: Approaching Rural Development

- | | |
|--|-----|
| 1.1 Rural: meaning, definition, national and international perspective, rurality, countryside; social, cultural and economic dimensions of rural | [5] |
| 1.2 Development: meaning, definition, Indicators of Development, Growth versus Development, Characteristics of Underdevelopment | [5] |
| 1.3 Concept of Rural Development: meaning and definition, importance of rural development in India | [5] |
| 1.4 Dimensions of Rural development- Economic, Social, Political and Environmental aspects | [4] |
| 1.5 Components of Rural Development- Determinants, planning, and strategies | [4] |

Unit 2: Rural Issues in India

- | | |
|--|-----|
| 2.1 Rural demography and health situation in India | [5] |
| 2.2 Rural agrarian issues: Major issues in agricultural development, role of agriculture and allied sectors in rural development; rural livelihood diversification | [5] |
| 2.3 Rural poverty in India: Poverty measures and dimensions, Incidence of rural Poverty | [6] |
| 2.4 Rural infrastructure: Water supply, Sanitation, Housing, Road Connectivity and Electricity | [6] |

Unit 3: Rural Governance and Planning in India

- | | |
|--|------|
| 3.1 Panchayati Raj in India: Origin and evolution of local self-government administration, Administrative structure, The Constitution Act, 1992 (73rd Amendment), and its role | [5] |
| 3.2 Rural planning: Need for Rural Planning; Rural Planning and policies in India; Approaches: Growth oriented, Area Development, Community Development, and Integrated Rural Development Approach | [10] |
| 3.3 Rural micro-finance: Role of microfinance in sustainable rural development | [6] |

Unit 4: Rural Development Programmes in India

- | | |
|---|-----|
| 4.1 Mahatma Gandhi National Rural Employment Guarantee Act-2005 (MGNREGA): Mission's goal, objective, framework | [5] |
| 4.2 Rural Housing Programme: Indira Awas Yojana | [5] |
| 4.3 Provision of Urban Amenities in Rural Areas (PURA) | [5] |
| 4.4 Pradhan Mantri Gram Sadak Yojana (PMGSY) | [4] |
| 4.5 National Rural Health Mission: Goals, Strategies, and Framework | [4] |

Suggested Readings: Rural Development

1. Assche, K.V. and Hornidge, A-K. (2015) *Rural Development*, Netherlands: Wageningen Academic Publishers.
2. Dixon, C. (2015) *Rural Development in the Third World*, London: Taylor and Francis.
3. Gallent, N., Hamiduddin, I., Juntti, M., Kidd S. and Shaw D. (2015) *Introduction to Rural Planning*, London: Taylor and Francis.
4. Green, G. P. (ed.) (2013) *Handbook of Rural Development*, Edward Elgar Publishing Limited.
5. Gupta, K.R. (2004) *Rural Development in India*, 2nd Volume. New Delhi: Atlantic Publishers and Distributors.
6. Hussain, T., Tahir, M. and Tahir, R. (2021) *Fundamentals of Rural Development*, New Delhi: Dreamtech press.
7. Nakkiran, S. And Ramesh, G. (2009) *Research Methods in Rural Development*, New Delhi: Deep & Deep Publications Pvt. Ltd.
8. Narasaiah, M.L. (2003) *Approaches to Rural Development*, New Delhi: Discovery Publishing House.
9. Narayanasamy, N. (2009) *Participatory Rural Appraisal*, New Delhi: Sage Publications.
10. Pain, A. and Hansen, K. (2019) *Rural Development*, New York: Routledge.
11. Panda, H. (ed.) (2007) *Governance of Rural Electricity systems in India*, New Delhi: Academic Foundation.
12. Singh, K. (2009): *Rural Development-Principles, Policies and Management*, 3rd Edition. Sage publications.
13. Woods, M. (2005) *Rural Geography*, London: Sage Publications.
14. Woods, M. (2011) *Rural*, London: Taylor and Francis.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Third Semester)

Course Name: *Economic Geography*

Course Type: Core Course

Course Code: *GEOG201C05*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most) will be set for answering any four and eleven semi-long answer type questions, each of 5 marks will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective:

- To introduce the students to fundamental ideas of economic geography and its major constituting dimensions.
- To acquaint students with economic theories and approaches to economic processes and typologies.
- To make students aware of the problem-solving approaches to transportation and cost-effectiveness.

Learning Outcome:

- Students will be able to connect economic theories with geographical phenomena.
- Students will get a geographical perspective to examine economic phenomena, including transport effectiveness.
- Students will be able to practically evaluate the problems of economic thoughts and commodification systems.

Professional Skill

Development:

- Students will be able to analyze economic processes theoretically and contribute to policy design.
- Students will be skilled in handling the syllabus for All India basis competitive exams.
- Students will be skilled in employing the modern techniques of GIS to evaluate economic programmes and transportation effectiveness at the local and regional levels.

GEOG201C05 (Theory) [Credits: 4 Marks: 70]

Unit 1: Basic Concepts

- | | |
|---|------|
| 1.1 Geographical approach to Economy - space, place and scale; Concepts in Economic Geography: Economic man, Goods and services, production, exchange and consumption, Economic processes - Development and globalization | [12] |
| 1.2 Technological changes and their geographical impacts; Economic agglomeration - bases and typology | [6] |
| 1.3 Nature in Economic Thought: Commodification, ownership, stewardship and marketing of the Nature | [5] |
| 1.4 Capitalist Economy - features and contradictions; Capitalism, commodities and consumers; Commodity Chain: spatial structure, buyer-driven and producer-driven, institutional framework | [6] |
| 1.5 Extended studies on New Economic Geography and the tenets of Political Economy | [4] |

Unit 2: Economic Theories

- | | |
|--|-----|
| 2.1 Extended studies on factors affecting location of Economic Activity with special reference to Agriculture (Von Thunen's Theory), and Industry (Weber's Theory) | [6] |
| 2.2 Determination of market areas: Theories of Losch and Palander | [4] |
| 2.3 Theories of Isard, Smith and Myrdal | [6] |

Unit 3: Global Economic Entities

- | | |
|---|-----|
| 3.1 Transnational Economic Activities - Forms of organization; Strategies of labour control in the global economy | [4] |
| 3.2 Consumption process: Significance of consumption in Economy, Fordist and Post-Fordist Consumption; Changing pattern of retailing; Spaces of Consumption - Store, Street, Mall and Theme Parks (Case studies from India) | [6] |
| 3.3 GATT, WTO, OPEC, and TRIPS: Functions and relevance | [4] |
| 3.4 International Trade Blocs; Case studies on Global Conflict on Energy resources | [4] |

Unit 4: Economics of Trade and Transport

- 4.1 Applicability of Geography in Transportation studies; Economic distance and Modes of transport; Extended studies in Comparative cost advantages [4]
- 4.2 Environment and transport: Case studies of positive and negative dimensions [3]
- 4.3 Transport Network Analysis: Topology, Graph Theory and its applicability; Accessibility and Connectivity- Network and nodal connectivity (Inter-regional and Intra-regional) [8]
- 4.4 Models of transport: Spatial interaction model, Traffic analysis and application of congestion model to manage Urban Transport problems [8]

GEOG201C05 (Practical) [Credits: 2 Marks: 30]

Unit 5: Spatiality of Economic Activities

- 5.1 Application of 'Minimum Requirements Method' for pattern analysis of industrial concentration in a given area/region [5]
- 5.2 Qualitative methods in evaluation of regional development programmes: Application of the story-based approach [5]
- 5.3 Application of GIS in the delineation of functional/metropolitan regions using freely available data [10]
- 5.4 Linking economic development with urbanization and modernization using open-source data [10]

Suggested Readings: Economic Geography

1. Alexander J. W. (1963). *Economic Geography*. Englewood Cliffs, New Jersey: Prentice-Hall Inc.
2. Aoyama, Y., Murphy, J., and Hanson, S. (2010). *Key Concepts in Economic Geography*. London: Sage.
3. Bagchi-Sen S. and Smith H. L. (2006). *Economic Geography: Past, Present and Future*. London and New York: Taylor and Francis.
4. Barnes, T., Peck, J., Sheppard, E. and Tickell, A. (Eds) (2003). *Reading Economic Geography*. London: Wiley-Blackwell.
5. Berry, B.J.L., Conklin, E.C. and Ray, M.D. (1976). *The Geography of Economic Systems*. Prentice Hall: New Jersey.
6. Boniface, B.G. and Cooper, C. (2005). *Worldwide Destinations: The Geography of Travel and Tourism*. Butterworth: Heinemann
7. Bradford, M.G. and Kent, W.A. (1977). *Human Geography, Theories and Applications*. Oxford: Oxford University Press.
8. Butler, R. (eds.) (2006). *The tourism area life cycle: application and modifications*, Volume-1. U.K.: Channel View Publications.
9. Clark, G., Gertler, M. and Feldman, M.(eds) (2003). *The Oxford Handbook of Economic Geography*. Oxford: OUP.
10. Coe, N., Kelly, P., and Yeung, H. (2007). *Economic Geography: A Contemporary Introduction*. London: John Wiley & Sons.
11. Combes P., Mayer T. and Thisse J. F. (2008). *Economic Geography: The Integration of Regions and Nations*, Princeton University
12. Courtney, P. (1965): *Plantation Agriculture*. London: G. Bell and Sons.
13. Durand L., (1961): *Economic Geography*. Crowell.
14. Fujita M., Krugman P. and Venables A.J. (2001). *The Spatial Economy: Cities, Regions and International Trade*. MIT Press.
15. Guha, J.L. and Chattaraj, P.R. (1989). *A New Approach to Economic Geography: A Study of Resources*. Kolkata: World Press Ltd.
16. Hartshorn, T.A. and Alexander, J.W. (1988). *Economic Geography*. New Delhi: Prentice Hall India.
17. Hodder B. W. and Lee Roger. (1974). *Economic Geography*. London and New York: Taylor and Francis.
18. Hudson, R. (2005). *Economic Geographies: Circuits, Flows and Spaces*. London: Sage.
19. Jones, C.F. and Darkenwald, G.G. (1954). *Economic Geography*. New York: Macmillan.
20. Karlsson, C., Andersson, M., & Norman, T. (2015). *Handbook of Research Methods and Applications in Economic Geography*. Cheltenham, UK: Edward Elgar Publishing, Incorporated.
21. Leong. G.C. and Morgan, G.C. (1975). *Human and Economic Geography*. Hong Kong: Oxford University Press.
22. Leyshon, A., Lee, R., McDowell, L and Sunley, P. (eds) (2011). *The Sage Handbook of Economic Geography*. London: Sage.
23. Miller, E. (1962). *A Geography of Manufacturing*. Englewood Cliff, New Jersey: Prentice Hall.
24. Morgan, W.B. and Munton, R.J.C. (1971). *Agricultural Geography*. London: Methuen.
25. Paterson, J.H. (1976). *Land, Work and Resources - An Introduction to Economic Geography*. London: Edward Arnold.
26. Picard P.M. and Toulemonde E. (2002). *Firms Agglomerations and Unions*. Centre for Economic Policy Research.
27. Simmons, I.G. (1981). *The Ecology of Natural Resources*. London: ELBS/ Edward Arnold.
28. Singh, J. (1974). *An Agricultural Atlas of India: A Geographical Analysis*. Kurukshetra: Vishal Publications .
29. Smith, D.N. (1971). *Industrial Location - An Economical Geographical Analysis*. New York: John Wiley.
30. Thomas, R.S. and Corbin, P.B. (1968). *Geography of Economic Activity*. New York: McGraw Hill.
31. Wearing, S. and Neil, J. (1999). *Ecotourism: Impacts, Potentials and Possibilities*. Butterworth: Heinemann.
32. Wheeler, J.O., Muller, P.O., Thrall, G.I., Fik, T.J. (1998). *Economic Geography*, 3rd ed. London and New York: Wiley.
33. Willington D. E. (2008). *Economic Geography*. Husband Press.
34. Wood, A., Roberts, A. (2010). *Economic Geography: Places, Networks and Flows*. London and New York: Routledge.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Third Semester)

Course Name: *Analytical Cartography*

Course Type: Core Course

Course Code: *GEOG241C06*

Credits: 6

Total Marks: 100

Course Evaluation: Entire Course of 100 marks to be evaluated via Continuous Assessments throughout the semester.

Pattern – Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)

- Course Objective:**
- Impart knowledge on analytical mapping, mathematical principles of maps, and examinations of specific maps.
- Learning Outcome:**
- Create different maps in various projections, undertake basic mathematical computations and assesses an area's geology
- Professional Skill Development:**
- Imbibe ability to assess variety of maps, perform mathematical analysis and undertake land resource evaluation

GEOG241C06 (Theory) [Credits: 4 Marks: 70]

Unit 1: Map Projection

- | | | |
|-----|--|------|
| 1.1 | Coordinate systems: Polar and rectangular; Concept of generating globe, geoid and oblate spheroid | [4] |
| 1.2 | Bearing: Magnetic and whole-circle; Grids: angular and linear measurement methods | [4] |
| 1.3 | Map projections: Classification, properties, deformations and uses | [5] |
| 1.4 | Basic concepts: parallels, meridians, great circles, scale factor, developable surface, constant of a cone, plane of projection | [4] |
| 1.5 | Principles, Theories, Construction and Properties of select Map Projections: <ul style="list-style-type: none"> - Polar Zenithal Case (Gnomonic, Stereographic, Orthographic, Equal Area, Equidistant) - Conical Case (Simple Conical Projection with one Standard Parallel, Bonne's, Polyconic, Sinusoidal, Simple conical projection with two standard parallel) - Cylindrical Case (Equal Area, Orthomorphic, Mercator, Gall) - Special Case (Molleweide) | [20] |
| 1.6 | Combining projections and noting distortions; calculations of length and area in different projections | [6] |
| 1.7 | Concept and significance of Universal Transverse Mercator projection | [2] |

Unit 2: Basic Mathematics for Cartography

- | | | |
|-----|--|-----|
| 2.1 | Basic Algebra: Sets and Venn Diagrams; Progression and Series; Functions, Graphs and Equations | [6] |
| 2.2 | Vector and Matrix Algebra: notations and computations; Minor and Co-factor Determinants, Matrix Inverse, Solving simultaneous equations using Matrix Inverse and Cramer's Rule | [6] |
| 2.3 | Logarithms and Indices: Laws of Logarithm - solving equations and finding solution by experiments | [6] |
| 2.4 | Basic Trigonometry: Trigonometric Ratios and Identities; Sum and difference of angles; Properties of Triangles | [6] |
| 2.5 | Calculus: Differentiation of basic functions; Integration - basic relationships, area and volume | [6] |

GEOG241C06 (Practical) [Credits: 2 Marks: 30]

Unit 5: Map Analysis

- | | | |
|-----|---|------|
| 5.1 | Interpretation of geological maps with different lithologies, structures and discontinuities | [6] |
| 5.2 | Drawing of cross sections and mapping horizontal, vertical, uniclinal, folded and faulted structures | [12] |
| 5.3 | Determining strike and dip attributes, bed succession and thickness | [8] |
| 5.4 | Correlating topography with geologic structures | [4] |
| 5.5 | Study of one G.S.I. Quadrangle map: major lithological units and their topographical expression, map legend components and marginal information | [10] |
| 5.6 | Land use and land cover map preparation (using mouza/cadastral maps and Google Earth) | [5] |

Suggested Readings: Analytical Cartography

1. Bennison, G.M. (1990): *An Introduction to Geological Structures and Maps*, Edward Arnold, London.
2. Bolton, T. 2009 (reprint). *Geological Maps: Their Solution and Interpretation*, Cambridge University Press.
3. Breach, M. (2011): *Fundamental Maths for Engineering and Science*, Palgrave Macmillan, New York.
5. Deetz, C.H. and Adams, O.S. (1944): *Elements of Map Projection, US Coast & Geodetic Survey*, Washington D.C., Sp. Pub. No. 68.
6. Gupta K.K. and Tyagi, V. C., 1992: *Working with Map, Survey of India, DST, New Delhi*.
7. Kellaway G.P. (1953): *Map Projections*. Metheun, London.
8. Kennedy, M., Kopp, S. 2001. *Understanding Map Projections*, Esri Press.
9. Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. *Map Use: Reading, Analysis, Interpretation*, 7th ed, Esri Press.
10. Lisle, R.J. (2004): *Geological Structures and Maps: A Practical Guide*, Butterworth-Heinemann, Amsterdam.
11. Mainwaring, J. (1942): *An Introduction to the Study of Map Projection*.
12. Monkhouse, F.J., Wilkinson, H.R. 1971. *Maps and Diagrams: Their Compilation and Construction*, Alphaneumera-Kolkata.
13. Pearson II, F. 1990. *Map Projections: Theory and Applications*, 2nd ed, CRC Press.
14. Riley, K. and Hobson, M. (2011): *Foundation Mathematics for the Physical Sciences*, Cambridge University Press, Cambridge
15. Robinson, A.H. (1949): *An Analytical Approach to Map Projections, Annals of the Association of American Geographers*, vol. 41.
16. Robinson, A.H., Morrison, J.L., Phillip, C.M., Kimerling, A.J., Guphill, S.C. 1995. *Elements of Cartography*, 6th ed, Wiley.
17. Roy, P. and Sarkar, A. (1981): Some Selected Map Projections for India: Their Relative Efficiencies, *Geographical Review of India*, vol. 43.
18. Saha, P.K. and Basu, P. (2009): *Advanced Practical Geography*, Books and Allied (P) Ltd., Kolkata.
19. Sarkar, A. (2008): *Practical Geography: A Systematic Approach*, Orient BlackSwan, Kolkata.
20. Sen, P.K. 1989. *Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters*, University of Burdwan.
21. Singh, R.L. and Singh, P.B. (2009): *Elements of Practical Geography*, Kalyani Publishers, New Delhi.
22. Steers J.A. (1974): *An Introduction to the Study of Map Projections*, Hodder Arnold.
23. Stewart, J. (2012): *Calculus: Early Transcendental*, Cengage Learning, Belmont, California.
24. Tobler, W.R. (1962): A Classification of Map Projections, *Annals of the Association of American Geographers*, vol. 33.
25. Vaidyanadhan, R., Subbarao, K.V. 2014. *Landforms of India from Topomaps and Images*, Geological Society of India.
26. Yang, X, (2009): *Introduction to Mathematics for Earth Scientists*, Dunedin Academic Press, London.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Third Semester)

Course Name: *GIS and GNSS*

Course Type: Skill Enhancement Course

Course Code: *GEOG242SEC01*

Credits: 4

Total Marks: 100

Course Evaluation: Entire Course of 100 marks to be evaluated via Continuous Assessments throughout the semester.

Pattern – Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation methods)

- Course Objective:**
- To impart basics of geospatial data handling and digital cartography, and precision surveying techniques.
- Learning Outcome:**
- Ability to handle digital maps and images in a variety of data formats and work inter-operably across different software domains. Extract and map geospatial information. Perform precision surveying and prepare suitable maps.
- Professional Skill Development:**
- The geospatial methods and precision surveying techniques directly relate to industry demands in this domain and shall enable the student to undertake further training and employment in this sector.

Unit 1: Concept of Geographical Information System

- | | | |
|-----|--|------|
| 1.1 | Definition and Key Components | [2] |
| 1.2 | Integration of Spatial and Attribute Information; Views of Information System and Interrelated Subsystems | [4] |
| 1.3 | Advantages, Limitations, Functions and Uses of GIS | [2] |
| 1.4 | Global Positioning System (GPS) - Principles and Uses; Hand-held GPS/DGPS; Application of hand-held GPS to map local streets | [12] |

Unit 2: GIS Data Structure

- | | | |
|-----|--|-----|
| 2.1 | Spatial, Thematic and Temporal Dimensions of Geographical Data; Spatial Data Model | [2] |
| 2.2 | Concept of Database and DBMS; Functions of DBMS | [4] |
| 2.3 | Concept of Metadata; Role of Metadata in GIS | [4] |
| 2.4 | Basics of SQL | [4] |
| 2.5 | Data Capture, Encoding, Linking Spatial and Attribute Data | [4] |

Unit 3: GIS Data Analysis

- | | | |
|-----|--|-----|
| 3.1 | Database Query | [4] |
| 3.2 | Overlay Operations | [3] |
| 3.3 | Georeferencing | [3] |
| 3.4 | Network Analysis | [4] |
| 3.5 | Geoprocessing; buffer, clip, intersect, merge, dissolve, erase | [6] |

Unit 4: Modern Trends in GIS

- | | | |
|-----|---|------|
| 4.1 | Integration of GIS and RS, Web GIS, 3D GIS and Virtual Reality | [5] |
| 4.2 | Mapping urban sprawl, Land use and land cover and morphological settlement zone using freely available data | [12] |

Unit 5: Precision Surveying

- | | | |
|-----|--|------|
| 5.1 | Fundamentals of Total Station Survey; Recording and plotting TS Data; DEM creation | [15] |
| 5.2 | DGPS Survey Techniques and preparation of maps | [15] |

Suggested Readings: GIS and GNSS

1. Albretcht, J. (2007): *Key Concepts & Techniques in GIS*, SAGE Publications Ltd., London.
2. Bhatta, B. 2011. *Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others*, CRC Press.
3. Bolstad, P. 2016. *GIS Fundamentals: A First Text on Geographic Information Systems*, 5th ed, XanEdu Publishing.
4. Brewer, C.A. 2015. *Designing Better Maps: A Guide for GIS Users*, 2nd ed, Esri Press.
5. Burroughs, P.A. and McDonnell, R.A. (1998): *Principles of Geographic Information Systems*, Oxford University Press, New York.
6. Clark, K.C. (2010): *Getting Started with Geographic Information Systems*, Prentice Hall, Upper Saddle River, New Jersey.
7. de Smith, M., Longley, P., Goodchild, M. 2011. *Geospatial Analysis: A Comprehensive Guide*. 3rd ed, The Winchelsea Press.
8. Fazal, S. (2008): *GIS Basics*, New Age International (P) Limited, Publishers, New Delhi.
9. Harvey, F. 2015. *A Primer of GIS: Fundamental Geographic and Cartographic Concepts*, 2nd ed, The Guilford Press.
10. Heywood, D.I., Cornelius, S. and Carver, S. (2006): *An Introduction to Geographical Information Systems*, Prentice Hall, Upper Saddle River, New Jersey.
11. Longley, P.A., Goodchild, M., Maguire, D.J. Rhind, D.W. (2010): *Geographic Information Systems and Science*, Wiley, New York.
12. Sarkar, A. 2015. *Practical Geography: A Systematic Approach*. 2nd ed, Orient Black Swan Private Ltd.
13. Shekhar, S. and Xiong, H. (eds.) (2008): *Encyclopaedia of GIS*, Springer, New York.
14. Tomlin, C.D. (1990): *Geographic Information Systems and Cartographic Modeling*, Prentice-Hall, Englewood Cliffs, NJ.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Third Semester)

Course Name: *Geography of Tourism*

Course Type: Minor Course

Course Code: *GEOG205MC03*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most) will be set for answering any four and eleven semi-long answer type questions, each of 5 marks will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective:

- . To give ideas on Tourism Geography and its implication in present society
- . To give an overview of the basic concepts in tourism studies and industrial components
- . To enable students to know the contemporary dimensions of the tourism industry

Learning Outcome:

- . Students will learn about different types of tourism products and their respective markets.
- . Students will be able to correlate social issues with the industrial components of tourism activities.
- . Students will be aware of the negative impacts of tourism activities in totality

Professional Skill

Development:

- . Students will develop a researcher's lens to gaze at the social implications of tourism activities.
- . Students will learn to design and administer attitude scales to survey tourists and locals.
- . Tourists will have practical knowledge about tourism products for professional job markets.

GEOG205MC03 (Theory) [Credits: 4 Marks: 70]

Unit 1: Basics of Tourism Geography

- | | | |
|-----|---|------|
| 1.1 | Scope and Nature of Tourism Geography; Leisure, Recreation and Tourism inter-relations | [6] |
| 1.2 | Geographical Parameters of Tourism after Robinson | [4] |
| 1.3 | Concepts in tourism studies: Tourists, Products, Demand and Supply; Tourism and its Employability | [10] |
| 1.4 | Infrastructure and support system - Types of accommodation; other facilities and amenities | [6] |

Unit 2: Tourism Typologies

- | | | |
|-----|---|------|
| 2.1 | Types of Tourism: Ecotourism, Adventure Tourism, Medical Tourism, Pilgrimage and Religious Tourism, , Urban Tourism | [14] |
| 2.2 | Extended study on Cultural Tourism - concept, components, and operations | [4] |
| 2.3 | Rural Tourism - Case Study from India | [4] |
| 2.4 | MICE as a Tourism product: product types, business operations, and niche markets | [4] |

Unit 3: Tourism Impacts and Policy

- | | | |
|-----|---|-----|
| 3.1 | Impact of tourism: physical, economic and social and perceptive positive and negative impacts | [6] |
| 3.2 | An extended study on Tourism-Climate interface and impacts of climate change on global destinations | [4] |
| 3.3 | Role of foreign capital and impact of globalization on tourism | [4] |
| 3.4 | Tourism in India: National Tourism Policy 1983, 2002 and its applicability | [6] |

Unit 4: Recent Trends

- | | | |
|-----|--|-----|
| 4.1 | Recent Trends of Tourism: Sustainable Tourism, Slow Tourism | [6] |
| 4.2 | Gender embodiments and tourism industry: employment scopes, glass ceiling, disparities | [4] |
| 4.3 | Social Tourism: concept, dimensions, opportunities and functionalities | [4] |
| 4.4 | Tourism-induced exclusion: types, causes and effects | [4] |

GEOG205MC03 (Practical) [Credits: 2 Marks: 30]

Unit 1: Spatiality and Perception Analysis

- | | | |
|-----|--|------|
| 1.1 | Spatial pattern of tourism: Application of Spatial affinity | [5] |
| 1.2 | Tourism perception survey: Application of Likert Scale | [10] |
| 1.3 | Tourism in India: Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal Areas | [15] |

Suggested Readings: *Geography of Tourism*

1. Beeton, S. (2006): *Community Development through Tourism*, Landlinks Press.
2. Buckley, R. (2009): *Ecotourism: Principles and Practices*, CABI.
3. Butler, R. and Hinch, T. (2007): *Tourism and Indigenous Peoples*, Taylor and Francis.
4. Cooper, C. and Hall, C.M. (2008): *Contemporary Tourism: An International Approach*, Butterworth-Heinemann.
5. Dwyer, L., Gill, A. and Seetaram, N. (2012): *Handbook of Research Methods in Tourism: Quantitative and Qualitative Approaches*, Edward Elgar.
6. Hall, C.M. (2011): *Fieldwork in Tourism: Methods, Issues and Reflections*, Routledge.
7. Hall, C.M. and Page, S.J. (2014): *The Geography of Tourism and Recreation: Environment, Place and Space*. Taylor & Francis
8. Jafari, J. (2003): *Encyclopaedia of Tourism*, Routledge.
9. Department of Tourism (2002): *National Tourism Policy, Ministry of Tourism and Culture, Govt. of India*.
10. Newsome, D., Dowling, R.K. and Moore, S.A. (2005): *Wildlife Tourism*, Channel View Publications.
11. Pearce, D.G. and Butler, R. (1999): *Contemporary Issues in Tourism Development*, Routledge.
12. Robinson, P., Heitmann, S. and Dieke, P.U.C. (2011): *Research Themes for Tourism*, CABI.
13. Suresh, K.T. (1994): *Tourism Policy of India: An Exploratory Study*, Equations, Bangalore
14. Sharma, K.K. (2004): *Tourism and Regional Development*, Sarup & Sons.
15. Sharma, K.K. (2005): *Tourism and Development*, Sarup & Sons.
16. Spirou, C. (2011): *Urban Tourism and Urban Change: Cities in a Global Economy*, Taylor and Francis.
17. Tribe, J. (2009): *Philosophical Issues in Tourism*. Channel View Publications.
18. Wearing, S. and Neil, J. (2013): *Ecotourism*, Taylor and Francis.
19. Williams, S. (2009): *Tourism Geography: A New Synthesis*, Taylor & Francis.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fourth Semester)

Course Name: *Climatology*

Course Type: Core Course

Course Code: *GEOG251C07*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- Explore the Earth's atmospheric system and climate patterns through data analysis and understanding natural processes
- Learning Outcome:**
- Students will be able to interpret and explain atmospheric phenomena, climate variability and change, and climate impacts on society and environment
- Professional Skill Development:**
- Extracting climate data from open source archives; Advanced MS-Excel; Foundation for Climate Change Analysis

GEOG251C07 (Theory) [Credits: 4; Marks: 70]

Unit 1: Composition, Structure and Energetics of the Atmosphere

- 1.1 Variation of Atmospheric Composition with Altitude, Latitude and Season; Constant and Variable gases; Vertical structure of the atmosphere; Temperature Inversion [10]
- 1.2 Understanding the processes of energy transfers: Conduction, convection and radiation; Nature of radiation; Radiation laws [10]
- 1.3 Atmosphere-Solar radiation interactions: reflection, scattering, absorption, transmission ; Planetary Radiation balance; Latitudinal heat balance; Greenhouse effect [10]

Unit 2: Atmospheric Moisture

- 2.1 Evaporation, Measures and measurements of atmospheric humidity; Vapour pressure, dew point and saturation; Adiabatic temperature changes; Stability and Instability; Lifting of air mass: orographic, frontal, convergence and convective [10]
- 2.2 Condensation; Aerosols; Nucleation of water vapour; Mechanisms of raindrop formation and types of precipitation; Near-surface condensation - dew, mist, fog and clouds [10]
- 2.3 Charge distribution in clouds; Thunderstorms [5]

Unit 3: Atmospheric Pressure and Winds

- 3.1 Laws governing the horizontal motion of air and flow patterns [5]
- 3.2 Planetary Winds, General Circulation, Jet Streams, Tricellular meridional circulation model [10]
- 3.3 Zonal circulations: Tropical, Mid latitudes and High latitudes. Walker circulation; Study of ENSO, IOD, MJO and related weather phenomena [10]
- 3.4 Monsoon - Origins and Mechanisms; Classification of world climates (Koppen and Thornthwaite) [10]

GEOG251C07 Practical [Credit 2; Marks: 30]

Unit 4: Climatological Diagrams

- 4.1 Preparation of Station model and interpretation of synoptic chart [5]
- 4.2 Preparation of hythergraph, hyteograph, climographs, ergograph [10]
- 4.3 Creating ombrothermic, rainfall dispersion and relative temperature diagrams [15]

Suggested Readings: Climatology

1. Ackerman, S.A. and Knox, J.A. (2012). *Meteorology: Understanding the Atmosphere*, Jones & Bartlett Learning, London.
2. Ahrens, C.D. (2012). *Essentials of Meteorology: An Invitation to the Atmosphere*, Cengage Learning, Boston.
3. Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. and Jackson, C.E.O. (2012). *Meteorology Today: An Introduction to Weather, Climate and the Environment*, Cengage Learning, Boston.
4. Atkinson, B. W. (Ed.) (1981). *Dynamical Meteorology: An Introductory Selection*, Methuen, London..
5. Barry, R.G. and Chorley, R.J. (2003). *Atmosphere, Weather and Climate*, Routledge, London.
6. Basu, R. and Bhaduri, S. eds., (2007). *Contemporary Issues and Techniques in Geography*, Progressive Publishers, Kolkata.
7. Brockwell, P.J. and Davis, R.A. (2016). *Time Series and Forecasting*, Springer.
8. Byers, H. R. (1974). *General Meteorology*, McGraw-Hill Book Company, New York.
9. Chandrasekar, A. (2010). *Basics of Atmospheric Science*, PHI Learning Pvt. Ltd., New Delhi.
10. Critchfield, H. J. (1983). *General Climatology* Prentice Hall India Ltd (2010 Reprint).
11. Houghton, J. (2002). *Physics of Atmosphere*, Cambridge University Press, Cambridge.
12. Lutgens, F.K., Tarbuck, E.J. (1998). *The Atmosphere An Introduction to Meteorology*, 9th Ed, Prentice-Hall Inc.
13. McIlveen, R. (2010). *Fundamentals of Weather and Climate*, Oxford University Press, Oxford.
14. Oliver, J.E. (1993). *Climatology: An Atmospheric Science*, Pearson Education India, New Delhi.
15. Rayner, J.N. (2001). *Dynamic Climatology - Basis in Mathematics and Physics*, Blackwell Publishers Ltd., Oxford.
16. Rohli, R.V. and Vega, A.J. (2013). *Climatology*, Jones and Bartlett Publishers, Massachusetts.
17. Saha, P.K. and Basu, P. (2009). *Advanced Practical Geography*, Books and Allied (P) Ltd., Kolkata.
18. Sarkar, A. (2008). *Practical Geography: A Systematic Approach*, Orient BlackSwan, Kolkata.
19. Thompson, R. D. (1998). *Atmospheric Pressures and Systems*, Routledge, London.
20. Trewartha G. T. and Horne L. H., (1980). *An Introduction to Climate*, McGraw-Hill.
22. Wallace, J.M. and Hobbs, P.V. (1977). *Atmospheric Science: An Introductory Survey*, Academic Press, New York.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fourth Semester)

Course Name: Remote Sensing

Course Type: Core Course

Course Code: GEOG291C08

Credits: 6

Total Marks: 100

Course Evaluation: Entire Course of 100 marks to be evaluated via Continuous Assessments throughout the semester.

Pattern – Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)

- Course Objective:**
- To impart fundamentals of remote sensing, image analysis techniques, and processing of a variety of geospatial datasets.
- Learning Outcome:**
- Student gains knowledge on satellite imaging systems, sensor characteristics, handling of large geospatial datasets, their analysis and information extraction and mapping, three-dimensional modelling of terrain.
- Professional Skill Development:**
- The imparted skills are directly related to facets of India's space programme and geospatial industry, with students able to advance into these domains and undertake further training and employment.

GEOG291C08 (Theory) [Credits: 4 Marks: 70]

Unit 1: Basic Concepts of Remote Sensing

- | | | |
|-----|--|-----|
| 1.1 | Definition and Development; Remote Sensing Process | [3] |
| 1.2 | Concepts of Spherical, Ellipsoid and Projection Systems; Significance of WGS84 and UTM | [5] |
| 1.3 | Sources of Energy - Interaction with Atmosphere and Targets | [2] |
| 1.4 | Remote Sensing Platforms; Geometry of Orbits | [5] |
| 1.5 | Sensor Resolutions | [2] |

Unit 2: Image Analysis

- | | | |
|-----|---|------|
| 2.1 | Image Pre-processing (Radiometric and Geometric Correction) | [4] |
| 2.2 | Image Classification (Supervised and Unsupervised) | [10] |
| 2.3 | Accuracy Assessment | [4] |
| 2.4 | Change Detection | [4] |
| 2.5 | Band Math: Addition, Subtraction, Multiplication, Division, Ration, Simple Model Building | [15] |
| 2.6 | Principles and utilities of different band ratio-based indices | [12] |

Unit 3: Digital Elevation Models

- | | | |
|-----|--|-----|
| 3.1 | Concept of DEM; Attributes of DSM and DTM; DEM preparation methods and accuracy | [2] |
| 3.2 | Different DEM datasets, their resolution and repositories; DEM application domains | [2] |
| 3.2 | Basic principles of digital terrain analysis: parameters and computations | [3] |
| 3.4 | Introducing other elevation datasets – building/canopy height, Bathymetry data, Lunar/Martian DEMs | [2] |

GEOG291C08 (Practical) [Credits: 2 Marks: 30]

Unit 4: Exercises on Satellite Images and Digital Elevation Models

- | | | |
|-----|---|------|
| 4.1 | Different Exercises on – | |
| | • Image Georeferencing and Image Enhancements | [6] |
| | • Image Mosaicking and Creating Multispectral Images | [5] |
| | • Image Classification – Unsupervised and Supervised and Accuracy Assessment | [10] |
| 4.2 | Application of UTM for area calculation and WGS84 for mapping different continents | [8] |
| 4.3 | NDVI and NDBI based mapping using Landsat and Sentinel images | [12] |
| 4.4 | Exercises on Digital Elevation Models and datasets – | |
| | • Preparing a DEM from elevation data; Mapping of primary terrain attributes and hypsometry | [3] |
| | • Viewshed and Watershed delineation, Stream network ordering; Surface/River profile extraction | [3] |

Suggested Readings: *Remote Sensing*

1. Bhatta, B. (2011). *Remote Sensing and GIS*, 2nd ed, Oxford Univ. Press.
2. Campbell, J.B. and Wynne, R.H. (2011): *Introduction to Remote Sensing*, The Guilford Press, New York.
3. Hengl, T., Reuter, H.I. (eds) (2008). *Geomorphometry: Concepts, Software, Applications*. Elsevier.
4. Jensen, J.R. (2006): *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice Hall, New Jersey.
5. Joseph, G. and Jegannathan, C. (2018). *Fundamentals of Remote Sensing*, 3rd ed, Universities Press.
6. Lillesand, T.M., Kiefer, R.W. and Chapman, J.W. (2008): *Remote Sensing and Image Interpretation*, John Wiley & Sons, New York.
7. Nag P. and Kudra, M., (1998): *Digital Remote Sensing*, Concept, New Delhi.
8. Rees W, G. (2001): *Physical Principles of Remote Sensing*, Cambridge University Press.
9. Sabins, F.F. (2008): *Remote Sensing: Principles and Interpretation*, Waveland Press Inc., Illinois.
10. Sahu, K.C. (2007): *Textbook of Remote Sensing and Geographical Information Systems*, Atlantic Publishers, New Delhi.
11. Sarkar, A. (2015) *Practical geography: A systematic approach*. Orient Black Swan Private Ltd., New Delhi.
12. Wilson, J.P., Gallant, J.C.(Eds.) (2000) *Terrain Analysis: Principles and Applications*. Wiley.
13. Wolf P. R. and Dewitt B. A. (2000): *Elements of Photogrammetry: With Applications in GIS*, McGraw- Hill.

Detailed Syllabus for Undergraduate Course in Geography (Hons.) with Research (Fourth Semester)

Course Name: *Field Work*

Course Type: Skill Enhancement Course

Course Code: *GEOG292SEC02*

Credits: 5

Total Marks: 50

Course Evaluation: A Field Report to be prepared and submitted individually by each student, based on actual Field Survey of an area, done jointly or in groups with other students under the supervision of one or more Prof-in-Charge of the Field Study, with Presentation, Group Discussion and Viva on the prepared Field Report. The Internal Supervisors shall award scores out of 15 marks based on the performance of the student in the field and during the preparation of the field report, while the External Expert shall award scores out of 35 marks, based on the content of the Field Report, its presentation and viva-voce.

- Course Objective:**
- Inculcate the ability to undertake fieldwork in geography and explore the physical and human components of a landscape and their linkages.
- Learning Outcome:**
- Ability to conduct a range of surveys in both physical and human geography, which shall allow assessment of landforms and their inherent formative processes, existing socioeconomic and demographic aspects of a region and the understanding of how these attributes are linked.
- Professional Skill Development:**
- Fieldwork and surveys are vital to a range of professional services in different government and non-governmental organisations and learning such techniques shall be of benefit to students.

A Field Survey shall involve "Identification, Mapping and Interpretation of Salient Features of the Environment, Economy and Society of the Local Inhabitants"

Unit 1: Field Training Methods

- | | | |
|-----|--|------|
| 1.1 | Objectives and scope of the field, methods of field work in different areas, preparation of interview schedule/questionnaire, sampling techniques for the collection of data | [20] |
| 1.2 | Measurement and mapping of slope using Clinometer / Dumpy Level / Abney Level or other instruments | [15] |
| 1.3 | Measurement and mapping of geomorphic and geographical features with GPS and other relevant instruments | [15] |
| 2.1 | Acquisition and mapping of landuse pattern by 'plot-to-plot' survey using cadastral map or of a municipal ward or of a Gram Panchayat | [15] |
| 2.2 | Acquisition and mapping of socio-economic data by 'door-to-door' household enumeration using questionnaire/ interview schedule | [15] |
| 2.3 | Identifying the relations between and among the attributes / components of : habitat, economy and society | [10] |

Pages containing illustrations (sketches, graphs, diagrams, maps, photographs, etc) = 25 (maximum)

Documentation and generation of the field report with the following arrangement : preface, introduction, objectives, methodology, data acquisition, data analysis, data display and interpretation, analysis and conclusion, appendix (of data), and bibliography / references

Word Limit = 8000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing = 1½, Arial / Times New Roman / Helvetica / Calibri / Trebuchet 10 / 11)

Suggested Readings:

1. Saha, P.K. and Basu, P. (2009): *Advanced Practical Geography*, Books and Allied (P) Ltd., Kolkata
2. Sarkar, A. (2008): *Practical Geography: A Systematic Approach*, Orient BlackSwan, Kolkata
3. Goudie, A. (1991): *Geomorphological Techniques*, Routledge.
4. Cook, S., Clarke, L., Nield, J. (2012): *Geomorphological Techniques*. British Society for Geomorphology, UK.
5. Phillips, R., Johns J. (2012): *Fieldwork for Human Geography*, Sage.
6. Pole, C., Hillyard, S. (2015): *Doing Fieldwork*. Sage.

Detailed Syllabus for Undergraduate Course in Geography (Hons.) with Research (Fourth Semester)

Course Name: *Survey and Data Analysis*

Course Type: Value Added Course

Course Code: *GEOG293VAC02*

Credits: 4

Total Marks: 50

Course Evaluation: Entire Module of 50 marks to be evaluated via Continuous Assessments throughout the semester

Question Pattern - Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)

- Course Objective:** • Develop ability to use precision instruments and undertake rigorous data analysis.
- Learning Outcome:** • Ability to use precise soil materials and hydrographic survey instruments and social data analysis
- Professional Skill Development:** • The taught components allow a student to apply analytical techniques to different types of data analysis and use various field instruments for hydrographic surveys and elemental analysis.

Unit 1: Elemental analysis and Hydrographic Surveys

- | | |
|---|------|
| 1.1 Principles of Spectrophotometry | [5] |
| 1.2 Use of Spectrophotometer for analysis of different Earth surface materials | [10] |
| 1.3 Conducting Hydrographic Surveys - Principles and methods of data acquisition, transfer and analysis | [5] |
| 1.4 Handling Hydrographic Instruments - Current meter, Echo sounder, Tide gauge | [10] |

Unit 2: Approaches to Socio-demographic Analysis

- | | |
|---|-----|
| 2.1 Kaplan-Meier curves, censoring, hazard function | [5] |
| 2.2 Cox proportional hazard | [5] |
| 2.3 Grounded theory approach; Ethnography | [5] |

Unit 3: Quantitative Analysis

- | | |
|--|-----|
| 3.1 Data collection and sampling: Sampling concepts, Probability sampling, Non-probability sampling; Sampling and Non-sampling error; Sample size; Sampling strategies, test of significance, statistical and logical basis of use of sampling in social research. | [6] |
| 3.2 Sources and types of open source socio-economic data; Tools and methods of data analysis | [4] |
| 3.3 Spatial representation of open source data | [5] |

Suggested Readings: Survey and Data Analysis

- Clarke, A.L. and Jennings, A.C. (1965): 'Soil analysis, spectrophotometric estimation of nitrate in soil using chromotropic acid' *Journal of Agricultural and Food Chemistry*, 13(2), pp. 174-176.
- Flick, U. ed. (2013): *The SAGE handbook of qualitative data analysis*. Sage.
- Hosker, B.S. (2018): 'Demonstrating principles of spectrophotometry by constructing a simple, low-cost, functional spectrophotometer utilizing the light sensor on a smartphone' *Journal of Chemical Education*, 95(1), pp178-181.
- Johnston, R.J.(1980): *Multivariate statistical analysis in geography; a primer on the general linear model*. Longman, Harlow.
- Khan, N. (1998): *Quantitative methods in geographical research*. New Delhi: Concept Publishing Company.
- Morris, R.(2015): 'Spectrophotometry'. *Current Protocols Essential Laboratory Techniques*, 11(1), pp 2-1.
- Patton, M.Q. (2014): *Qualitative research & evaluation methods: Integrating theory and practice*. London: Sage Publications.
- Ripley, B.D. (2005): *Spatial statistics*. New Jersey: John Wiley & Sons.
- Ritchie, J. Lewis, J. Nicholls, C.M. and Ormston, R. eds. (2013): *Qualitative research practice: A guide for social science students and researchers*. London: Sage Publication.
- Sommer, L. (2012): *Analytical absorption spectrophotometry in the visible and ultraviolet: the principles*. Elsevier.
- Thomas, O. and Burgess, C. eds. (2022): *UV-visible Spectrophotometry of Waters and Soils*. Elsevier. 3rd edition.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fourth Semester)

Course Name: Sustainable Development

Course Type: Minor Course

Course Code: GEOG255MC04

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The course aims to provide comprehensive and critical ideas about sustainable development.
 - Several best practices of sustainable development will be introduced to the students.
 - Students will be taught how to measure and assess different aspects of sustainability
- Learning Outcome:**
- The students will have detail extensive knowledge of different dimensions of sustainability, measurement and assessment of sustainable development.
- Professional Skill Development:**
- Students will become competent for collaborative interdisciplinary works with public agencies and NGOs.
 - They will become competent in sustainable policy making and plan formulation.

GEOG255MC04 (Theory) [Credits: 4 Marks: 70]

Unit 1: Sustainable Development - An Introduction

- | | |
|--|-----|
| 1.1 Sustainable Development: Concept, historical perspectives; Key principles of sustainable development - economic, social and environmental dimensions | [6] |
| 1.2 Sustainable Development Goals (SDGs): Goals, measurement and monitoring | [6] |
| 1.3 Global challenges of sustainable development; International responses to meet the challenges | [6] |
| 1.4 Nature of sustainable development strategies: concept, key principles, current practice- existing country level frameworks | [5] |
| 1.5 Critique of sustainable development: Poststructuralist and Environmental Marxism | [2] |

Unit 2: Social and economic Sustainability

- | | |
|--|-----|
| 2.1 Social justice, equity and inclusivity in sustainable development | [4] |
| 2.2 Economic sustainability: concept, importance and practices | [4] |
| 2.3 Food security: concept, dimensions; severity of food insecurity; sustainable consumption | [4] |
| 2.4 Sustainable Agriculture: concept, types of farming; Role of organic farming in sustainable agriculture | [6] |

Unit 3: Environmental Issues and Sustainability

- | | |
|--|-----|
| 3.1 Environmental sustainability and environmental ethics | [3] |
| 3.2 Sustainable utilization of natural resources: Land, Water and Forest | [4] |
| 3.3 Non-conventional energy: concepts, types and utilization of non-conventional energy resources, advantages and disadvantages of non-conventional energy resources | [4] |
| 3.4 Environmental management: ecological threshold, environmental quality index | [6] |
| 3.5 Climate Change, biodiversity loss and their impacts on sustainability | [4] |

Unit 4: Habitats, Livelihoods and Sustainability

- | | | |
|-----|---|-----|
| 4.1 | Sustainable livelihood framework: Rural and Urban context | [4] |
| 4.2 | Sustainable city and smart city: Key features | [4] |
| 4.3 | Sustainable approaches of urban water management: demand side and supply side management | [6] |
| 4.4 | Sustainable urban planning: Compact city, transit-oriented development, vertical sprawling, green infrastructure | [6] |
| 4.5 | Urban governance and sustainability: Key features and practices (LEED, GRIHA, Eco-Housing, PEARL, Mumbai first and Open Mumbai) | [6] |

GEOG255MC04 (Practical) [Credits: 2 Marks: 30]

Unit 5: Sustainability Analysis

- | | | |
|-----|---|------|
| 5.1 | Indicators of sustainability: Measuring ecological footprint and analysis | [10] |
| 5.2 | WASH Bottleneck Analysis tool (WASH BAT) | [10] |
| 5.3 | Environmental Impact Assessment (EIA) | [10] |

Suggested Readings: Sustainable Development

1. Atkinson G., Dietz S., Neumayer E. (2006) *Handbook of Sustainable Development*, Cheltenham: Edward Elgar Publishing Limited.
2. Birch, E.L. and Wachter, S.M. (eds.) (2008) *Growing Greener Cities: Urban Sustainability in the 21st Century*, Philadelphia: University of Pennsylvania Press.
3. Blewett, J. (ed.) (2008) *Understanding Sustainable Development*, 3rd edition, London: Routledge.
4. Brundtland Commission, (1987) *Our Common Future*, New York: Oxford University Press.
5. Dalal-Clayton, B. and Bass, S. (2002) *Sustainable Development Strategies: A Resource Book*, London: Earthscan.
6. Elliot, J.A. (2013) *An Introduction to Sustainable Development*, 4th ed, London: Routledge publications.
7. Jacquet, P., Pachauri, R.K. and Tubiana, L. (eds.) (2010) *CITIES: steering towards sustainability*, New Delhi: TERI Press.
8. Rogers P. (2007) *An Introduction to Sustainable Development*, London: Earthscan Publications.
9. Rogers, P. P., Jalal, K. F. and Boyd, J. A., (2008) *An Introduction to Sustainable Development*, UK: Earthscan.
10. Servaes J., (ed.) (2017) *Sustainable Development Goals in the Asian Context*, Singapore: Springer.
11. Smith D.W., et al (2018) *Geographies of Development*, Forth Edition. London: Routledge.
12. Soubbotina, T.P. (2004) *Beyond Economic Growth: An Introduction to Sustainable Development*, Washington D.C: World Bank.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fifth Semester)

Course Name: *Regional Geography of India*

Course Type: Core Course

Course Code: *GEOG301C09*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (80 marks) and Internal Assessment (20 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 11 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 6 marks, will be set for answering any six.

Internal Assessment - Tutorial / IA (20 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective: . To provide basic knowledge about physiography, demography and cultural attributes of Indian landscapes.

Learning Outcome: . The expected learning outcome would be conceptual clarity about the physical, demographic, social, cultural and economic spheres of Indian regions.

Professional Skill Development: . Several professional skills that students may develop after completing this course. Such skills benefit their academic and professional development and can be applied in various fields such as research, planning, and policy-making.

GEOG301C09 (Theory) [Credits: 5 Marks: 80]

Unit I: Physical Setup

- | | | |
|-----|--|------|
| 1.1 | Structural and morphological evolution of Himalaya, Indian Plateaus, cratons and Ganga/Brahmaputra plains, major geomorphic units and identified landforms. | [10] |
| 1.2 | Drainage regimes of Himalayan and Peninsular Drainage Systems - Case studies of Ganga and Godavari; Tectonic signatures in drainage pattern, evolution, hypothesis of Pascoe and Pilgrim | [6] |
| 1.3 | Principal climatic characteristics, Mechanism of the Indian monsoon, India's climatic classification (Koppen) | [6] |
| 1.4 | Soils: distribution, types and characteristics of major soil groups; Natural Vegetation Classification (Champion) and Agro-Climatic Regions of India | [6] |

Unit 2: Population and Social Aspects

- | | | |
|-----|---|-----|
| 2.1 | Growth of Population; Distribution and Density of Population | [6] |
| 2.2 | Population Composition: Sex ratio, Rural and Urban population, Literacy, Urbanization | [6] |
| 2.3 | Population problems; Poverty; Unemployment | [6] |
| 2.4 | Social structure of population: Distribution by race, caste, religion and language | [6] |

Unit 3: Economic Aspects

- | | | |
|-----|--|-----|
| 3.1 | Agriculture: Production and Distribution of Food crops - Rice and Wheat; Production and Distribution of Cash crops - Cotton and Sugarcane, Green Revolution, Agro-Ecological regions | [6] |
| 3.2 | Energy resources: Conventional and Non-Conventional; Mineral resources | [5] |
| 3.3 | Industries: Mineral-based and Agro-based; Industrial Regions, Industrial Policy, SEZ | [8] |
| 3.4 | Transport system of India: Railways, Roadways, Airways and Waterways | [6] |

Unit 4: West Bengal

- | | | |
|-----|--|-----|
| 4.1 | Physical Setup: Physiographic divisions, Drainage characteristics, Soil types, and Natural Vegetation | [6] |
| 4.2 | Economy: Agriculture, Mining, and Industry | [5] |
| 4.3 | Population: Growth, distribution and migration; Tribal development programmes | [8] |
| 4.4 | Regional issues: Darjeeling Himalaya (landslides), Active Sundarban Delta (salinization), Moribund Delta (arsenic contamination), Rarh Bengal (water scarcity) and North Bengal Plain (flash flood). | [8] |

GEOG301C09 (Tutorial) [Credits: 1 Marks: 20]

Unit 5: Presentation and Review

5.1 Literature review, book review, written assignment submission, and presentation on various topics [15]

Suggested Readings: Regional Geography of India

1. Husain, M. (2014) *Geography of India*. New Delhi: Tata McGraw-Hill Education.
2. Kale, V.S. (2014) *Landscapes and Landforms of India*. Switzerland: Springer
3. Khullar, D.R. (2011) *India: A Comprehensive Geography*. New Delhi: Kalyani Publishers.
4. Krishnan, M.S. (1949) *Geology of India and Burma*. Chennai: The Madras Law Journal Press.
5. Mamoria, C.B. (1995) *Economic and Commercial Geography of India*. Agra: Shiv Lal Agarwal & Co.
6. Pal, S.K. (1998) *Physical Geography of India*. New Delhi: Sangam Books Ltd.
7. Sharma, T.C. (2012) *Economic Geography of India*. Jaipur: Rawat Publications.
8. Singh, J. (2003) *India-A Comprehensive & Systematic Geography*. Allahabad: Gyanodaya Prakashan.
9. Singh, J. and Dhillon, S.S. (2004) *Agricultural Geography*. New Delhi: Tata McGraw-Hill Education,
10. Singh, R.L. (1993) *India: A Regional Geography*. New Delhi: UBS Publishers Distributors,
11. Spate, O.H.K., Learmonth, A.T.A. (1967) *India and Pakistan: A General and Regional Geography*. Delhi: Methuen.
12. Tirtha, R. (2002) *Geography of India*. Jaipur: Rawat Publications.
13. Tiwari, R.C. (2007) *Geography of India*. Allahabad: Prayag Pustak Bhawan.
14. Valdiya, K.S. (2010) *The Making of India - Geodynamic Evolution*. New Delhi: Macmillan Publishers India Ltd.
15. Valdiya, K.S. (2013) *Environmental Geology: Indian Context*. New Delhi: Tata McGraw-Hill.
16. Wadia, D.N. (1919) *Geology of India*. London: Macmillan & Co. Ltd.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fifth Semester)

Course Name: *Soil Geography*

Course Code: *GEOG302C10*

Total Marks: 100

Course Type: Core Course

Credits: 6

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To introduce different aspects of soil science, soil formation and development processes, the classification and utility of the major soil groups, their erosion and relationships with land capability and crop suitability.
- Learning Outcome:**
- Ability to synthesis knowledge on soil profile development, their physico-chemical characteristics and changes over time, measure and quantify information on soil properties and erosion, land capability and crop suitability.
- Professional Skill Development:**
- Obtain the ability to recognise and sample different soils in the field; Imbibe fundamental knowledge on how to analyse soil properties; Learn skills for measuring soil erosion quantitatively and its impact on land capability.

GEOG302C10 (Theory) [Credits: 4 Marks: 70]

Unit 1: Soil and Soil Properties

- | | | |
|-----|--|-----|
| 1.1 | Concept and definition of soil; Components; Soil as Three-phase system; recent approaches | [4] |
| 1.2 | Analysing the Soil Profile: Regolith, weathering profile; Ideal soil profile: Master horizons and sub-horizons, style of designation, solum | [6] |
| 1.3 | Recognizing soil units: Pedon, polypedon, soilscape, soil continuum, soil mapping unit | [5] |
| 1.4 | Understanding soil physical properties: Colour; Texture; Structure; Bulk Density; Porosity; Consistence | [8] |
| 1.5 | Soil Mineralogy: Types of clay minerals; crystal structure, properties and occurrences of oxides and silicates | [5] |
| 1.6 | Significance of Soil Organisms: Types; Roles in nitrogen fixation, nitrification, denitrification and ammonification | [6] |
| 1.7 | Dynamics of Soil Organic Matter: Sources, composition, decomposition of soluble and insoluble substances; Humus; Clay-humus complex; Properties of soil colloids; Cation Exchange; Base Saturation | [8] |
| 1.8 | Soil Water: Modes of occurrence; Forces on soil water; Soil water retention; Soil water movement | [4] |
| 1.9 | Importance of Soil pH: Definition and concept of soil pH; Effects on nutrient availability | [4] |

Unit 2: Pedogenic Factors and Processes

- | | | |
|-----|---|-----|
| 2.1 | Jenny's factorial model of soil genesis: Roles of parent material, relief, biotic, climate and time in soil formation | [6] |
| 2.2 | Pedogenic Processes: Simonsen's process-system model; Understanding fundamental pedogenic processes – Eluviation and Illuviation | [5] |
| 2.3 | Study of specific processes of horizon differentiation: Calcification-decalcification; Podzolization; Laterization; Latosolization; Gleization; Lessivage; Pedoturbation; Paludization; Melanization, with examples | [8] |
| 2.4 | Study of typical soil profile development: Podzol; Laterite and Chernozem with case studies | [8] |

Unit 3: Soil and Land Classification

- 3.1 1938 Soil Classification System; System of Soil Taxonomy – diagnostic horizons, soil moisture and temperature regimes; Soil names and formative elements; USDA Seventh Approximation [8]
- 3.2 Land Capability Classification (USDA) and relation with soil groups; Wasteland and Land Degradation in India [5]

GEOG302C10 (Practical) [Credits: 2 Marks: 30]

Unit 4: Exercises on soil analysis and land use

- 4.1 Plotting of soil texture in ternary diagram [2]
- 4.2 Determination of soil colour using Munsell colour chart [5]
- 4.3 Soil sample extraction: disturbed and undisturbed; Soil coring methods [8]
- 4.4 Analysing SLUSI and NBSS & LUP Maps: overlaying soil groups with physiography, climate and land capability [5]
- 4.5 Data extraction and mapping using soil databases: Bhoomi, FAO Harmonised Soil Units, ISRIC SoilGrids [4]
- 4.6 GIS-based soil loss mapping (Universal Soil Loss Equation) [6]

Suggested Readings: Soil Geography

1. Birkeland, P.W. (1999): *Soils and Geomorphology*, Oxford University Press, Oxford.
2. Boul, S.W., Hole, F.D. and McCracken, R.J. (1993): *Soil Genesis and Classification*, Affiliated East-West Press, New Delhi.
3. Breibart, R. (1988): *Soil Testing Procedures for Soil Survey: Part 2 - Laboratory Procedure Manual*. FAO, UNDP.
4. Burt, R. (ed.) (2004): *Soil Survey Laboratory Methods Manual: Soil Survey Investigations Report No. 42. v 4.0*, USDA, USA.
5. Daji, J.A. (1970): *A Textbook of Soil Science*, Asia Publishing House, London.
6. Foth, H.D. (2016) *Fundamentals of Soil Science*. 8th Ed. Wiley.
7. Fullen, M.A. and Catt, J.A. (2004): *Soil Management - Problems and Solutions*; Routledge, London.
8. Gerrard, A.J. (1992): *Soil Geomorphology*, Chapman & Hall, London.
9. Gerrard, J. (2000): *Fundamentals of Soils (Routledge Fundamentals of Physical Geography Series)*, Routledge, London.
10. Huang, P.M., Li, Y. and Sumner, M.E. (2011): *Handbook of Soil Sciences: Properties and Processes*; CRC Press, New York.
11. Majhi A, Shaw R, Mallick K, Patel PP (2021) Towards improved soil erosion modelling in India: A review of prevalent pitfalls and implementation of exemplar methods. *Earth-Science Reviews* 221, 103786. <https://doi.org/10.1016/j.earscirev.2021.103786>
12. McKenzie, N.J., Grundy, M.J., Webster, R. and Ringrose-Voase, A.J. (2008): *Guidelines for Surveying Soil and Land Resources*; CSIRO Publishing, Melbourne.
13. Nayak, D.C., Sarkar, D. and Velayutham, M. (2001): *Soil Series of West Bengal (Technical Bulletin)*; NBSS&LUP (ICAR), Govt. of India, Kolkata.
14. Park, S. (1997): *Modelling Soil-landform Continuum on a Three-dimensional Hill slope*, University of Oxford, UK.
15. Plaster, E.J. (2009): *Soil Science and Management*, Cengage Learning, Boston.
16. Rowell, D.L. (1995): *Soil Science- Methods and Applications*; Longman Scientific & Technical, UK.
17. Sarkar, D. (2003): *Fundamentals and Applications of Pedology*, Kalyani Publishers, New Delhi.
18. Schaetzl, R. and Anderson, S. (2005): *Soils - Genesis and Geomorphology*, Cambridge University Press, New York.
19. Sehgal, J. (1996): *Pedology - Concepts and Application*, Kalyani Publishers, New Delhi.
20. United States Bureau of Plant Industry, Soils, and Agricultural Engineering (1951): *Soil Survey Manual, United States Dept. of Agriculture Handbook No. 18*, U.S. Government Printing Office, New York.
21. Weil R, Brady NC (2016) *The Nature and Properties of Soils*. 15th Ed., Pearson.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Fifth Semester)

Course Name: *Political Geography and Geopolitical Issues*

Course Type: Core Course

Course Code: *GEOG303C11*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination and Internal Assessment (20 marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 11 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 6 marks, will be set for answering any six.

Internal Assessment - Tutorial / IA (20 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- This course aims to impart knowledge about political processes operating in society and how the global world order has been reshaped by these power plays. The course gives additional stress on understanding political manipulations with reference to geographical factors in India. Another objective of the course is to understand various democratic processes like elections, constitutionality and good governance.
- Learning Outcome:**
- This course will enable students to understand the complex contemporary world power structure. This would also help students to have a vivid understanding of India's political system and political positions. The students shall be able to grip the inter-relationships between space and politics.
- Professional Skill Development:**
- Barring academics, which is an obvious outcome of this course; the students will also develop employability through getting placed into various panning bodies. The course also helps in cracking civil service examinations. In various interview boards, especially for management institutions, the curriculum of this course is immensely productive. The students also can pursue politics, law and governance from the learning of this course.

GEOG303C11 (Theory) [Credits: 5 Marks: 80]

Unit 1: Fundamentals of Political Geography

- | | |
|---|-----|
| 1.1 Political Geography: Definition, nature and scope, historical development and relation to other branches of social sciences | [4] |
| 1.2 State: Nation, power, type of states, core and periphery, capitals | [4] |
| 1.3 Governance: Governance and its types, democracy | [4] |
| 1.3 Elements of Political Geography: Spatial, physical, economic and human factors of state formation | [4] |
| 1.5 Frontier and Boundary: Definition, Classification of international boundaries, maritime boundaries | [5] |

Unit 2: Classical Geopolitics

- | | |
|--|-----|
| 2.1 Background of Geopolitics: Application of tools in geopolitics (Maps, propaganda, perception and strategy) | [4] |
| 2.2 Geo-Strategic Views: Lebensraum, Heartland and Rimland theories | [4] |
| 2.3 Emergence of Geopolitical World Order: Global powers in modern age, demands of nation states and First World War, colonialism and British geopolitics | [5] |
| 2.4 The Age of Conflict and Hegemony: German geopolitics and expansionism; naval politics of Japan and Second World War | [4] |
| 2.5 Cold War Geopolitics: Warsaw Pact - Soviet communistic rule and its collapse, resurgence of right-wing politics - American supremacy and emergence of unipolar world | [4] |

Unit 3: Indian State Formation and Political Basis

- 3.1 Constitution of India: Salient features of India's Constitution, schedules, fundamental rights, directive principles of the state policies, amendments of the Constitution [4]
- 3.2 Federalism: Concept of federalism and its types, strengths and crisis, nature of India's federalism, [4]
- 3.3 Political Basis of India: Ethnicity, caste, tribe, religion, language [5]
- 3.4 State in Indian Politics: Colonial India, reorganization of states in India, regional aspirations and demand of new states [5]
- 3.5 Democracy in India: Separation of power, executives, legislature, judiciary, other branches [3]

Unit 4: Electoral Geography

- 4.1 Electoral systems: FPTP, run off, AV, block voting, SNTV, PR, STV, Mixed [5]
- 4.2 Case studies of federal electoral system: USA, Australia, Brazil, Germany, Sweden [4]
- 4.3 Voting in India: Parliament Lower House election, Assembly election, Election Commission, Gerrymandering [4]
- 4.4 Other elections in India: President, Upper House, local level elections [4]
- 4.5 Voting blocks in India: Geographic factors in voting behaviour, some case studies of voting blocks [4]

Unit 5: Contemporary Geopolitics

- 5.1 Change of Leftism: Emergence of Chinese market socialism; neo-left and geopolitical conflicts in Latin America [4]
- 5.2 Geo-Economic and Political Blocks: UNO, SAARC and ASEAN, NATO and EU, BRICS, OPEC (some selected case studies) [3]
- 5.3 Geopolitics of India: India's position in insurgency and terrorism, India as a global power (G20, G77), UNSC- India's aspiration and challenges [4]
- 5.4 India and its Neighbours: India's relationship with neighbouring countries: Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka [5]
- 5.5 Conflict in the Contemporary World: Middle East, Far East, East Europe, Africa [5]

GEOG303C11 (Tutorials) [Credits: 1 Marks: 20]

Unit 5: Presentation and Review

- 6.1 Book and Article Review [2]
- 6.2 Computation of electoral data [4]
- 6.3 Viva and Group Discussion [4]
- 6.4 Doubt clearance [3]
- 6.5 Test as Internal Assessment [2]

Suggested Readings : Political Geography and Geopolitical Issues

1. Agnew J., (2002): *Making Political Geography*, Arnold.
2. Agnew J., Mitchell K. and Toal G., (2003): *A Companion to Political Geography*, Blackwell.
3. Cohen, S. (1964): *Geography and Politics in a World Divided*, Random House, New York.
4. Cox K. R., Low M. and Robinson J., (2008): *The Sage Handbook of Political Geography*, Sage Publications.
5. Cox K., (2002): *Political Geography: Territory, State and Society*, Wiley-Blackwell.
6. de Blij, H.J. and Glassner, M. (1968): *Systematic Political Geography*, John Wiley & Sons, New York.
7. Dikshit, R.D. (1987): *Political Geography and Geopolitics*, Tata McGraw Hill, New Delhi.
8. Dikshit, R.D. (2000): *Political Geography: A Contemporary Perspective*, Prentice-Hall, New Delhi.
9. Dwivedi, R.L. (2004): *Fundamentals of Political Geography*, Chaitanya, Allahabad.
10. Gallaher, C., Dahlman, C.T., Gilmartin, M., Mountz, A. and Shirlow, P. (2009): *Key Concepts in Political Geography*, SAGE Publications Ltd., London.
11. Glassner, M., (1993): *Political Geography*, John Wiley & Sons, New York.
12. Jones, M., (2004): *An Introduction to Political Geography: Space, Place and Politics*, Routledge, London.
13. Painter, J. and Jeffrey, A. (2009): *Political Geography*, SAGE Publications Ltd., London.
14. Prescott, J.R.V. (1972): *The Political Geography*, Methuen, London.
15. Taylor, P. and Flint, C. (2000): *Political Geography*, Pearson Education, Harlow, Essex.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Sixth Semester)

Course Name: *Nature and Natural Disaster*

Course Type: Core Course

Course Code: *GEOG351C12*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The course aims to provide a comprehensive understanding of physical concepts and laws governing nature, basics of natural hazards and disasters, hydrolo-meteorological and ecological hazards, as well as practical skills in climatological time series analysis.
- Learning Outcome:**
- Upon completion of the course, students will acquire a thorough comprehension of physical laws, natural hazards and practical proficiency in climatological time series analysis.
- Professional Skill Development:**
- The syllabus provides opportunities for students to develop professional skills in applying physical laws, analyzing natural hazards and conducting climatological time series analysis for real-world applications.

GEOG351C12 (Theory) [Credits: 4 Marks: 70]

Unit 1: Physical Concepts and Laws Governing Nature

- | | | |
|-----|---|-----|
| 1.1 | Motion in one dimension: description and equations; Motion under gravity; Universal Law of Gravitation; Mass, weight and pressure; Circular motion; Simple Harmonic Motion | [5] |
| 1.2 | Work: moment, couple, torque; Energy - potential and kinetic; Power; Stress, strain, deformation and elasticity; Hydrostatic balance, Buoyancy and Flotation; Viscosity | [5] |
| 1.3 | Waves: Properties, types and propagation | [5] |
| 1.4 | Atomic structure; Chemical measures - atomic number, atomic mass, molecular weight, Avogadro's number and mole; Periodic Table; Chemical bonding; Radioactivity and Half-life; Acids, bases and salts; Chemical reactions | [5] |
| 1.5 | Dating techniques; Isotopes, Chemical groupings of elements in the Periodic Table; Numerical problems on chemical measurements | [5] |
| 1.6 | Kinetic Theory of gases and gas laws; Change of state - latent heat; Heat flow and heat capacity; Laws of Thermodynamics and related concepts; Adiabatic process | [5] |

Unit 2: Basics of Natural Hazard and Disaster: Hydrological Disaster

- | | | |
|-----|---|-----|
| 2.1 | Hazards - concept, classification, susceptibility, vulnerability and risk | [4] |
| 2.2 | Causes and impacts of flood disasters, preparedness, resilience strategies and practices (case study from India) | [5] |
| 2.3 | High Mountainous flood (GLOF), atmospheric, cryospheric, geotechnical and geomorphological control, lake susceptibility measurement; GLOF modelling | [8] |
| 2.5 | Evaluating multi-hazards, hazard interactions, cascading events, Types, spatio-temporal scale, intensity scale, modelling of multi-hazards | [7] |
| 2.6 | Triggering relationship, probability, Coincidence and Catalysis/impedance relationship | [6] |

Unit 3: Hydro-Meteorological and Ecological Hazard

- 3.1 Tropical cyclones - naming, mechanism of formation, structure (horizontal and vertical); Disastrous effects of the weather elements like –thunderstorms and dust storms [8]
- 3.2 Extra-tropical cyclones – Stages of frontogenesis and frontolysis; Theories of formation - Polar Front theory, Impacts, forecasting and emergency response planning [7]
- 3.3 Water stress condition - Sequence of drought occurrence and impacts of commonly accepted drought types, Pre-monsoonal heat waves and mid-monsoonal drought over India at regional scale [7]
- 3.4 Ecosystem collapse – Mechanisms and symptoms; Process for assessing the risk of collapse; IUCN Red List of Ecosystem criteria [8]

GEOG351C12 (Theory) [Credits: 2 Marks: 30]

Unit 4:– Climatological Time Series Analysis

- 4.1 Analysis of Trend - Smoothing Techniques (Moving Average and Least Square) and detrending [15]
- 4.2 Analysis of Seasonality - Seasonal average of detrended data, Deseasonalization, Seasonally adjusted Series [15]

Suggested Readings: Nature and Natural Disaster

- Bani-Mustafa, T., Zeng, Z., Zio, E. and Vasseur, D., (2020). *A new framework for multi-hazards risk aggregation*. Safety Science, 121, pp.283-302.
- Bhattacharya, A., Bolch, T., Mukherjee, K., King, O., Menounos, B., Kapitsa, V., Neckel, N., Yang, W. and Yao, T., (2021). *High Mountain Asian glacier response to climate revealed by multi-temporal satellite observations since the 1960s*. Nature communications, 12(1), p.4133.
- Bland, L.M. et al., Eds. (2017). *Guidelines for the Application of IUCN Red List of Ecosystems Categories & Criteria*. Ver. 1 IUCN, Gland, Switzerland.
- Brázdil, R. et al., (2018). *Documentary data and the study of past droughts: a global state of the art*. Past Clim. 14, 1915–1960. <https://doi.org/10.5194/cp-14-1915-2018>
- Das, J. and Bhattacharya, S.K. eds., (2023). *Monitoring and Managing Multi-hazards: A Multidisciplinary Approach*. Springer.
- Dubash, N.K., Jogesh, A. and Ghosh, S., Eds. (2017). *India's Climate Change Identity: Between Reality and Perception*. Oxford University Press.
- Eshrati, L., Mahmoudzadeh, A. and Taghvaei, M., (2015). *Multi hazards risk assessment, a new methodology*. International Journal of Health System and Disaster Management, 3(2), p.79.
- Gill, J.C. and Malamud, B.D., (2016). *Hazard interactions and interaction networks (cascades) within multi-hazard methodologies*. Earth System Dynamics, 7(3), pp.659-679.
- Hyndman, D. and Hyndman, D., (2017). *Natural hazards and disasters*. Cengage Learning. Boston, USA, 506.
- Markowski, P. M. and Richardson, Y. P., (2010). *Mesoscale Meteorology in Mid-latitudes*. John Wiley & Sons.
- Mezősi, G., (2022). *Natural Hazards and the Mitigation of their Impact*. Springer.
- Mishra, A.K. and Singh, V.P., (2010). A review of drought concepts. *Journal of Hydrology*, 391(1-2), pp.202-216.
- Petterssen, S.,(1956). *Weather Analysis and Forecasting* (2nd ed.), Vol.1: Motion and Motion system.
- Saran, S. and Jones, A., (2016). *India's climate change identity: between reality and perception*. Springer.
- Shi, P., & Kaspersen, R., (Eds.). (2015). *World atlas of natural disaster risk*. Springer.
- Vlachogiannis, D., Sfetsos, A., Markantonis, I., Politi, N., Karozis, S., & Gounaris, N., (2022). Quantifying the Occurrence of Multi-Hazards Due to Climate Change. *Applied Sciences*, 12(3), 1218.
- Wallace, J.M. and Hobbs, P.V., (2006). *Atmospheric Science: An Introductory Survey* (Second Ed). Academic Press
- Wohl, E.E., (2000). *Mountain rivers*. American Geophysical Union.
- World Bank, & United Nations., (2010). *Natural hazards, unnatural disasters: the economics of effective prevention*. The World Bank.
- Yousefi, S., Pourghasemi, H.R., Emami, S.N., Pouyan, S., Eskandari, S. and Tiefenbacher, J.P., (2020). *A machine learning framework for multi-hazards modeling and mapping in a mountainous area*. Scientific Reports, 10(1), p.12144

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Sixth Semester)

Course Name: *Environmental Geography*

Course Type: Core Course

Course Code: *GEOG352C13*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern: Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment: IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The aim of the course is to comprehend the environment and its ecosystem, ecosystem services along with biodiversity and environmental statistics.
- Learning Outcome:**
- The capacity to assess and appraise ecosystem services, biodiversity and environmental conditions using measurement tools, statistical techniques, mapping approaches and accounting methods.
- Professional Skill Development:**
- Students will be equipped with tools for measuring, mapping, and analyzing the environment comprehensively.

GEOG352C13 Environmental geography (Theory) [Credits: 4 Marks: 70]

Unit 1: Basics of the Environment

- Human-Environment Relationships: Historical Processes (Speciation, Diversification, Distribution and Abundance, Extinction, Dispersal – Mechanisms of range expansion, Barriers and Corridors) [16]
- Ecosystem*: Concept, Structure and Organization (Components, Trophic Structure, Food Chain and Food Web, Keystone Species, Ecological Pyramids); Functions (Energy Flow, Biogeochemical Cycles, Gross and Net Productivity); Case Study of East Kolkata Wetlands Ecosystem [16]
- Ecosystem Processes*: Plant Community Dynamics- Competition, Predation, Mutualism, Symbiosis; Causes, Stages and Types of Plant Succession, Climax Communities: Climatic, Edaphic and Biotic; Adaptation Strategies of Hydrophytes, Xerophytes and Halophytes); Ecosystem Types - Terrestrial and Aquatic [16]
- Biome*: Concept; Adaptation in different Biomes (Extended Study on Tropical and Temperate Forests and Grasslands) [4]

Unit 2: Ecosystem Services and Ecological Controls

- Ecosystem Services: Concept, Identifying Ecosystem Services (Provisioning services, Cultural services, Supporting services, Regulating services), Ecosystem Services in Natural Resource Management [8]
- Protection of life on land; targets, indicators and achievements [5]
- Ecological Controls: Physical limiting factors and habitat; Niche and Life Forms; Relationships: Niche and Geographic Range and Distribution and Abundance [10]

Unit 3: Biodiversity and Environmental Statistics

- Biodiversity*: Concept and Types; Gradients in biodiversity- Latitude, Altitude and Depth; Threats to biodiversity - causes (direct exploitation, habitat loss and degradation, introduced species, extinction cascades), IUCN Red list categories and criteria; Maintaining biodiversity-conservation approaches and international treaties [6]
- Environmental Statistics*: Environmental information, data, statistics and indicators; Sources of environment statistics; UNSD/UNEP Environmental Indicators [4]
- Environmental-Economic Accounting (EEA)*: Ecological Footprint (EF), Carbon Footprint (CF), Environmental Kuznets Curve (EKC), Environmentally Adjusted Net Domestic Product (EDP), Environmental Sustainability Index (ESI), Environmental Performance Index (EPI) [5]

GEOG352C13 Environmental Geography (Practical) [Credits: 2 Marks: 30]

Unit 4: Environmental Geography Practical

- 4.1 Valuing Ecosystem Services – Total Economic value (Use Values and Non-Use Values); Concept of Scarcity Valuation; Delineation of ecosystem boundaries [15]
- 4.2 Methods of studying Plant Communities - Species density, frequency, abundance; Species diversity and dominance indices - Shannon Entropy, Simpson Index, Sorenson's Co-efficient; Biodiversity profiling at regional scale from Indian Biodiversity Information System (IBIS) [15]

Suggested Readings and Online Resources: *Environmental Geography*

1. Chandna R. C., (2002): *Environmental Geography*, Kalyani, Ludhiana. ^[L]_[SEP]
2. Chapman, J.L. and Reiss, M.J. (1992): *Ecology Principles and Applications*, Cambridge University Press, Cambridge.
3. Cox, B., Moore, P.D., Ladle, R. (2016): *Biogeography: An Ecological and Evolutionary Approach*, 9th ed, Wiley-Blackwell.
4. Cunningham W. P. and Cunningham M. A., (2004): *Principals of Environmental Science*.
5. FDES (2013): *Framework for the Development of Environment Statistics*. Department of Economic and Social Affairs Statistics Division ST/ESA/STAT/SER.M/92. Studies in Methods Series M No. 92. United Nations New York, 2017.
6. Gaston, K.J. and Spicer, J.I. (2004): *Biodiversity: An Introduction* (2nd Ed.). Blackwell Publishing company.
7. Goudie A., (2001): *The Nature of the Environment*, Blackwell, Oxford.
8. Huggett, R. J. (2004): *Fundamentals of Biogeography*, Routledge, London.
9. IUCN (2022): *Guidelines for Using the IUCN Red List Categories and Criteria* (Ver 15.1). <https://www.iucnredlist.org/documents/RedListGuidelines.pdf>.
10. Jorgensen, S.E. and Fath, B.D. (2008): *Encyclopaedia of Ecology* (Ed.). Elsevier B.V.
11. Kendeigh, S.C. (1975): *Ecology with Special Reference to Man and Animals*, Prentice Hall, New York.
12. Kormondy, E.J. (1991): *Concepts of Ecology*, Prentice Hall India, New Delhi.
13. Lomolino, M.V., Riddle, B.R., Whittaker, R.J. (2016): *Biogeography*, 5th ed, Oxford University Press.
14. MacDonald, G. (2001): *Biogeography: Introduction to Space, Time, and Life*, Wiley.
15. Miller G. T., (2004): *Environmental Science: Working with the Earth*, Thomson BrooksCole, Singapore.
16. Nebel, J.B. (1981): *Environmental Science*, Prentice Hall, New York.
17. Odum, E. P. et al, (2005): *Fundamentals of Ecology*, Ceneage Learning India.
18. Simmons, I.G. (1980): *Bio-geographical Processes*, George Allen and Unwin, London.
19. Singh, R.B. (1998): *Ecological Techniques and Approaches to Vulnerable Environment*, New Delhi, Oxford & IBH Pub.
20. Singh, R.B. (Eds.) (2009): *Biogeography and Biodiversity*. Rawat Publication, Jaipur.
21. Spicer, J. (2021): *Biodiversity: A Beginner's Guide*. One world Publications.
22. Stern D. I. (2008): *The Environmental Kuznets Curve*. Reference Module in Earth Systems and Environmental Sciences. <https://doi.org/10.1016/B978-0-12-409548-9.09278-2>
23. UN Statistics Division, *Environment Glossary*: <https://unstats.un.org/unsd/environmentgl/>
24. UNEP (2007): *Global Environment Outlook: GEO4: Environment For Development*, United Nations ^[L]_[SEP] Environment Programme.
25. Watts, D. (1971): *Principles of Biogeography: An Introduction to Functional Mechanisms of Ecosystems*, McGraw Hill, London.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Sixth Semester)

Course Name: *Geographical Thought*

Course Type: Core Course

Course Code: *GEOG353C14*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (80 marks) and Internal Assessment (20 Marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 11 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 6 marks, will be set for answering any six.

Internal Assessment - Tutorial / IA (20 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective: . The course is intended to develop the philosophical and historical aptitude among students in the context of evolution and development of geographical ideas, theme, approaches and knowledge. Students will be acquainted with the philosophers of different schools of thought that contributed in the development of geography as a branch of knowledge.

Learning Outcome: . After the end of the course, students will be able to visualize the basic theme, ideas, dichotomies and approaches of geographic knowledge related to historical juncture, varying schools and the era of their emergence. Students will be able to critically evaluate the nature of geography as spatial science with changing space and time.

Professional Skill Development: . Prepare students for careers in academia, research, policy-making, urban planning, environmental management, and other fields that require a deep understanding of geographical thought and its practical applications.

GEOG353C14 (Theory) [Credits: 5 Marks: 80]

Unit I: Early and Medieval Geographical Ideas

- | | | |
|-----|--|------|
| 1.1 | Contribution of Greek and Roman Scholars: Herodotus, Eratosthenes, Strabo and Ptolemy in the early development of geographical thought | [10] |
| 1.2 | Medieval Geography: Dark Age in Europe; Contribution of Arab scholars - Al-Masaudi, Al-Biruni and Ibn-Khaldun | [8] |
| 1.3 | Age of Exploration and Discoveries; Impact of Darwinism in Geography | [8] |

Unit 2: Modern Geographical Thought

- | | | |
|-----|--|-----|
| 2.1 | Founders of modern geography: Contribution of Humboldt and Ritter | [6] |
| 2.2 | Contribution of German and French schools of geography with special reference to Ratzel and Vidal De La Blache | [8] |
| 2.3 | Contribution of British and American schools of geography with special reference to Mackinder and Huntington | [8] |

Unit 3: Dualism and Dichotomies in Geography

- | | | |
|-----|--|-----|
| 3.1 | Environmental Determinism, Possibilism and Neo-determinism | [6] |
| 3.2 | Development of Dualism in geography: Physical versus Human Geography, Regional versus Systematic Geography | [8] |
| 3.3 | Hartshorne and Schafer's debate: Geography as Regional Science | [5] |
| 3.4 | Regional approach in geography | [6] |

Unit 4: Towards a Maturing Geography from World War - II to Present Time

- | | | |
|------|---|------|
| 4.1 | Positivism in geography; Quantitative Revolution; | [6] |
| 4.2 | Reaction to quantitative revolution: Behaviouralism, Humanistic Geography | [6] |
| 4.3 | Welfare Geography, Marxist Geography, Geography of Gender | [10] |
| 4.4. | Post-Modernism and Post-Modern Geographies | [10] |

GEOG353C14 (Tutorial) [Credits: 1 Marks: 20]

Unit 5: Presentation and Review

- | | | |
|-----|---|------|
| 1.1 | Literature review, book review, written assignment submission, and presentation on various topics | [15] |
|-----|---|------|

Suggested Readings: Geographical Thought

1. Adhikari, S. (2007): *Fundamentals of Geographical Thought*. Allahabad: Orient Blackswan.
2. Bonnett A. (2008): *What is Geography?*. London: Sage.
3. Dixit, R.D. (2004): *Geographical Thought' A Contextual History / Ideas*. New Delhi: Concept Publisher.
4. Hartshorn R. (1959): *Perspectives of Nature of Geography*. USA: Rand MacNally and Co.
5. Hussain, M. (2004): *Evolution of Geographical Thought*. Jaipur: Rawat Publication.
6. James, R.E. (2004): *All Possible Worlds: A History of Geographical Ideas*. New York.
7. Johnston R. J. (Ed.): *Dictionary of Human Geography*. United Kingdom: Routledge.
8. Peet, R. (1998): *Modern Geographical Thought*. Jaipur: Rawat Publication.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Sixth Semester)

Course Name: *Regional Planning and Development*

Course Type: Core Course

Course Code: *GEOG354C15*

Credits: 6

Total Marks: 100

Course Evaluation: Semester Examination (70 marks) and Internal Assessment (30 marks)

Semester Examination - Written examination of 3 hours duration will be held at semester end.

Question Pattern - Seven Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any four and eleven semi-long answer type questions, each of 5 marks, will be set for answering any six.

Internal Assessment - IA (30 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The course aims to make students learn about regions and different types of regional plans.
 - It helps students understand the various theories of regional planning.
 - The third objective of the course lies in making the candidate aware of the various development plans and planning policies implemented in India.

- Learning Outcome:**
- Students will develop understanding of the history and purpose of regional planning process. They will be able to evaluate the different strategies undertaken for regional development.

- Professional Skill Development:**
- Students will acquire a base knowledge to understand effective planning practices which will help them to work in collaboration with public agencies and community groups.

GEOG354C15 (Theory) [Credits: 4 Marks: 70]

Unit 1: Regions and Regional Planning

- | | | |
|-----|--|-----|
| 1.1 | Regions: Concepts, Types and Delineation with Special Reference to India | [4] |
| 1.2 | Types of Planning; Principles and Objectives of Regional Planning | [3] |
| 1.3 | Evaluation of five year plans in India | [2] |
| 1.4 | Need for regional planning | [3] |
| 1.5 | Delineation of planning region in India: Schemes of Nath, Bhat and Rao, NATMO, Sengupta and TCPO | [6] |

Unit 2: Theories of Regional Planning and Development

- | | | |
|-----|--|-----|
| 2.1 | Development and its meaning: Growth vs Development | [2] |
| 2.2 | Stage Model of Development (Marks and Rostow) | [4] |
| 2.3 | Growth Pole Model and Core Periphery Models (Perroux and Friedman) | [5] |
| 2.4 | Trickledown Theory and Cumulative Causation (Hirschman and Myrdal) | [4] |

Unit 3: Regional Planning in India

- | | | |
|-----|--|-----|
| 3.1 | Industrial corridors: Extended case studies on Delhi-Mumbai Industrial Corridor (DMIC) and Amritsar-Kolkata Industrial Corridor (AKIC) | [4] |
| 3.2 | Multilevel Planning in India: Structure and functioning of different levels, problems and solutions to multilevel planning | [4] |
| 3.3 | Census Definitions; Changing Connotations of Urban Regions in India | [2] |
| 3.4 | Hierarchy of Urban Systems, City Types, Metropolitan Area, Urban Agglomerates | [4] |

Unit 4: Regional Development

- | | | |
|-----|---|-----|
| 4.1 | Indicators of development: Economic, social and environmental | [3] |
| 4.2 | Concept of underdevelopment; equity-efficiency debate | [4] |
| 4.3 | Backward regions: Concept and identification | [4] |
| 4.4 | Area development Plans in India: DVC, Indira Gandhi Canal Area Development Programmes and SPMRM | [6] |
| 4.5 | NITI Aayog: Objectives and key initiatives | [4] |

Unit 5: Regional Development in India

- 5.1 Regional Disparity and Diversity in India [4]
5.2 Sustainable development and Indian urbanization [3]

GEOG354C15 (Practical) [Credits: 2 Marks: 30]

Unit 6: Exercises Related to Planning

- 6.1 Network Analysis- Extraction of Transport Network of a Region from Satellite Images and Indices [30]
6.2 Shopper's Disparity Index, Construction of Life Table [15]

Suggested Readings: *Regional Planning and Development*

1. Berry, B.J.L. and Horton, F.F. (1970): *Geographic Perspectives on Urban Systems*. Prentice Hall, New Jersey.
2. Bhat L.S. (1972): *Regional Planning In India*, Statistical Publishing Society.
3. Blij H. J. De. (1971): *Geography: Regions and Concepts*, John Wiley and Sons.
4. Chand ,M and Puri V.K. (1983) : *Regional planning In India*, Allied Publishers , New Delhi.
5. Claval, P.I. (1998): *An Introduction to Regional Geography*, Blackwell Publishers, Oxford and Massachusetts.
6. Dickinson, R.E. (1947): *City, Region and Regionalism*, Oxford University Press.
7. Dickinson, R.E. (1964): *City and Region*, Rutledge, London.
8. Friedmann J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
9. Gore C. G., (1984): *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London.
10. Gore C. G., Köhler G., Reich U-P. and Ziesemer T. (1996): *Questioning Development; Essays on the Theory, Policies and Practice of Development Intervention*, Metropolis- Verlag, Marburg.
11. Hall, P. (1992): *Urban and Regional Planning*, Routledge, London.
12. Haynes J., (2008): *Development Studies*, Polity Short Introduction Series.
13. Johnson E. A. J. (1970): *The Organization of Space in Developing Countries*, MIT Press, Massachusetts.
14. Kulshetra ,S.K (2012) : *Urban and Regional Planning in India : A handbook for Professional Practitioners*, Sage Publication , New Delhi.
15. Kundu, A. (1992): *Urban Development Urban Research in India*, Khanna Publ. New Delhi.
16. Misra , R.P, Sundaram K.V, PrakashRao , VLS(1974): *Regional Development Planning in India* , Vikas Publication , New Delhi.
17. Misra, R.P (1992): *Regional Planning: Concepts , techniques , Policies and Case Studies* , Concept , New Delhi.
18. N.A.T.M.O. *Regional Planning*, IGU Publication.
19. Peet, R. (1999): *Theories of Development*, The Guilford Press, New York.
20. UNDP 2001-04: *Human Development Report*, Oxford University Press.
21. World Bank 2001-05: *World Development Report*, Oxford University Press, New Delhi.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Hydrology*
Course Code: *GEOG401C16A*
Total Marks: 50

Course Type: Core Course
Credits: 4

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- Introduce students to the principles of the water cycle, its measurement, and management for sustainable use.
- Learning Outcome:**
- Develop understanding of hydrological processes and their application for water resources management.
- Professional Skill Development:**
- Analytical skill for numerical problem solving; GIS; Advanced spreadsheet applications

Unit 1: Hydrological Cycle, Water Balance, Precipitation and Evaporation

- | | | |
|-----|---|------|
| 1.1 | Hydrological Cycle; Renewable freshwater resources (RFWR); Effect of climate change on RFWR; Basin Hydrological Cycle | [8] |
| 1.2 | Global Water Balance and Catchment Water Budget with numerical problems | [8] |
| 1.3 | Precipitation: Area Rainfall- Thiessen Polygon, Isohyetal Method, Estimation of Missing Data; Intensity-Duration-Frequency-Depth Relationships | [4] |
| 1.4 | Evaporation: Measurement of evaporation with Evaporimeters, Theory and principles of Energy Balance method for evaporation measurement; Measurement of Evapotranspiration with Lysimeter; Thornthwaite method for Potential Evapotranspiration (PET) estimation, Reference Crop Evapotranspiration (ET ₀) - Calculation using FAO Penman-Monteith and other empirical methods | [10] |

Unit 2: Infiltration, Runoff, Hydrographs, Flood and Drought

- | | | |
|-----|--|-----|
| 2.1 | Infiltration: Distribution of Soil Moisture; Factors affecting Infiltration Capacity; Principles of Infiltration for infiltration measurements; ϕ - Index for Measuring infiltration Rate | [8] |
| 2.2 | Runoff Processes; Area Relationship; Time of Concentration-Basin lag; NRCS CN method for estimating runoff | [8] |
| 2.3 | Baseflow separation in a hydrograph; Measurement of river discharge in low and high flow conditions in large and small rivers; Unit hydrograph and rating curve | [8] |
| 2.4 | Flood Frequency Analysis; Hydrologic Routing of Streamflow; Drought: Types and Indices | [6] |

Unit 3: Advanced Hydrology-Groundwater and Rainfall-Runoff Modelling

- | | | |
|-----|---|-----|
| 3.1 | Groundwater: Types of subsurface water, Types of aquifers, The Concept of Field Capacity and Wilting Point; Groundwater Flow: Darcy's Law; Effect of Pumping on Water Table, Seawater intrusion | [8] |
| 3.2 | Basics of Rainfall-runoff modelling process, Perceptual models of catchment hydrology | [6] |
| 3.3 | The problem of choosing a conceptual model: Runoff generation and runoff routing | [8] |
| 3.4 | Model calibration and Validation issues: Optimization; Uncertainty and Equifinality | [8] |

Suggested Readings: Hydrology

1. Beven, K. J. (2011). *Rainfall-runoff modelling: the primer*. John Wiley & Sons.
2. Dingman, S.L. (2015). *Physical Hydrology* (3rd ed.). Macmillan Publishing Co.
3. Raghunath, H.M. (2006). *Hydrology: Principles, Analysis, Design* (3rd ed.). New Age International Publishers.
4. Shaw, E. M., Beven, K. J., Chappell, N. A., & Lamb, R. (2010). *Hydrology in practice*. CRC press.
5. Subramanya, K. *Engineering hydrology*. McGraw-Hill, New Delhi, 2017.
6. Todd, D.K., & Larry, W.M. (2004). *Groundwater Hydrology*. John Wiley & Sons.
7. Viessman, Warren, Gary L. Lewis, John W. Knapp, and Terence Eugene Harbaugh. "Introduction to hydrology." (1989). *Geophysics*, CUP, Cambridge.
8. Ward, A.D., Trimble, S.W., Burckhard, S.R., & Lyon, J.G. (2016). *Environmental Hydrology* (3rd ed.). CRC Press.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: Agricultural Geography

Course Type: Core Course

Course Code: GEOG401C16B

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three

Internal Assessment – IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To familiarise the students with the basics of agricultural geography, starting from its nature, contents, progress, approaches, determinants etc., to the important concepts like cropping intensity, crop-concentration, crop pattern, crop combinations, diversification, commercialization, agricultural regionalization, agricultural development etc.
- Learning Outcome:**
- The course should fully acquaint the students with the understanding of agricultural geography as a developed branch of geography. The students shall learn the major concepts, factors affecting agricultural land use, different types of agricultural land use by giving simple examples from their own and neighbouring areas.
- Professional Skill Development:**
- The professional skills agricultural geography students develop are highly transferable and can be applied in various settings, including academia, government, industry, and non-profit organizations.

Unit I: Introduction to Agricultural Geography

- | | | |
|-----|--|------|
| 1.1 | Nature, Scope, Significance, and Development of Agricultural Geography | [6] |
| 1.2 | Approaches to the study of Agricultural Geography: Regional, Systematic, Commodity and Recent Approaches | [10] |
| 1.3 | Agricultural data: Sources, Scope, Reliability and Limitations | [4] |
| 1.4 | Contribution of Agricultural sector to the Indian Economy | [4] |

Unit 2: Factors Influencing Agricultural Pattern and Land Use

- | | | |
|-----|--|-----|
| 2.1 | Determinants Agricultural Performance: Physical and Non-Physical determinants | [6] |
| 2.2 | Concept of Land use, Agricultural land use - Land capability classification and land use planning for agricultural development | [6] |
| 2.3 | Land Use Location Theory - Von Thunen and its applicability | [4] |
| 2.4 | Irrigation: Sources and Types; Role of Irrigation in crop production; Irrigation Intensity | [6] |

Unit 3: Agricultural Regionalization and Green Revolution

- | | | |
|-----|---|------|
| 3.1 | Agricultural Regions: Concept and Techniques; Methods of Agricultural Regionalization | [4] |
| 3.2 | Selected agricultural concepts and their measurement: Intensity of Cropping, Crop Combination, Degree of Commercialization, Diversification and Specialization, Efficiency and Productivity | [10] |
| 3.3 | Mechanization of agriculture: need, scope and progress of mechanization | [4] |
| 3.4 | Green Revolution: Impact and Consequences; Concept of second green revolution in India | [4] |

Unit 4: New perspectives in Agriculture

- | | | |
|-----|--|-----|
| 4.1 | Food security and its components; Public Distribution System (PDS) | [6] |
| 4.2 | Contract farming: Issues and Challenges; Agri-business; Agricultural Subsidies | [6] |
| 4.3 | National Agricultural Policy; Minimum Support Price (MSP); Farmers Welfare Schemes | [6] |
| 4.4 | Sustainable Agricultural Development and Poverty | [4] |

Suggested Readings: Agricultural Geography

1. Basu, D.N., and Guha, G.S. (1996) *Agro-Climatic Regional Planning in India*. New Delhi: Concept Publication.
2. Bryant, A. (2016) *Agricultural Economics and Agribusiness Management*. New York: Syrawood Publishing House.
3. Gautam, A. (2016) *Agricultural Geography*. Allahabad: Shardha Pustak Bhawan.
4. Husain, M. (2004) *Systematic Agricultural Geography*. Jaipur: Rawat Publications.
5. Ilbery, B. W. (1985) *Agricultural Geography*. London: Oxford University Press.
6. Mohammad, N. (1992) *New Dimension in Agriculture Geography*. New Delhi: Concept Publication.
7. Pacione, M. (2013) *Progress in Agricultural Geography*. United Kingdom: Routledge Revivals.
8. Panda, S.C. (2008) *Mechanization of Agriculture*. Kolkata: Kalyani Publishers.
9. Shafi, M. (2006) *Agricultural Geography*. New Delhi: Doring Kindersley India Pvt. Ltd.
10. Singh, J. (2003) *Agricultural Geography*. New Delhi: Oxford.
11. Singh, J. and Dhillon, S.S. (1984) *Agricultural Geography*. New Delhi: Tata McGraw Hill.
12. Symons, L. (1967) *Agricultural Geography*. London: G. Bells.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Advanced Climatology and Oceanography*

Course Type: Core Course

Course Code: *GEOG402C17A*

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern: Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The course aims to provide a comprehensive understanding of atmospheric dynamics, synoptic meteorology and physical, chemical and biological oceanography.
- Learning Outcome:**
- Acquiring knowledge in atmospheric thermodynamics, synoptic meteorology, oceanography, and climate change through comprehensive study.
- Professional Skill Development:**
- Develop advanced skills in weather prediction, climate change impact evaluation through the application of scientific principles and methodologies. Practical application of theoretical concepts, equations, and observational techniques.

Unit 1: Atmospheric Thermodynamics and Dynamics

- 1.1 Application of thermodynamic principles in the study of the atmosphere: Equations of state for ideal gases, Specific Gas Constant; First Law of Thermodynamics - Work, Internal Energy, Entropy, Specific Heat Capacity [3]
- 1.2 Understanding adiabatic processes, Equations of state of moist air and latent heat [2]
- 1.3 Hydrostatic equilibrium: Hydrostatic equation, variation of pressure with height, geopotential; Hydrodynamic stability [3]
- 1.4 Entropy and Second Law of Thermodynamics, Carnot Cycle and Clausius-Clapeyron equation [2]
- 1.5 Electrical fields in Thunderstorms, Theories of Thunderstorm Electrification [4]
- 1.6 Basic equations and fundamental forces: Pressure, Gravity, Centripetal and Coriolis forces, Continuity Scale Analysis, Inertia Flow, Geostrophic and Gradient Winds, Thermal Wind, Divergence and Vertical Motion; Rossby, Richardson, Reynold and Froude Numbers; Circulation, Vorticity and Divergence [6]

Unit 2: Synoptic Meteorology, Atmospheric Statistics and Climate Change

- 2.1 Synoptic Meteorology: Weather observations and transmission, synoptic charts, analysis of surface, upper air another derivative chart, stream-lines, isotachs and contour analysis; tilt and slope of pressure/weather systems with height. [5]
- 2.2 Synoptic weather forecasting: Thunderstorm indices as dichotomous predictors; Verification of Categorical Forecasts - thresholds value test and Skill scores statistics. [5]
- 2.3 Forecast of local weather with applicability in planning farming activity [3]
- 2.4 Tropical and Monsoonal meteorology: Trade wind inversion; monsoon trough; monsoon depressions; western disturbances; Synoptic features associated with the onset, withdrawal, break, active and weak monsoons and their prediction [5]
- 2.5 Air masses - Classification, sources, origin and modifications; Fronts - Types, frontogenesis and frontolysis [4]
- 2.6 Urban heat island: Nature and Causes [4]
- 2.7 Global Climate Change: Evidences of past climatic changes; Causes; Possible impacts; mitigation and adaptations [4]

Unit 3: Physical Oceanography

- | | | |
|-----|--|-----|
| 3.1 | Continent and Ocean floor Hypsography, shelf, slope, abyssal plain and continental rise | [3] |
| 3.2 | Global wind system and conveyor belt system, Ekman's theory, Geostrophic motion | [3] |
| 3.3 | Upper Ocean Structure and Processes, Thermohaline Circulation, Instability and Ocean Heat Budget | [4] |
| 3.4 | Ocean waves and currents, Formation of subtropical gyres | [3] |
| 3.5 | Tide generating forces, Types, Theories and effects | [4] |
| 3.6 | Concept of paleo-oceanographic reconstruction, Proxy indicators | [3] |

Unit 4: Chemical and Biological Oceanography

- | | | |
|-----|--|-----|
| 4.1 | Composition of sea water, Chemical exchange, Hydrothermal vents | [4] |
| 4.2 | Biochemical cycle of nutrients, Nature of sedimentary deposits as CaCO ₃ , Silicate, T-S diagrams | [6] |
| 4.3 | Physico-chemical factors – Light, Temperature, Salinity, Pressure, Nutrients and Dissolved gases | [5] |
| 4.4 | Marine Resources, Coral reefs and Mangroves, Impact of pollution on marine environment | [5] |

Suggested Readings: Advanced Climatology

- Ackerman, S.A. & Knox, J.A. (2012). *Meteorology: Understanding the Atmosphere*. Jones & Bartlett Learning, London.
- Atkinson, B.W. (Ed.) (1981). *Dynamical Meteorology: An Introductory Selection*. Methuen, London.
- Barry, R.G., & Chorley, R.J. (2003). *Atmosphere, Weather and Climate*. Routledge, London.
- Barry, R.G., & Chorley R.J. (1973). *Synoptic Climatology: Methods and Applications*. Methuen & Co Ltd., London, 555p.
- Chandrasekar, A. (2010): *Basics of Atmospheric Science*. PHI Learning Pvt. Ltd., New Delhi.
- Holton, J.R. (2004). *An Introduction to Dynamic Meteorology* (4th Ed.). Elsevier.
- Houghton, J. (2002): *Physics of Atmosphere*. Cambridge University Press, Cambridge.
- Jolliffe, I.T., & Stephenson, D.B. Eds. (2011). *Forecast Verification: A Practitioner's Guide* (2nd Ed.). Wiley & Sons., 296p.
- Kossin, J.P., Emanuel, K.A., & Vecchi, G.A. (2017). *Introduction to Tropical Meteorology*. CRC Press.
- Lehr, P.E., & Burnett, R.W., & Zim, S.H. (1987). *Weather: Air Masses, Clouds, Rainfall, Storms, Weather Maps, Climate*. Golden Guides, UK.
- McIlveen, R. (2010). *Fundamentals of Weather and Climate*. Oxford University Press, Oxford.
- Nurmi, P. (2003). *Recommendations on the verification of local weather forecasts*. ECMWF Tech. Mem. 430.
- Rayner, J.N. (2001). *Dynamic Climatology - Basis in Mathematics and Physics*. Blackwell Publishers Ltd., Oxford.
- Rohli, R.V., & Vega, A.J. (2012). *Climatology*. Jones & Bartlett Learning, London.
- Thompson, R.D. (1998). *Atmospheric Pressures and Systems*. Routledge, London.
- Uman, M. A. (1984). *Lightning, Dover-Publications*. New York.
- Wilks, D.S. (2006). *Statistical Methods in the Atmospheric Sciences*. Int. Geophysics Series, (Ch 7 Forecast Verification). Elsevier, UK.

Suggested Readings: Oceanography

- Basu, S.K. (2003) (ed). *Handbook of Oceanography*, Global Vision, Delhi.
- Garrison, T. (2009). *Essentials of Oceanography*, Brooks/Cole, Belmont, California.
- Knauss, J.A., & Garfield, N. (2016). *Introduction to Physical Oceanography*. Waveland Press.
- Lalli, C., & Parsons, T. (1997). *Biological Oceanography: An Introduction*. Elsevier.
- Pugh, D., & Woodworth, P. (2014). *Sea-Level Science: Understanding Tides, Surges, Tsunamis and Mean Sea-Level Changes*, Cambridge.
- Sharma, R.C. and Vatal, M. (1962). *Oceanography for Geographers*. Chaitanya Publishing House, Allahabad.
- Stewart, R.H. (2008). *Introduction to Physical Oceanography*. Robert H. Stewart.
- Thorpe, S.A., Steele, J.H., & Turekian, K.K. (Eds.). (2009). *Elements of Physical Oceanography*. Academic Press, London.
- Thurnman, H.V. (1978). *Introduction to Oceanography*. Charles E. Merrill Pub. Co., London.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Social Geography with special reference to India*

Course Type: Core Course

Course Code: *GEOG402C17B*

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To acquaint students with the unique social geography of India.
 - To provide an analytical understanding of the socio-geographical elements.
 - To provide an analytical understanding of social-geographical processes under various theoretical frameworks.

- Learning Outcome:**
- Knowledge of the geographic basis of socio-cultural regionalisation in India.
 - Understanding of elements of Indian society at the pan-Indian level.
 - Knowledge of essential theories and application of social issues in India.

- Professional Skill Development:**
- The student will be equipped with the analytical skills to evaluate diverse social processes and issues.
 - The student will be able to engage and contribute to public policies related to various social-geographical issues.

Unit 1: Introduction to Social Geography

- | | | |
|-----|---|-----|
| 1.1 | Social Geography: Definition, Nature and Scope, and Relation with other social sciences | [8] |
| 1.2 | Key ideas: Society, Organisations, Social relations, social process, spatial form, space and place, well-being, politics, inequality, justice | [9] |
| 1.3 | Major theoretical approaches to Social Geography and academic positionality - Humanistic, Welfare, Marxist, and Gender Geographies | [9] |

Unit 2: Social Geography of India (Part -I)

- | | | |
|-----|--|-----|
| 2.1 | Social Geography of India; Indian Society, social differentiation and regional formation in India | [8] |
| 2.1 | Race, Ethnicity: Meaning of the concept, basis of identity, territoriality; social conflict and regional formation - a case study of North Eastern India | [9] |
| 2.2 | Caste: Meaning, origin, evolution of the concept, various dimensions - varna versus jati, purity versus pure, constitutional arrangements, forward versus backward castes, caste as tradition, the basis of power, caste-class relationship, social backwardness and exclusion in Indian society; Distribution of SC population in India | [9] |

Unit 3: Social Geography of India (Part II)

- | | | |
|-----|---|-----|
| 2.3 | Tribe: Meaning, Diversity of Indian Tribes - Race, Ethnicity, Economy, Society, Religion, and Languages; Tribes in Transition, Social backwardness of Tribal People; Distribution of Tribal Population in India | [8] |
| 2.4 | Religion and Languages in India: Major and minor religions, distribution; Major and minor languages- Distribution, Language shift; Language as the basis of regionalism and regional formation | [8] |
| 2.5 | Class: Origin, meaning and evolution of the concept; Gender: meaning and development of the concept, patriarchy, gender space | [8] |

Unit 4: Theoretical and methodological engagement

- | | | |
|-----|--|------|
| 4.1 | Geographies of Exclusion: Theory of social exclusion - Amartya Sen's view; application of the theory in studying social-geographical issues in India | [12] |
| 4.3 | Gentrification: Meaning; Theory-Capital, class and the production of space, rent gap; application of the theory - select case studies from India. | [12] |

Unit 5: Presentation and Review

C17B [Tutorials Credits: 1 Marks: 30]

5.1	Literature review	[5]
5.2	Book review	[5]
5.3	Written assignment submission	[5]
5.4	Presentation on various topics	[5]

Suggested Readings: *Social Geography*

1. Ahmad, A. (1999): *Social Geography*, Rawat Publications, Jaipur and New Delhi.
2. Casino, V.J.D., Jr., (2009): *Social Geography: A Critical Introduction*, Wiley-Blackwell, Chichester.
3. Coates, B.E., Johnston, R.J. and Knox, P.L. (1977): *Geography and Inequality*, Oxford University Press, Oxford and London.
4. Gregory, D. and Larry, J. (eds.) (1985): *Social Relations and Spatial Structures*, MacMillan, London.
5. Smith, D. (1977): *Geography: A Welfare Approach*, Edward Arnold, London.
6. Hammett, C. (eds.) (1996): *Social Geography: A Reader*, Arnold, London.
7. Harvey, D. (1973): *Social Justice in the City*, University of Georgia Press, Athens.
8. Sen, A.(2000): *Social Exclusion: Concept, Application, and Scrutiny*, Social Development Papers No. 1, Asian Development Bank.
9. Sibley, D.(1995): *Geographies of Exclusion*, Routledge, London.
10. Smith, N.(1996): *New Urban Frontier: Gentrification and Revanchist City*, Routledge, London.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Approaches to Modelling and Qualitative Methods*

Course Type: Core Course

Course Code: *GEOG441C18*

Credits: 4

Total Marks: 50

Course Evaluation: Entire Course of 50 marks to be evaluated via Continuous Assessments throughout the semester
Pattern - Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)

- Course Objective:**
- . To develop understanding about modelling natural systems and use of numerical methods in solving problems.
 - . To develop skills in handling time series data and modelling temporal data.
 - . To provide expert knowledge in deriving information from qualitative data.
- Learning Outcome:**
- . Intermediate knowledge about modeling techniques for Earth System Sciences
 - . Gain expertise in time series modelling.
 - . Ability to handle qualitative data and handling related projects.
- Professional Skill Development:**
- . Skills of using modeling software for research works.
 - . Skills of using Python for time series analysis and modeling temporal data.
 - . Skills for handling qualitative analytic software.

Unit 1: Fundamentals of Models and Modelling

- | | | |
|-----|--|------|
| 1.1 | Concept of model; Nature of environmental systems; Types of model | [4] |
| 1.2 | Purpose of modelling; Model structure and formulation | [5] |
| 1.3 | Describing problems with mathematical formalism | [7] |
| 1.4 | Introduction to numerical methods - Ordinary Differential Equations, Partial Differential Equations, Polynomial Approximations, Finite Differences and Finite elements | [10] |
| 1.5 | Model parameterization and calibration; Model evaluation methods - Graphical analysis, Quantitative analysis of accuracy, Sensitivity analysis, Uncertainty analysis | [7] |
| 1.6 | <i>Case Studies of environmental models:</i> Soil and Hydrology - experimental models, Erosion and transport models | [8] |

Unit 2: Modelling Temporal Data

- | | | |
|-----|--|-----|
| 2.1 | Analysis of Temporal Data: Markov Chains - Concept, transitions frequency matrix, transition probability matrix, testing the transition frequency matrix | [8] |
| 2.2 | Decomposition of Trend, Cyclical, Seasonal and Noise Components | [6] |
| 2.3 | Autocorrelation; Autoregression (AR); Moving Average (MA) | [6] |
| 2.4 | ARMA and ARIMA modelling techniques | [7] |

Unit 3: Handling Qualitative Data

- | | | |
|-----|---|-----|
| 3.1 | Designing a project for qualitative data analysis using a qualitative analytic software | [6] |
| 3.2 | Creating documents and document attributes for qualitative analysis | [6] |
| 3.3 | Setting up a coding system and coding text for qualitative analysis | [8] |
| 3.4 | Modelling the conceptual framework using qualitative analytic software | [8] |

Suggested Readings: Approaches to Modelling and Qualitative Methods

1. Auerbach, C.F. and Silverstein, L.B. (2003): *Qualitative Data: An Introduction to Coding and Analysis*, New York University Press.
2. Bar-Yam, Y. (2000): *Dynamics of Complex Systems*, Perseus Books, Reading.
3. Bazeley, P. (2007): *Qualitative Data Analysis with NVivo*, SAGE Publications, London.
4. Chatfield, C. (1995): *The Analysis of Time Series: An Introduction*, Chapman & Hall, Boca Raton.
5. Gibbs, G. (2002): *Qualitative Data Analysis: Explorations with NVivo*, Open University, London.
6. Guermond, Y. (ed.) (2008): *The Modeling Process in Geography: From Determinism to Complexity*, John Wiley & Sons, London.
7. Rapoport, A. (1983): *Mathematical Models in Social and Behavioral Sciences*, John Wiley & Sons, New York.
8. Richards, L. (1999): *Using NVIVO in Qualitative Research*, SAGE Publications, London.
9. Sanders, L. (ed.) (2007): *Models in Spatial Analysis*, ISTE Ltd., London.
10. Smith, J. and Smith, P. (2011): *Environmental Modelling: An Introduction*, Oxford University Press, Delhi.
11. Strauss, A.L. (1987): *Qualitative Analysis of Social Scientists*, Cambridge University Press, Cambridge.
- 12.13. Swan, A.R.H., Sandilands, M. and McCabe, P. (1995): *Introduction to Geological Data Analysis*, Blackwell Science Ltd., Oxford.
13. Wainwright, J. and Mulligan, M. (Eds.) (2004): *Environmental Modelling: Finding Simplicity in Complexity*, Wiley & Sons Ltd., Chichester.
14. Wilson, A.G. and Kirkby, M.J. (1980): *Mathematics for Geographers and Planners*, Oxford University Press, Oxford.

Detailed Syllabus for Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Project / Dissertation*

Course Type: Dissertation

Course Code: *GEOG442C19*

Credits: 4

Total Marks: 50

Course Evaluation: Part Evaluation based on performance in the Field and during preparation of the Dissertation Report and its Research and Academic Quality, Part Evaluation based on Presentation and Viva Examination at semester end

Course Objective: To teach the skills associated with undertaking a focused research, meeting the set objectives, undertaking data analysis, and preparing a scientific report.

Learning Outcome: Preparation of a Dissertation Report and encapsulates the research undertaken

Professional Skill Development: Shall inculcate the ability to undertake scientific research and report writing to meet focused objectives, which shall be valuable for further higher education and employment.

The Research

The Dissertation should comprise an object-specific, goal-oriented Geographical Study based on the following types-

1. those which test a hypothesis or theory, as virtually all aspects of Geography have theories attached to them,
2. those which compare the geographical characteristics of two places or phenomena. A variation on this theme is a comparison of the geographical characteristics of one place or phenomena at two or more stages of time, i.e., a study of changes over time,
3. those which study a geographical problem related to the habitat, economy and society of people.

Dissertation Report

- Each Examinee shall prepare a Dissertation Paper individually under the supervision of a Departmental Faculty on his / her own chosen Theme.
- The Report must be documented in triplicate (1 = examinee, 2 = seminar library, 3 = supervisor) under the following Heads –
Introduction and Conceptual Background; Statement of the Problem; Objectives of Study; Literature Review; Methodology including data / information / map collection; Location of the Study Area; analysis, Display and Interpretation of Data (relating to each Objective separately); and Conclusion.
- The Dissertation Paper should contain Acknowledgement, Preface, Table of Content, List of Tables, List of Figures, List of Photographs, List of References, Appendix, and Bibliography/ Reference.
- Pages containing Illustrations (Sketches, Graphs, Diagrams, Maps, Photographs, etc) = 40 (maximum).
Word Limit = 10000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing = 1½; Font = Arial Narrow / Times New Roman / Calibri; Font size = 10 / 11)

Presentation

Each Examinee shall present his / her Paper before an audience comprising Internal / External Examiners and others on the day of Examination using OHP or LCD Projector (maximum 25 slides about – *concept / idea / theme; major objectives; methodology; study area; observations and analysis; conclusion*).

Marks Distribution

Marks shall be awarded by the External Examiner(s) on the Research and Academic Quality of the Report (=15) followed by the Presentation and Viva Voce (= 35).

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Seventh Semester)

Course Name: *Research Methodology: Advanced Geoinformatics*

Course Type: Minor Course

Course Code: *GEOG443MC05*

Credits: 4

Total Marks: 50

Course Evaluation: Entire Course of 50 marks to be evaluated via Continuous Assessments throughout the semester
Pattern - Continuous evaluation (class test, viva-voce, presentation, assignments or any other suitable evaluation method)

- Course Objective:**
- Develop proficiency in GIS & Remote Sensing software/tools to analyze, visualize, and manage spatial data for informed decision-making.
- Learning Outcome:**
- Gain advanced skills in integrating ArcGIS, Google Earth Engine, and Microwave Remote Sensing for accurate spatial data analysis, visualization, and modelling.
- Professional Skill Development:**
- ArcGIS GIS Software, Geospatial Cloud Computing, Basic JAVA Script, Processing Radar Earth Observation Data.

Unit 1: Desktop GIS using ArcGIS

- 1.1 Introduction to GIS: Concepts of Projection, datum and spheroid, mean sea level, orthometric height, geoid models; Formats of storing GIS Data; Georeferencing a raster layer with GPS Points and an existing georeferenced layer, defining projection, re-project from one projection to another [10]
- 1.2 Creating Vector layers through on-screen digitisation - Point, Line, Polygon; Creating Attribute Table: Add Fields for different data types, Joining and relating tables, Simple query building [15]
- 1.3 Geoprocessing functions: Union, intersection, Merge, Erase, Buffer, Dissolve; Creating Map Layout with multiple Dataframes and Graticules [10]
- 1.4 Raster data manipulation with mathematical operations; Application of Spatial Analyst processing raster data; Processing Multidimensional Data [10]

Unit 2: Google Earth Engine and Microwave Remote Sensing

- 2.1 Introduction to Google Earth Engine (GEE); Important Geospatial and Science Data Collection in GEE; Basic Earth Engine Commands for loading, sub-setting, stretching, and visualizing GEE Datasets [10]
- 2.2 Tables and Vectors in GEE: Load, manipulate, display and analyse vector data; Import/Export and render to and from GEE Assets & Personal Google Drive; Classification of images: supervised and unsupervised using modern machine learning techniques, such as Random Forest; Accuracy Assessment [15]
- 2.3 Basics of Microwave, Microwave remote sensing for land cover objects and terrain characteristics; SAR polarimetry: concepts and analysis; SAR interferometry concepts [10]
- 2.4 Exercises using Sentinel data on: Flood mapping; agriculture; Introduction to using SLC data in open source software [10]

Suggested Readings: *Advanced Geoinformatics*

1. Albretcht, J. (2007): *Key Concepts & Techniques in GIS*, SAGE Publications Ltd., London.
2. Burroughs, P.A. and McDonnell, R.A. (1998): *Principles of Geographic Information Systems*, OUP, New York.
3. Clark, K.C. (2010): *Getting Started with Geographic Information Systems*, Prentice Hall, Upper Saddle River, New Jersey.
4. Fazal, S. (2008): *GIS Basics*, New Age International (P) Limited, Publishers, New Delhi.
5. Harvey, F. (2008): *A Primer of GIS: Fundamental Geographic and Cartographic Concepts*, The Guilford Press, New York.
6. Heywood, D.I., Cornelius, S. and Carver, S. (2006): *An Introduction to Geographical Information Systems*, Prentice Hall, NJ.
7. Jensen, J.R. (2006): *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice Hall, New Jersey.
8. Lillesand, T.A., Keifer, R.W. and Chipman, J.W. (2008): *Remote Sensing and Image Interpretation*, Wiley, New York.
9. Longley, P.A., Goodchild, M., Maguire, D.J. Rhind, D.W. (2010): *Geographic Information Systems and Science*, Wiley, NY.
10. Sabins, F.F. (2008): *Remote Sensing: Principles and Interpretation*, Waveland Press Inc., Illinois.
11. Sahu, K.C. (2007): *Textbook of Remote Sensing and Geographical Information Systems*, Atlantic Publishers, New Delhi.
12. Shekhar, S. and Xiong, H. (eds.) (2008): *Encyclopaedia of GIS*, Springer, New York.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Advanced Geomorphology*

Course Code: *GEOG451C20A*

Total Marks: 50

Course Type: Core Course

Credits: 4

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most) will be set for answering any two and five semi-long answer type questions, each of 5 marks will be set for answering any three.

Internal Assessment: IA (15 marks) to be conducted via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To further the existing understanding in diverse aspects of Physical Geology and Geomorphology by building on initial fundamental concepts and also detail the different realms of modern geoscience along with the present research frontiers in the same.
- Learning Outcome:**
- Students shall have a broad grasp of the present topical aspects of geoscience, learn about immediate and probable future research domains and requirements and be able to apply these concepts for assessing a wide range of physical landscapes along with their formative processes and evolutionary pathways in order to discern human impacts on the environment and natural hazard issues.
- Professional Skill Development:**
- Ability to discern and apply multiple components of land sustainability management and natural hazard mitigation, based on imbibing profound understanding of geological and geomorphological processes, their dynamics and precise measurement methods.

Unit 1: Geomorphology: Introduction to Concepts, Traditions and Technologies

- 1.1 Explanation in Geomorphology: Uniformitarianism, Catastrophism, Neo-catastrophism, Actualism, Substantive uniformitarianism, Space-time substitution (Ergodic reasoning) and Hysteresis [5]
- 1.2 Systems Analysis in Geomorphology: Feedback mechanisms, Ideas of Equilibrium, Geomorphic thresholds and complexity of landscape response and sensitivity [6]
- 1.3 Hierarchies of Geomorphic scales: River Styles approach; Catchment linkages and (Dis)connectivity issues; Conceptualizing time in geomorphology; Magnitude-frequency relationship in river systems [6]
- 1.4 River metamorphosis - Predicting response to changes in discharge and sediment supply; Climate change and channel behavioural alteration; Base level changes and trunk to tributary response [5]
- 1.5 Rapid Geomorphic and Habitat Assessment: Suitable schemes [4]
- 1.6 Present research frontiers of Geomorphology in the Anthropocene; Field and Laboratory experiments in Geomorphology: Design, relevance and scaling [4]

Unit 2: Assessing Geomorphic Landscape Change

- 2.1 Global Topographic Orders and Hypsometric comparisons of Earth and other near planetary bodies [2]
- 2.2 Tectonic and Structural landform types; Case studies of notable tectonic provinces – Ladakh and Chotanagpur; Triple-Plate Junctions: Types, Geometry and Stability; Case Studies – Japan, Afar Triangle and San Andreas [4]
- 2.3 Tectonic Geomorphology: Basic principles; Geomorphic Markers of landscape uplift and erosion; Indices and methods for ascertaining neotectonic movements [4]
- 2.4 Linkages between Climate Change and Tectonics; Snowball Earth Hypothesis and other Ice Ages [3]
- 2.5 Concept of Critical Zone Science: geochemical signatures and indices of estimating weathering rates [3]
- 2.6 Fire and geomorphic change: forest fire effects on sediment and runoff generation, routing and landscape erosion [3]
- 2.7 Principles of River Restoration: hard and soft approaches; Riparian quality and environmental flow evaluation norms [4]
- 2.8 Geodiversity: Basic concept; Measuring Geodiversity; IUCN Guidelines for Geoheritage conservation [3]
- 2.9 Geoinformatics in Geomorphology: Utility of satellite images, Digital Elevation Models, LiDAR and photogrammetry [4]

Unit 3: Geomorphological Regions and Regimes

- | | | |
|-----|---|-----|
| 3.1 | Mountain Geomorphology: Mountain System, Channel-reach morphology in mountain drainage basins, evolution and rates of erosion; Case studies from the Himalayas | [5] |
| 3.2 | Periglacial, Proglacial and Paraglacial Landscapes: Denudation processes and landforms | [6] |
| 3.3 | Karst Landscapes: formational processes, cycle, human modifications | [3] |
| 3.4 | Long-term and large-scale processes in mountains and sedimentary basins; Compressional and Extensional basins and their tectonics; Paleoenvironmental reconstruction from sediment deposits | [6] |
| 3.5 | Sediment fluxes along coastlines and estuaries; Beach morphology; Bioturbation, Tidal accretion, Storm surge effects | [5] |
| 3.6 | Urban Geomorphology in the Anthropocene: Geomorphic changes in cities; Case studies of Darjeeling and Mumbai | [5] |

Suggested Readings: Advanced Geomorphology

- Bierman, P.R. and Montgomery, D.R. (2014): *Key Concepts in Geomorphology*. W.H. Freeman and Co.
- Brunsdon, D. (2001): *A critical assessment of the sensitivity concept in geomorphology*. *Catena* 42 2001 99–123
- Charlton, R. (2007): *Fundamentals of Fluvial Geomorphology*. Routledge, USA.
- Chorley, R. J., & Kennedy, B. A. (1971): *Physical geography: a systems approach*. Prentice-Hall.
- Coulthard, T.J. and Van De Wiel, M.J. (2012): *Modelling river history and evolution*. *Phil. Trans. R. Soc. A*. 370, 2123–2142
- Fryiris, K.A. and Brierley, G.J. (2013): *Geomorphic analysis of river systems: An approach to reading the landscape*. Wiley-Blackwell Chichester, UK.
- Goudie, A.S. (ed.) (2004): *Encyclopaedia of Geomorphology*. Routledge, London.
- Gutiérrez, M. (2013): *Geomorphology*, CRC Press, Boca Ranton, Florida.
- Harvey, A. (2012): *Introducing Geomorphology: A guide to landforms and processes*. Dunedin, London.
- Heeren, D.M. et al.(2012): Using rapid geomorphic assessments to Assess streambank stability in Oklahoma Ozark streams. *American Society of Agricultural and Biological Engineers*. Vol. 55(3): 957-968.
- McKenna Neuman, C., Ashmore, P., Bennett S.J. (2013): Laboratory and experimental geomorphology: examples from fluvial and aeolian systems. In: Shroder, J. (Editor in Chief), Orme, A.R., Sack, D. (Eds.), *Treatise on Geomorphology*. Academic Press, San Diego, CA, vol. 1, *The Foundations of Geomorphology*, pp. 325–348.
- National Research Council (2010): *Landscapes on the Edge: New Horizons for Research on Earth's Surface*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/12700> [pp. 1-12].
- Plater, A.J., Daniels, M.D. & Oguchi, T. (2013): Present research frontiers in geomorphology. In: Shroder, J., Orme, A.R., Sack, D. (Eds.), *Treatise on Geomorphology*. Academic Press, San Diego, CA, vol. 1, *The Foundations of Geomorphology* [pp. 349–376].
- Plater, A.J., Daniels, M.D., Oguchi, T. (2013): Present research frontiers in geomorphology. In: Shroder, J. (Editor in Chief), Orme, A.R., Sack, D. (Eds.), *Treatise on Geomorphology*. Academic Press, San Diego, CA, vol. 1, *The Foundations of Geomorphology*, pp. 349–376.
- Richter, G. (1981): Recent trends of experimental geomorphology in the field. *Earth Surface Processes and Landforms*, vol. 6, 215-219.
- Sack, D. & Orme, A.R. (2013): Introduction to the Foundations of Geomorphology. In: Orme, A.R. & Sack, D. (eds.), *Treatise on Geomorphology*, Academic Press. San Diego, CA. Vol. 1 Foundations of geomorphology. 10.1016/B978-0-12-374739-6.00001-4.
- Schumm, S. A. (1973): Geomorphic thresholds and complex response of drainage systems. In B.L. Rhoads, & C. E. Thorn (Eds.), *Channel changes: observations and experiments* (pp. 299-310). University of Minnesota Press.
- Starkel, L. (1999): *Space and time scales in geomorphology*. Fourth international conference on geomorphology - Italy 1997 plenary lecture. *Suppl. Geogr. Fis. Dinam. Quat.* III, T.3 (1999), 61-66.
- Summerfield, M.A. (1991): *Global Geomorphology: An Introduction to the Study of Landforms*. Longman, London
- The Rapid Habitat Assessment Method Manual*:
https://www.dws.gov.za/iwqs/rhp/eco/EcoStatus/RHAM_2009_VERSION_MODIFIED_JUNE_2014.pdf
- Thorn, C. E., & Welford, M. R. (1977): *Equilibrium concepts in geomorphology*. Wiley.
- Vitek, J.D. & Giardino, J.R. Ed. (1993): *Geomorphology: the research frontier and beyond*. *Proceedings of the 24th Binghamton Symposium in Geomorphology*, August 25,1993. Reprinted from *Geomorphology*, Volume 7, Nos. 1-3 [pp. 1-7; 251-262].

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Development Geographies*

Course Type: Core Course

Course Code: *GEOG451C20B*

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment(15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- To make students acquainted with different meanings of development in the context of community and social well-being.
 - To make students aware of tourism as a development process in society and its connection to communities.
 - To make students understand how well-being is seen from different lenses of development processes.

- Learning Outcome:**
- Students will be able to correlate developed regions with the underdeveloped areas in the context of economy and well-being.
 - Students will be able to connect theoretical understandings with community development.
 - The course will enable students to understand the importance of tourism in human development and well-being.

- Professional Skill Development:**
- Students will have practical skills to handle the data related to community development and progress.
 - Students will be able to theoretically contribute to public policies related to social well-being.
 - Students will have practical expertise in analysing tourism community relationship at a destination region.

Unit 1: Geography and Development

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|-----|--|-----|
| 1.1 | Development: Meaning, approaches and issues; Growth versus Development; Geographical perspective of development and underdevelopment - region, society and community | [4] |
| 1.2 | Development as Social Well-being: Welfare tradition in geography, origin, meaning, nature and scope | [6] |
| 1.3 | Communities: Definition and concept; Rural, urban and tribal perspectives | [4] |
| 1.4 | The Tourism-Development dilemma: Ecological impacts; Extended study on Tourism-Poverty nexus | [6] |

Unit 2: Social Well-being

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|-----|---|-----|
| 2.1 | Social wellbeing: meaning, approaches, philosophical and methodological aspects of human wellbeing | [5] |
| 2.2 | Quality of life: meaning, criteria, components, approaches, measures and significance | [6] |
| 2.3 | Health and well-being: Meaning, Components, Public health-care structure in India, Measuring Health and wellbeing in Indian context | [6] |
| 2.4 | Crime and well-being: Meaning, approaches to geography of crime, measures, crime in India- IPC and SLL, classification of crime, and geographical pattern of crime in India | [6] |

Unit 3: Community Development

- | | | |
|-----|--|-----|
| 3.1 | Community Development: approaches and processes; Need-based and Asset-based community development | [6] |
| 3.2 | Theories of Community Development: Social capital theory, structural functionalism, conflict theory, symbolic interactionism, communicative action theory, Rational choice theory, Giddens's structuration theory | [7] |
| 3.3 | Tribal communities and their Developmental issues: Assimilative and isolationist approaches, policies and programmes; Issues and challenges of tribal development; Adverse effect of development: Development induced displacement | [6] |
| 3.4 | Community development assessment: Data collection methods, asset mapping and analysis. | [6] |

Unit 4: Community Well-being and Tourism

- | | | |
|-----|--|-----|
| 4.1 | Destination evolution and Tourist Area Life Cycle Model; Impacts on local resources and culture | [5] |
| 4.2 | Modes of experiences and behavioural identity of tourists: Application of classification scheme of Cohen and Plog; Changing definitions of tourism and touristscape and their utilities | [5] |
| 4.3 | Connections between Tourism, Well-being and Justice; Globalization, Neoliberal tourism and socio-cultural change | [6] |
| 4.4 | Tourism-induced power structure and community politics of resources: Extended study from India; Community development and Participatory exclusion in tourism operations; Application of Social Network Analysis in tourism resource distribution | [6] |

Suggested Readings: Development Geography

1. Beeton, S. (2006): *Community Development through Tourism*, Landlinks Press.
2. Butler, R. and Hinch, T. (2007): *Tourism and Indigenous Peoples*, Taylor and Francis.
3. Cooper, C. and Hall, C.M. (2008): *Contemporary Tourism: An International Approach*, Butterworth-Heinemann.
4. D'Mello, L. (2018): *Community Development- Rural, Urban and a Tribal Perspective*, FSP media Publications.
5. Dwyer, L., Gill, A. and Seetaram, N. (2012): *Handbook of Research Methods in Tourism: Quantitative and Qualitative Approaches*, Edward Elgar.
6. Hall, C.M. (2011): *Fieldwork in Tourism: Methods, Issues and Reflections*, Routledge.
7. Hussain, T., Tahir, M. and Tahir R. (2021): *Fundamentals of Rural Development*, Dreamtech press, New Delhi.
8. Jafari, J. (2003): *Encyclopedia of Tourism*, Routledge.
9. Nathan, D. And Xaxa, V. (Eds) (2012): *Social Exclusion and Adverse Inclusion*, Oxford University Press, New Delhi.
10. Patil A.R. (2012): *Community Organization and Development- an Indian perspective*, Prentice Hall India Learning Private Limited.
11. Pearce, D.G. and Butler, R. (1999): *Contemporary Issues in Tourism Development*, Routledge.
12. Peet, R., Hartwick, E. (2015): *Theories of Development*, Third Edition, Guilford Press.
13. Philips R. and Pittman R.H. (eds.) (2008): *An Introduction to Community Development*, Routledge, Taylor & Francis group.
14. Rath, G.C. (2006): *Tribal Development in India*, Sage publications.
15. Robinson, P., Heitmann, S. and Dieke, P.U.C. (2011): *Research Themes for Tourism*, CABI.
16. Sharma, K.K. (2005): *Tourism and Development*, Sarup & Sons.
17. Smith D. M. (1973): *The geography of social well-being in the United States: an introduction to territorial social indicators*, McGraw-Hill, London.
18. Smith D. M. (1977): *Human geography: A welfare approach*, St. Martin's Press, London.
19. Smith D. M. (1979): *Where the Grass is Greener: Geographical Perspectives on Inequality*, Croom Helm, London.
20. Smith, N. (2010): *Uneven Development: Nature, Capital, and the Production of Space*, University of Georgia Press.
21. Williams, S. (2009): *Tourism Geography: A New Synthesis*, Taylor & Francis.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Techniques in Environmental Geography*

Course Type: Core Course

Course Code: GEOG452C21A

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions, each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment - IA (15 marks) to be conducted via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective: . To inculcate the ability to analyse a wide range of environmental parameters and datasets.

Learning Outcome: . Understanding of different ecological, hydrological, pedological and sedimentary analyses.

Professional Skill Development: . Ability to undertake various methodological investigations in environmental geography that pertain to ecological components, sedimentary environments, hydrological changes and soil properties.

Unit 1: Sediment Analysis

- | | | |
|-----|--|-----|
| 1.1 | Major fluvial environments for deposition of sediments | [4] |
| 1.2 | Sediment collection techniques and application of sediment samplers | [4] |
| 1.3 | Grain-size sorting: Classification, application of statistical techniques | [6] |
| 1.4 | Facies analysis : Layer identification, pinching, flow regime, deformation, grain size | [6] |

Unit 2: Ecological Survey Methods

- | | | |
|-----|--|-----|
| 2.1 | Assessing densities of large or obvious plants that are present at low density applying count method | [4] |
| 2.2 | Quadrats: Measuring density, frequency, cover or biomass | [4] |
| 2.3 | Application of Point Quadrats for Estimation of cover of grasses and herbs | [4] |
| 2.4 | Transects: Line intercept, belt intercept, gradient-directed transect | [4] |
| 2.5 | Mapping of terrestrial vegetation; Species distribution; Application of NDVI to estimate green density | [4] |

Unit 3: Land Classification

- | | | |
|-----|--|------|
| 3.1 | Definition and Components of Land Suitability | [4] |
| 3.2 | Mapping of Land Suitability at Macro or Micro level of any part of India using parameters following FAO guidelines:
Soil Reaction, Electrical Conductivity (EC), Organic Carbon (C), Availability of Nitrogen (N), Available phosphorus (P), Available Potassium (K), Exchangeable sodium percentage (ESP), Base Saturation (BS) and Cation exchange capacity (CEC), Soil texture | [16] |
| 3.3 | Simulating land use and land cover change using CA-Markov model | [6] |
| 3.4 | Enumerating landscape metrics with FRAGSTATS | [4] |

Unit 4: Quantitative Techniques for Hydrological Assessments

- | | | |
|-----|---|-----|
| 3.1 | Analysis of precipitation data at different temporal and spatial scales with appropriate numerical and GIS techniques: IMD Daily Data, Sub-daily data from Tropical Rainfall Measuring Mission (TRMM) | [4] |
| 3.2 | Hydrological Statistics: Frequency Analysis, Return Period, Probability Plotting, Extreme Value Distribution, Log-Pearson Distribution Type III | [3] |
| 3.3 | Flood susceptibility and flood vulnerability analysis using weighted measures and basic machine learning algorithms; Enumerating inundation extents from surface water datasets; Assessing groundwater fluctuations from secondary data | [8] |
| 3.4 | Assessing glacier extents, mass balance and GLOF hazards from satellite images and secondary datasets | [5] |

Suggested Readings and Online Resources: Techniques in Environmental Geography

1. Chow, V.T, Maidment, D.R and Mays, L.W. (1988): *Applied Hydrology*, McGraw Hill
2. Ernst, W. (2012): *Geochemical facies analysis*. Elsevier.
3. *Facies Models; Response to sea Level Change* edited by R. G. Walker and N. P. James. Geological Association of Canada, 1992. No. of pages: 409. Price: \$CDN 30.00 (paperback). ISBN 0 919216 49 8.M. Williams.
4. FAO, (1981): *A Framework for Land Evaluation*, FAO, Rome
5. FAO, (1995): *Planning for Sustainable Use of Land Resources- towards a New Approach, Land and Water Bulletin 2*, FAO, Rome
6. FAO/UNESCO (1974): *Soil Map of the World*, Vol. I Legend, UNESCO, Paris
7. Guerit, L., Barrier, L., Narteau, C., Métivier, F., Liu, Y., Lajeunesse, E., Gayer, E., Meunier, P., Malverti, L. and Ye, B., 2014. *The Grain-size Patchiness of Braided Gravel-Bed Streams—example of the Urumqi River (northeast Tian Shan, China)*. *Advances in Geosciences*, 37, pp.27-39.
8. López, G.I. (2017): Grain size analysis. *Encyclopedia of geoarchaeology*, pp.341-348.
9. Mahaney, W.C. and Mahaney, W. (2002): *Atlas of sand grain surface textures and applications*. Oxford University Press, USA.
10. Miall, A.D. (2013): *The geology of fluvial deposits: sedimentary facies, basin analysis, and petroleum geology*. Springer.
11. Milan, V. and Andjelko, S. (1992): *Determination of hydraulic conductivity of porous media from grain-size composition* (No. 551.49 V 986).
12. Nichols, G. (2009): *Sedimentology and stratigraphy*. John Wiley & Sons.
13. S.M. Sengupta, 2015. *Introduction to Sedimentology*.
14. Gerhard, E. (2000): *Sedimentary Basins- Evolution, Facies, and Sediment Budget*, Springer.
15. Subramanya, K (2013): *Engineering Hydrology*, Tata McGraw Hill, New Delhi.
16. Sutherland, W.J. (eds.) (2006): *Ecological Census Techniques: A Handbook*, Cambridge University Press, New York.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Planning for Sustainable Cities*

Course Type: Core Course

Course Code: *GEOG452C21B*

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) and Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern: Four Long-answer type questions, each of 10 marks (may be split into two parts, one carrying 2 marks at most), will be set for answering any two and five semi-long answer type questions, each of 5 marks, will be set for answering any three.

Internal Assessment: Tutorial / IA (15 marks) to be conducted on the notified practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

Course Objective:

- The course aims to impart comprehensive and critical understanding of diverse concepts, approaches, practices and issues related to sustainable cities and its planning.
- Case studies of different best practices from different parts of the world will be introduced to the students in order to make them aware about the best possible planning solutions for sustainable city making.
- They will also be taught the methodological aspects of city planning and assessment of sustainability.

Learning Outcome:

- Students will become acquainted with the theoretical, technical and critical aspects of planning for sustainable cities.
- They will be in a position to offer professional services to the concerned institutions for city planning.
- It is also expected that students will engage in cutting edge research.

Professional Skill

Development:

- Students will be able to measure sustainability from different angles at different scales.
- They will become competent in baseline report preparation for planning, plan formulation and its evaluation.

Unit 1: Sustainability and Urban Planning

- | | | |
|-----|---|-----|
| 1.1 | Basic characteristics of a sustainable city | [2] |
| 1.2 | Case studies of sustainable cities: Examples from Scandinavia, North America, Western Europe, East Asia and Australia | [6] |
| 1.2 | Data in sustainable studies: Strengthening planning education; Monitoring documentation and analysis | [3] |
| 1.3 | Sustainable Development Goals (SDGs): Measurement and monitoring | [2] |
| 1.4 | City planning: Elements and general processes of planning; Case study of the Master Plan for Delhi - 2041 | [6] |
| 1.5 | Urban planning in sustainable development: Importance of urban planners; Role of UN Habitat | [4] |
| 1.6 | Strategies of urban planning in India: Regulatory, urban expansion, capital-improvement and urban renewal | [2] |
| 1.7 | City sustainability in India: Salient features of the smart city mission; Some notable case studies | [4] |

Unit 2: Changing Perspectives of Contemporary Urban Planning

- | | | |
|-----|--|-----|
| 2.1 | Planning patterns: Compact city pattern; Articulated density pattern; Transit oriented development pattern | [6] |
| 2.2 | Urbanism and planning; Diversifying compact urbanism; NIMBYISM; Green gentrification; Pandemic urbanism; Vertical sprawling: concept and consequence | [6] |
| 2.3 | Suburban studies: Theory; Urban political ecology of suburbanization; Debate on sustainability and counter-sustainability fixes | [4] |
| 2.4 | Spotting from the South; Informality; Strategic-spatial planning | [2] |
| 2.5 | Urban planning and issues of well-being: Insights from compact city, smart city and city as usual approaches | [3] |
| 2.6 | Secondary cities: Opportunities for sustainable urbanization | [3] |

Unit 3: Socio-economic Issues in Sustainable City Planning

- | | | |
|-----|--|-----|
| 3.1 | Slum growth, eviction and spatial reproduction of poverty | [3] |
| 3.2 | Housing issues: Policy biased against incremental housing, un-affordability, tenure insecurity, informal rental housing and homelessness | [6] |
| 3.3 | Changing urban labour market and informal economy | [5] |
| 3.4 | Problems of sustainable city planning in Kolkata | [3] |

Unit 4: Case Studies on Sustainable Urban Planning

- | | | |
|-----|--|-----|
| 4.1 | Strategic Spatial Planning for small cities: Case studies of Egypt and Vietnam | [4] |
| 4.2 | Climate change and urban development: Case studies on Philippines (water logging) and China (air pollution) | [4] |
| 4.3 | Local economic development and infrastructure planning: Case studies on Indonesia (neighbourhood improvement) and Kenya (local market and public spaces) | [4] |
| 4.4 | Social urbanism: Case study of Medellin, Colombia | [4] |
| 4.5 | Planning for sustainable housing: Case study of Singapore | [4] |

Suggested Readings: Planning for Sustainable City

1. Basiago, Andrew D. (1996): The search for the sustainable city in 20th century urban planning, *Environmentalist*, 16(2), pp135-155
2. Chakrabarti, PG Dhar. (2001): Urban crisis in India: new initiatives for sustainable cities, *Development in Practice*, 11(2-3), pp260-272.
3. Cohen, S. and Dong, G. (2021): *The sustainable city. Colombia*: Columbia university press.
4. Das, A. K. (2000): *Urban planning in India*. New Delhi: Rawat publication.
5. Davis, M. (2006): *Planet of Slums*. Verso: London.
6. DDA. (2023): *MPD 2041*. Delhi: Delhi Development Authority.
7. Hassan, A. M., and Lee, H. (2015): The paradox of the sustainable city: definitions and examples, *Environment, development and sustainability*, 17, pp1267-1285.
8. Jenks, M, and Jones, C. (eds.) (2008): *Dimensions of the sustainable city*. London and New York: Springer.
9. Keil, R. (2017). *Suburban Planet*. Wiley: New York.
10. Kenworthy, Jeffrey R. (2006): 'The eco-city: ten key transport and planning dimensions for sustainable city development' *Environment and Urbanization*, 18 (1), pp67-85.
11. Potter, R. B. and Lloyd Evans, S. (2014): *The City in the Developing World*. London and New York: Routledge.
12. Rai, P. T. (2012): Townships for sustainable cities' *Procedia-Social and Behavioral Sciences*, 37, pp417-426.
13. Shaw, A. (1995): *The Making of Navi Mumbai*. Chennai: Orient Longman.
14. Shaw, A. (2018): 'Towards sustainable cities in India' in J. Mukherjee (ed.) *Sustainable Urbanization in India: Challenges and Opportunities*. New Delhi: Springer.
15. *UN Global Compact Strategy 2021-22*.
16. *World Cities Report, 2022*, UN Habitat.
17. *World Urbanization Prospects (Interactive Data)*, United Nations Populations Division.
18. *World Urbanization Prospects 2014: Highlight*.

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Advanced Analytical Techniques*

Course Type: Core Course

Course Code: GEOG491C22

Credits: 4

Total Marks: 50

Course Evaluation: Entire course of 50 marks to be evaluated via Continuous Assessments throughout the semester.

Pattern - Continuous Assessment (class test, viva-voce, presentation, assignments or any other suitable evaluation method.)

- Course Objective:**
- To develop proficiency in statistical methods for analyzing multivariate data, applying machine learning techniques, and utilizing spatial statistics for data analysis and interpretation.
- Learning Outcome:**
- By the end of the course, students will be able to effectively apply matrix algebra, multiple linear regression, machine learning algorithms, and spatial statistics techniques to analyze complex data sets, interpret results, and make informed decisions.
- Professional Skill Development:**
- Students can hone their professional skills in multivariate data analysis, machine learning, and spatial statistics through the syllabus, equipping them with the ability to proficiently analyze intricate data, interpret findings, and make informed decisions in practical settings.

Unit 1: Multivariate Data Analysis

- | | | |
|-----|---|-----|
| 1.1 | Matrix Algebra, Multiple Linear Regression, Dummy Variable, Partial Correlation, Stepwise Regression, Path Analysis | [7] |
| 1.2 | Eigen Vector Methods: Principal Component Analysis, Factor Analysis and Maximum Likelihood Analysis | [7] |
| 1.3 | Cluster Analysis, Multidimensional Scaling, ANOVA | [6] |
| 1.4 | Linear Discriminant Analysis, Logit and Probit models; Analytic Hierarchy Process | [6] |
| 1.5 | Structural Equation Modelling | [4] |

Unit 2: Basics of Machine Learning

- | | | |
|-----|---|-----|
| 2.1 | Types of ML; Steps in Supervised Learning - Training, Validation and Test data sets | [3] |
| 2.2 | Linear Regression- Cost Function and Coding | [5] |
| 2.3 | Multivariable Regression - Complexity Analysis, Gradient Descent, Learning Rate and Coding MVR | [5] |
| 2.4 | Logistic Regression - Cost Function, Multiclass Classification, Coding, Classification Measures, Precision | [5] |
| 2.5 | Decision Tree - building a decision tree, Greedy Recursive algorithm, Features to Split, Coding DT, Information Gain, Pruning | [5] |
| 2.6 | Random Forest - algorithm and coding RF; Support Vector Machine - cost function, decision boundary and coding SVM | [7] |

Unit 3: Spatial Statistics

- | | | |
|-----|---|-----|
| 3.1 | Trend Surface Analysis: First order | [4] |
| 3.2 | Spatial Smoothing Techniques: Locally weighted averages, Non-parametric regression, Probability mapping | [6] |
| 3.3 | Areal pattern analysis: Spatial Autocorrelation - Join-Count Statistics (Computation of Global Moran's I; Global Geary's C; Local Moran's I); | [5] |
| 3.4 | Surface Interpolation: Inverse Distance Averaging, Variograms and Kriging; Analysis of fractal dimensions | [5] |
| 3.5 | Density-based Point Pattern Measures: Quadrat Count Method; Kernel Density Estimation (K means) | [5] |
| 3.6 | Distance-based Point Pattern Measures: G function; F function; K function; Pair Correlation Function | [5] |

Suggested Readings: *Advanced analytical techniques*

1. Afifi, A., May, S., Donatello, R., & Clark, V. A. (2019). *Practical multivariate analysis*. CRC Press.
2. Anselin, L. (1995): *Local Indicators of Spatial Association - LISA*, *Geographical Analysis* 27(2), 93-115.
3. Baddeley, A., Rubak, E., & Turner, R. (2015): *Spatial point patterns: methodology and applications with R*. CRC press.
4. Bonaccorso, G. (2017). *Machine Learning Algorithms*. United Kingdom: Packt Publishing.
5. Chatfield, C. (2018). *Introduction to multivariate analysis*. Routledge.
6. Chopra, D., & Khurana, R. (2023). *Introduction to Machine Learning with Python*. Bentham Science Publishers.
7. Chun, Y. and Griffith, D.A. (2013): *Spatial statistics and geo-statistics*. Sage, London.
8. Denis, D. J. (2021). *Applied Univariate, Bivariate, and Multivariate Statistics Using Python: A Beginner's Guide to Advc Analysis*. United Kingdom: Wiley.
9. Diggle, P. J. (2014): *Statistical analysis of spatial point patterns*. Academic Press.
10. Hahs-Vaughn, D. L. (2016). *Applied Multivariate Statistical Concepts*. United States: Taylor & Francis.
11. Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2014). Pearson new international edition. *Multivariate data analysis*, Seventh Edition. Pearson Education Limited Harlow, Essex.
12. Müller, A. C., & Guido, S. (2016). *Introduction to machine learning with Python: a guide for data scientists*. "O'Reilly Media, Inc."
13. Nagy, Z. (2018). *Artificial Intelligence and Machine Learning Fundamentals: Develop Real-world Applications Powered by the Latest AI Advances*. United Kingdom: Packt Publishing.
14. Navarro Alberto, J. A., Manly, B. F. (2016). *Multivariate Statistical Methods: A Primer*, Fourth Edition. United States: CRC Press.
15. Oliver, M. A., & Webster, R. (2014): *A tutorial guide to geostatistics: Computing and modelling variograms and kriging*. Catena, 113, 56-69
16. Oyana, T.J., and Margai, F.M. (2016): *Spatial Analysis: Statistics, Visualization, and Computational Methods*. CRC Press. 294 pp.
17. Ravi, A., Churiwala, S., Rebala, G. (2019). *An Introduction to Machine Learning*. Germany: Springer International Publishing.
18. Ripley, B. D. (1981): *Spatial statistics*. John Wiley & Sons.
19. Sarma, K. V. S., & Vardhan, R. V. (2018). *Multivariate statistics made simple: a practical approach*. Chapman and Hall/CRC.
20. Spencer, N. H. (2013). *Essentials of multivariate data analysis*. CRC press.
21. Vannatta, R. A., LaVenía, K. N., Mertler, C. A. (2022). *Advanced and Multivariate Statistical Methods: Practical Application and Interpretation*. United Kingdom: Routledge.
22. Warner, R. M. (2020). *Applied Statistics II: Multivariable and Multivariate Techniques*. United States: SAGE Publications.

Detailed Syllabus for Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Project / Dissertation*

Course Type: Core Course

Course Code: *GEOG492C23*

Credits: 8

Total Marks: 100

Course Evaluation: Based on the entire Project Report and its Research and Academic Quality, through Presentation and Viva Examination at semester end.

Course Objective: To judge the skills associated with undertaking a focused research, meeting the set objectives, undertaking data analysis, and preparing a scientific report.

Learning Outcome: Preparation of a Project Report that encapsulates the research undertaken individually and in self-guidance mode by the student.

Professional Skill Development: Shall inculcate the ability to undertake scientific research and report writing to meet focused objectives, which shall be valuable for further higher education and employment.

The Research

The Project should comprise an object-specific, goal-oriented Geographical Study based on the following types-

1. those which test a hypothesis or theory, as virtually all aspects of Geography have theories attached to them,
2. those which compare the geographical characteristics of two places or phenomena. A variation on this theme is a comparison of the geographical characteristics of one place or phenomena at two or more stages of time, i.e., a study of changes over time,
3. those which study a geographical problem related to the habitat, economy and society of people.

Project Report

- Each Examinee shall prepare a Project Report individually under self-guidance on his / her own chosen Theme. The student can also submit a Report based on research undertaken by them individually in another allied Department of the University or any other Institution or as part of an Internship, provided that such a Report has not been submitted for credit earlier in this or any other course.
- The Report must be documented in triplicate (1 = examinee, 2 = seminar library, 3 = supervisor) under the following Heads –
Introduction and Conceptual Background; Statement of the Problem; Objectives of Study; Literature Review; Methodology including data / information / map collection; Location of the Study Area; analysis, Display and Interpretation of Data (relating to each Objective separately); and Conclusion.
- The Project Report should contain Acknowledgement, Preface, Table of Content, List of Tables, List of Figures, List of Photographs, List of References, Appendix, and Bibliography/ Reference.
- Pages containing Illustrations (Sketches, Graphs, Diagrams, Maps, Photographs, etc) = 40 (maximum).
Word Limit = 10000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing = 1½; Font = Arial Narrow / Times New Roman / Calibri; Font size = 10 / 11)

Presentation

Each Examinee shall present his / her Project before an audience comprising Internal / External Examiners and others on the day of Examination using OHP or LCD Projector (maximum 25 slides about – *concept / idea / theme; major objectives; methodology; study area; observations and analysis; conclusion*).

Marks Distribution

Marks shall be awarded by the External Examiner(s) on the Research and Academic Quality of the Report (=30) followed by the Presentation and Viva Voce (= 70).

Detailed Syllabus for 4-Year Undergraduate Course in Geography (Hons.) with Research (Eighth Semester)

Course Name: *Research Methodology and Publication Ethics*

Course Type: Minor Course

Course Code: *GEOG455MC06*

Credits: 4

Total Marks: 50

Course Evaluation: Semester Examination (35 marks) And Internal Assessment (15 marks)

Semester Examination - Written examination of 2 hours duration will be held at semester end.

Question Pattern - Four Long-answer type questions each of 10 marks (may be split into two parts, one carrying 2 marks at most) will be set for answering any two and five semi-long answer type questions, each of 5 marks will be set for answering any three.

Internal Assessment – IA (15 marks) to be conducted on the practical / tutorial portion / topic(s) via class test, viva-voce, presentation, assignments or any other suitable evaluation method.

- Course Objective:**
- The course addresses the basic issues related to fundamentals of research and should guide in every step of research process including problem identification, hypothesis building, data collection and analysis and finally developing a conclusion.
 - The course will also help in understanding the philosophy of research integrity and publication ethics.
- Learning Outcome:**
- Will develop the skill of contextualization of knowledge and critical thinking and will have the ability to choose methods appropriate to research aims and objectives. The course will also enable students to apply ethical principles in research work.
- Professional Skill Development:**
- Will develop skills in qualitative and quantitative data analysis and presentation and will be well equipped about ethical issues in research.

Unit 1: Fundamentals of Research

- 1.1 Nature of Science: description, causality, prediction and explanation; Nature of natural and behavioural systems; Nature of Geographical enquiries - Physical and Human; Deterministic and non-deterministic approaches [6]
- 1.2 Theorizing our World - ontology, epistemology, research paradigms, methods and methodology; Types of logical reasoning - Inductive, Deductive and Abductive [6]
- 1.3 Nature and objectives of research; Research Types: descriptive-analytical, pure-applied, conceptual-empirical, qualitative-quantitative [4]

Unit 2: Research Process

- 2.1 Steps in Research process; Needs and objectives of Literature Review; Conducting literature survey - searching literature, reviewing selected literature, developing theoretical and conceptual frameworks, Reporting literature review [9]
- 2.2 Research Problems - meaning, importance and sources; selecting, defining, stating and evaluating a research problem; Selection of research objectives; Exercises on writing the introduction of a research article [6]
- 2.3 Citation methods - foot note, text note, end note, bibliography, annotated bibliography and citation rules [8]
- 2.4 Hypothesis: Definition, sources, roles and types of hypotheses; Tests of hypothesis with small and large samples; Type I and Type II Errors in testing hypotheses [4]
- 2.5 Research Strategies: Case studies, Experiments, Ethnography, Phenomenology, Grounded Theory, Action Research [10]
- 2.6 Data Collection Methods: Questionnaire, Interview, Focus Group, Participant Observation; Sampling - Concept, principles, factors affecting inferences drawn from a sample; Types of sampling - random and probability sampling designs, systematic sampling; Sample size calculation [10]

Unit 3: Reading a Scientific Research Paper

- | | | |
|-----|---|-----|
| 3.1 | Introduction Section: Background, Hypothesis/Research Question, Premise, Logic, Novelty | [4] |
| 3.2 | Material and Method Section: Research Design, Data/Materials used, Sampling Strategy, Techniques used | [4] |
| 3.3 | Result Section: Coherence, Reliability and validity of data; Important observations | [4] |
| 3.4 | Discussion Section: Interpretation of results and main conclusions | [2] |

Unit 4: Research Publications Ethics

- | | | |
|-----|--|-----|
| 4.1 | Ethical Issues in Research Publications | [4] |
| 4.2 | Meaning and seriousness of Plagiarism; Types of Plagiarism | [4] |
| 4.3 | Plagiarism Checking Tools and Preventing Plagiarism | [3] |
| 4.4 | UGC Guidelines on Research Ethics | [2] |

Suggested Readings: *Research Methodology and Publication Ethics*

1. Clifford, N., Cope, M., Gillespie, T., & French, S. (Eds.). (2016): *Key methods in Geography*. Sage.
2. Gomez, B., & Jones III, J. P. (Eds.). (2010): *Research methods in geography: A critical introduction* (Vol. 6). John Wiley & Sons.
3. Hegde, D. S. (Ed.). (2015): *Essays on research methodology*. Springer.
4. Kleiner, S. (1993): *The logic of discovery: A theory of the rationality of scientific research*. Springer Science & Business Media.
5. Kumar, R. (2019): *Research methodology: A step-by-step guide for beginners*. Sage Publications Limited.
6. Locharoenrat, K. (2017): *Research Methodologies for Beginners*. Pan Stanford.
7. Mellenbergh, G. J., & Adèr, H. J. (Eds.). (1999): *Research Methodology in the Life, Behavioural and Social Sciences*. Sage.
8. Pruzan, P. (2016): *Research Methodology: The aims, practices and ethics of science*. Springer.
9. Singh, Y. K. (2006): *Fundamental of Research Methodology and Statistics*. New Age International.
10. Yeong, F. M. (2014): *How to Read and Critique a Scientific Research Article: Notes to Guide Students Reading Primary Literature (with Teaching Tips for Faculty Members)*. World Scientific Publishing Company.