Annexure - A

Chaudhary Bansi Lal University

Hansi Road, Prem Nagar, Bhiwani

(A State University Established under Govt. of Haryana Act No 25 of 2014)

वासुधैव कुटुम्बकम्

(The world is one family.)

Scheme & Syllabus
of
M.Sc. Geography

(In accordance with NEP-2020)

DEPARTMENT OF GEOGRAPHY

Approved

PGBOS&R: 15 July 2025 **Faculty Board: 02 Aug 2025**

Programme Learning Outcomes (PLO) of M.Sc. Geography

PLO 1	Demonstrate advanced knowledge about Geography with a critical understanding of the emerging developments and issues relating to the learners domain area.
PLO 2	Demonstrate advanced knowledge and understanding of principles, methods, and techniques applicable to the chosen field of study.
PLO 3	Demonstrate the capacity to extrapolate the acquired knowledge and skills to real-life situations and apply acquired competencies in new/unfamiliar contexts.
PLO 4	Demonstrate the ability to apply the acquired conceptual, operational or technical knowledge and a range of cognitive and practical skills to identify and address problems related to the chosen field of learning.
PLO 5	Demonstrate the apply advanced knowledge relating to research methods to carryout research and investigations to formulate evidence-based solutions to complex and unpredictable problems in the field of Geography.
PLO 6	Demonstrate the ability to communicate, in a well-structured manner the findings/ results of the research studies undertaken in the field of Geography.
PLO 7	Pursue self-paced and self- directed learning to upgrade knowledge and skills, including research-related skills avoiding unethical practices.

Scheme of Examination and Syllabus for M.Sc. Geography (w.e.f. 2025-26)

Semester	Course Type	Course Code	Nomenclature of the Paper	Credits	Hours/Week	External Assessment Marks	Internal Assessment Marks	Total Marks	Duration of Exam.
I	CC 1	25 PG GEO 101	Principles of Geomorphology (Theory)	3	3	50	20	70	3 Hours
			Principles of Geomorphology (Practical)	1	2	20	10	30	1.5 Hours
	CC 2	25 PG GEO 102	Advanced Climatology (Theory)	3	3	50	20	70	3 Hours
			Advanced Climatology (Practical)	1	2	20	10	30	1.5 Hours
	CC 3	25 PG GEO 103	Population and Development (Theory)	3	3	50	20	70	3 Hours
			Population and Development (Practical)	1	2	20	10	30	1.5 Hours
	CC 4	25 PG GEO 104	Statistical Methods in Geography (Theory)	3	3	50	20	70	3 Hours
			Statistical Methods in Geography (Practical)	1	2	20	10	30	1.5 Hours
	CC 5	25 PG GEO 105	Digital Cartography & Morphometric Analysis (Practical)	4	8	70	30	100	3 Hours
	DEC 1	25 PG GEO 106	Fluvial Geomorphology (Theory)						
			Fluvial Geomorphology (Practical)						
		25 PG GEO 107	Social and Spatial Inequalities (Theory)						
			Social and Spatial Inequalities (Practical)						
		25 PG GEO 108	Principles and Practices of Disaster Risk Reduction (Theory)	3	3	50	20	70	3 Hours
			Principles and Practices of Disaster Risk Reduction (Practical)	1	2	20	10	30	1.5 Hours
		25 PG GEO 109	Theories and Models of Regional Development (Theory)						
			Theories and Models of Regional Development (Practical)						
		25 PG GEO 110	Foundations of Geospatial Technology (Theory)						
			Foundations of Geospatial Technology (Practical)						
		25 PG GEO 111	MOOC/SWAYAM						

CC-1			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Principles of Geomorphology		
Course Code	25PG-GEO-101		
Course Type	CC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand and explain the fundamental concepts and processes in geomorphology. 2. Analyze the evolution of landforms in relation to structure, process, and time. 3. Evaluate different geomorphic theories and apply them in interpreting landscapes. 4. Use topographic maps, field techniques, and GIS tools to identify and map landforms.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Foundations and Approaches in Geomorphology:** Nature, scope, and significance of geomorphology in Earth system science, Historical development of geomorphic thought: Davisian, Penckian, and Dynamic Equilibrium, Systems approach and process-response models, Contemporary trends: Process geomorphology, tectonic geomorphology, and environmental geomorphology.	15
II	**Earth Surface Processes and Landform Development:** Endogenic processes: volcanism, earthquakes, folding and faulting, mountain building, Exogenic processes: weathering, mass movement, erosion, transportation, and deposition, Geomorphic agents and associated landforms: fluvial, glacial, aeolian, coastal, and karst systems	15

III	**Tectonic and Climatic Geomorphology:** Plate tectonics and landform evolution, Neo-tectonics and active tectonics in landscape modification, Climatic geomorphology: landforms in arid, humid, periglacial, and tropical regions, Quaternary landscape evolution: glacial-interglacial cycles and sea-level changes.	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Lab Exercises/ Practicum:** 1. Interpretation of topographic maps & Aerial Photographs for geomorphic features (2) 2. Slope analysis: clinographic, hypsometric, and gradient analysis (2) 3. Drainage basin and network analysis (stream order, bifurcation ratio, density) (2) 4. Landforms Interpretation and Analysis with Digital Elevation Models (DEMs) (2) 5. Field identification and interpretation of landforms and geomorphic processes (local/nearby region) (1) 6. Prepare a geomorphic map using GIS tools. (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Huggett, R. J. (2011). *Fundamentals of geomorphology* (3rd ed.). Routledge.
2. Summerfield, M. A. (1991). *Global geomorphology*. Prentice Hall.
3. Ritter, D. F., Kochel, R. C., & Miller, J. R. (2011). *Process geomorphology* (5th ed.). Waveland Press.
4. Kale, V. S., & Gupta, A. (2001). *Introduction to geomorphology*. Orient Blackswan.Burbank,
5. D. W., & Anderson, R. S. (2011). *Tectonic geomorphology* (2nd ed.). Wiley-Blackwell.
6. Anderson, R. S., & Anderson, S. P. (2010). *Geomorphology: The mechanics and chemistry of landscapes*. Cambridge University Press.
7. Huggett, R. J. (2011). *Fundamentals of geomorphology (3rd ed.).* Routledge.
8. Summerfield, M. A. (1991). *Global geomorphology*. Prentice Hall.
9. Kale, V. S. (2014). *Landscape processes and landforms of India.* Springer.
10. Sharma, V. K. (2010). *Coastal geomorphology.* Concept Publishing Company.
11. Gregory, K. J. (2010). *The Earth's land surface: Landforms and processes in geomorphology.* SAGE Publications.
12. Selby, M. J. (1993). *Hillslope materials and processes (2nd ed.).* Oxford University Press.
13. Twidale, C. R. (2004). *River patterns and their meaning*. Nova Science Publishers.
14. Fairbridge, R. W. (Ed.). (1968). *Encyclopedia of geomorphology*. Reinhold Book Corporation.
15. Goudie, A. S. (2004). *The human impact on the natural environment: Past, present, and future* (6th ed.). Blackwell Publishing.

CC-2			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Advanced Climatology		
Course Code	25PG-GEO-102		
Course Type	CC-2		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Explain advanced atmospheric processes and global climate systems using theoretical and empirical perspectives. 2. Analyze spatial and temporal patterns of climate variability using climatological datasets. 3. Evaluate the science and evidence of climate change and its regional and global impacts. 4. Apply remote sensing, GIS, and statistical tools for climatic data analysis and visualization.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Advanced Atmospheric Processes and Global Climate System:** Structure and thermodynamics of the atmosphere, Global energy balance, radiation laws, and heat transfer mechanisms, General circulation of the atmosphere, Walker circulation, jet streams, ENSO, and monsoon systems, Atmospheric stability, cloud microphysics, and precipitation processes, Contemporary approaches: numerical modeling, climate system feedbacks, Earth system science perspective	15

II	**Climate Classification, Variability, and Dynamics:** Classical and modern climate classifications (Köppen, Thornthwaite, Trewartha, and empirical/statistical systems), Inter-annual, decadal, and centennial climate variability (ENSO, NAO, PDO), Paleoclimatology: proxies, methods, and climatic reconstructions, Regional climatology with special reference to India: monsoon dynamics, droughts, and extreme weather events, Synoptic and mesoscale meteorology; role of teleconnections.	15
III	**Climate Change Science and Applications:** IPCC framework, greenhouse gases, radiative forcing, and anthropogenic emissions, Climate models and scenarios (GCMs, RCMs, downscaling techniques), Observed and projected climate trends (temperature, precipitation, sea-level rise), Impacts on ecosystems, agriculture, water resources, and human health, Climate change mitigation, adaptation, and policy (UNFCCC, Paris Agreement), Role of geospatial technologies in climate research, Anthropogenic impacts on geomorphic systems (urbanization, mining, damming)	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Interpretation of synoptic weather maps and weather symbols (2) 2. Preparation of isopleth maps (isotherms, isohyets) using GIS (2) 3. Time series analysis of temperature and rainfall data (trend detection) (2) 4. Correlation and regression analysis of climatic variables (2) 5. Field visit to a weather observatory and recording of the observations from various instruments (01) 6. Introduction to climate model outputs and scenario mapping (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Barry, R. G., & Chorley, R. J. (2010). *Atmosphere, weather and climate* (9th ed.). Routledge.
2. Lutgens, F. K., & Tarbuck, E. J. (2013). *The atmosphere: An introduction to meteorology* (12th ed.). Pearson.
3. Critchfield, H. J. (2013). *General climatology* (4th ed.). Prentice Hall.
4. Aguado, E., & Burt, J. E. (2018). *Understanding weather and climate* (7th ed.). Pearson.
5. Lal, D. S. (2012). *Climatology* (4th ed.). Sharda Pustak Bhawan.
6. IPCC. (2021). *Climate change 2021: The physical science basis*. Cambridge University Press.
7. Trenberth, K. E. (Ed.). (2005). *Climate system modeling*. Cambridge University Press.
8. Peixoto, J. P., & Oort, A. H. (1992). *Physics of climate*. Springer.
9. Singh, M. B. (2015). *Applied climatology*. Rawat Publications.
10. Dash, S. K. (2006). *Climate change: An Indian perspective*. Cambridge University Press India.
11. Tyndall Centre for Climate Change Research. (Various Reports).
12. Indian Meteorological Department (IMD) reports and bulletins.

CC-3			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Population and Development		
Course Code	25PG-GEO-103		
Course Type	CC-3		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Explain demographic theories, transitions, and spatial population structures in developed and developing regions. 2. Analyze the relationships between population growth, human development, resources, and environmental sustainability. 3. Evaluate contemporary population issues such as migration, ageing, urbanization, and gender disparities. 4. Apply demographic data, GIS tools, and statistical techniques to population mapping and regional analysis.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Population Theories, Patterns, and Transitions:** Nature, scope, and significance of population geography**,** Classical and modern demographic theories: Malthus, Marx, Neo-Malthusianism, Demographic Transition**,** Spatial distribution and density of population: global and regional patterns**,** Population structure: age-sex pyramid, dependency ratio, literacy, and workforce participation**,** Population data sources and reliability: census, surveys, civil registration.	15

II	**Population and Development Interface:** Population growth and its relationship with economic and human development, Population-resource-environment nexus, Sustainable development goals (SDGs) and demographic indicators, Urbanization, internal migration, and development corridors, Population policies: comparative review (India, China, Sweden, Kenya).	15
III	**Contemporary Issues in Population and Spatial Analysis:** Population ageing and implications for health and economy, Gender and population: sex ratio, female literacy, reproductive health, and empowerment, Climate change and population vulnerability (environmental migration, climate refugees), Role of geospatial technologies in population mapping and demographic change, Contemporary tools: Population dashboards, UN DESA, IPUMS, WorldPop	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Construction and interpretation of age-sex pyramids (static and progressive)(2) 2. Analysis of population growth rates and doubling time using census data (2) 3. Calculation of population density, dependency ratio, literacy rate (2) 4. Spatial mapping of population indicators using GIS (e.g., district-level census data) (2) 5. Analysis of Human Development Index (HDI) and other demographic indicators (01) 6. Case study report on a contemporary population issue (e.g., migration, ageing, gender) (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Chandna, R. C. (2020). *Geography of population: Concepts, determinants and patterns* (12th ed.). Kalyani Publishers.
2. Clarke, J. I. (1972). *Population geography*. Pergamon Press.
3. Weeks, J. R. (2021). *Population: An introduction to concepts and issues* (13th ed.). Cengage Learning.
4. Trewartha, G. T. (1969). *A geography of population: World patterns*. John Wiley & Sons.
5. Bhende, A. A., & Kanitkar, T. (2019). *Principles of population studies* (8th ed.). Himalaya Publishing House.
6. Dyson, T. (2010). *Population and development: The demographic transition*. Zed Books.
7. UNFPA. (2023). *State of world population report*. United Nations.
8. Desai, S. et al. (2021). *India Human Development Survey*. National Council of Applied Economic Research.
9. UNDP. (2022). *Human development report*. https://hdr.undp.org/
10. Poston, D. L., & Bouvier, L. F. (2010). *Population and society: An introduction to demography* (2nd ed.). Cambridge University Press.
11. Mitchell, R. (2009). *Environmental geography*. Oxford University Press.
12. IPUMS. (n.d.). *Integrated Public Use Microdata Series*. https://ipums.org/

CC-4			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Statistical Methods in Geography		
Course Code	25PG-GEO-104		
Course Type	CC-4		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Explain demographic theories, transitions, and spatial population structures in developed and developing regions. 2. Analyze the relationships between population growth, human development, resources, and environmental sustainability. 3. Evaluate contemporary population issues such as migration, ageing, urbanization, and gender disparities. 4. Apply demographic data, GIS tools, and statistical techniques to population mapping and regional analysis.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Fundamentals of Statistical Analysis in Geography**: Nature and significance of statistical methods in geography, Types and sources of data: primary, secondary, spatial, and temporal data, Measures of central tendency and dispersion (mean, median, mode, standard deviation, coefficient of variation), Probability distributions: normal, binomial, and Poisson, Data visualization: histograms, box plots, scatter diagrams, cartograms.	15

II	**Correlation, Regression, and Hypothesis Testing:** Bivariate and multiple correlation analysis, Linear regression: applications in spatial and environmental studies, Hypothesis formulation, significance testing, levels of confidence, Parametric and non-parametric tests: t-test, chi-square, ANOVA, Mann-Whitney U-test.	15
III	**Multivariate and Spatial Statistical Techniques:** Principal Component Analysis (PCA) and Factor Analysis, Cluster analysis and spatial classification, Discriminant analysis and canonical correlation, Time series analysis and trend forecasting in climatology and demography, Introduction to geostatistics: kriging, interpolation, and spatial modelling, Use of R, SPSS, and GIS for spatial statistical computation.	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Descriptive statistics and data visualization using Excel and SPSS (02) 2. Correlation and regression analysis of geographical data (02) 3. Principal Component and Factor Analysis using SPSS or R (02) 4. Spatial autocorrelation and mapping using Moran's I in GIS (02) 5. Trend and time series analysis in climate or population datasets (01) 6. Application of kriging/interpolation using GIS (QGIS/ArcGIS) (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Mahmood, A. (1977). *Statistical methods in geographical studies*. Rajesh Publications.
2. Gregory, S. (1978). *Statistical methods and the geographer*. Longman.
3. Ebdon, D. (1985). *Statistics in geography: A practical approach* (2nd ed.). Blackwell.
4. Hammond, R., & McCullagh, P. S. (1980). *Quantitative techniques in geography: An introduction* (2nd ed.). Oxford University Press.
5. Rogerson, P. A. (2015). *Statistical methods for geography: A student's guide* (4th ed.). Sage.
6. Wong, D. W. S., & Lee, J. (2005). *Statistical analysis with ArcGIS*. Wiley.
7. Johnston, R. J., & Semple, R. K. (2010). *A quantitative revolution in geography*. Routledge.
8. de Smith, M. J., Goodchild, M. F., & Longley, P. A. (2018). *Geospatial analysis: A comprehensive guide* (6th ed.). Winchelsea Press.
9. Brunsdon, C., & Comber, L. (2015). *An introduction to R for spatial analysis and mapping*. Sage.
10. Yeates, M., & Garner, B. (1976). *Quantitative methods in geography: An introduction*. McGraw-Hill.
11. Sarkar, A. (2013). *Practical geography: A systematic approach*. Orient BlackSwan.
12. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of geographical information systems* (2nd ed.). Oxford University Press.

CC-5			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Digital Cartography & Morphometric Analysis (Practical)		
Course Code	25PG-GEO-105		
Course Type	CC-5		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Develop proficiency in digital mapping using GIS tools and cartographic principles. 2. Analyze terrain features using morphometric techniques with spatial datasets. . 3. Apply GIS-based tools and DEMs to interpret surface processes and watershed dynamics. 4. Design high-quality cartographic outputs and quantitative morphometric reports.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	**3 hours**		
Part B- Contents of the Course			

Instructions for Lab Exercises & Practical Record: Students are required to complete all practical exercises outlined in the syllabus, ensuring that at least 7–8 exercises are prepared and documented from each unit. Proper pagination and organization of the record are mandatory for appearing in the final examination.

Instructions for Paper- Setter: The examiner shall set eight exercises based on the syllabus, with two exercises from each unit. Students are required to attempt four exercises, selecting one from each unit. All exercises carry equal marks.

Distribution of Marks for Evaluation

Exercise = l0x4=40 **File Record = 15** **Viva-voce : 15**

Unit	Topics	Contact Hours
I	**Introduction to GIS Interface and Data Management:** Exploring the GIS environment: QGIS, ArcGIS, Global Mapper, Working with vector and raster datasets, Understanding file formats: shapefiles, GeoTIFFs, CSVs, Managing layers, attributes, metadata, Coordinate systems and layer properties. **Understanding Map Scale and Projections:** Types of map scales: representative fraction, verbal, and graphical**,** Understanding coordinate reference systems (CRS) and UTM/Zones**,** Transformation and reprojection of spatial data, Using EPSG codes and custom projections in GIS.	30
II	**Cartographic Design and Thematic Mapping:** Principles of map design: visual hierarchy, color, symbology, typography, Preparation of thematic maps: land use, rainfall, soil, drainage. **Use of classification methods:** natural breaks, quantiles, equal interval, Creating legends, north arrows, scale bars, inset maps, Map layout preparation and export for publication.	30
III	**Terrain Analysis Using Digital Elevation Models (DEMs):** Sources of DEMs: SRTM, ASTER, LiDAR, Generating slope, aspect, hillshade, and contour maps, Elevation profiling and 3D surface visualization, Applications in hazard mapping, urban planning, and watershed studies. **Linear and Areal Morphometric Analysis:** Stream ordering (Strahler and Horton), stream length, bifurcation ratio, Drainage density, stream frequency, texture ratio, Basin shape indices: form factor, circularity ratio, elongation ratio, Relief aspects: basin relief, ruggedness number, relief ratio.	30
IV	**GIS-Based Watershed Delineation and Analysis**: Watershed boundary delineation from DEMs, Flow direction, accumulation, stream network extraction, Sink filling and hydrologic correction, Sub-watershed analysis and prioritization using morphometric parameters. **Small group project:** Digital mapping and morphometric assessment of a selected basin and Interpretation of morphometric outputs in relation to geology and land use etc.	30
Total Contact Hours		120

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ Practicum	30	➢ Practicum	70
o Class Participation:	05	Examination (Lab Exercises, Practical Record & Viva) : 70	
o Seminar/presentation/assignment/quiz/Practical Record etc.:	10		
o Field/Lab Performances:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of geographical information systems* (2nd ed.). Oxford University Press.
2. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). *Geomorphology*. Methuen.
3. Clarke, K. C. (2018). *Getting started with geographic information systems* (6th ed.). Pearson.
4. de Smith, M. J., Goodchild, M. F., & Longley, P. A. (2022). *Geospatial analysis: A comprehensive guide* (7th ed.). Winchelsea Press.
5. Dent, B. D., Torguson, J. S., & Hodler, T. W. (2008). *Cartography: Thematic map design* (6th ed.). McGraw-Hill.
6. Field, K. (2018). *Cartography*. Esri Press.
7. Gorr, W. L., & Kurland, K. S. (2016). *GIS tutorial for ArcGIS Pro 2.6*. Esri Press.
8. Jenson, S. K., & Domingue, J. O. (1988). Extracting topographic structure from digital elevation data. *Photogrammetric Engineering & Remote Sensing, 54*(11), 1593–1600.
9. Kale, V. S. (2014). *Landscape processes and landforms of India*. Springer.
10. Keates, J. S. (1996). *Understanding maps* (2nd ed.). Routledge.
11. Kraak, M. J., & Ormeling, F. J. (2020). *Cartography: Visualization of geospatial data* (4th ed.). Routledge.
12. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems* (4th ed.). Wiley.
13. MacEachren, A. M. (2004). *How maps work: Representation, visualization, and design*. Guilford Press.
14. Monmonier, M. (1996). *How to lie with maps* (2nd ed.). University of Chicago Press.
15. Pearson.Tate, N. J., & Tate, D. M. (2022). *Principles of geospatial data handling*. Wiley-Blackwell.
16. Peterson, M. P. (2014). *Mapping in the cloud*. Guilford Press.
17. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J., & Guptill, S. C. (1995). *Elements of cartography* (6th ed.). Wiley.
18. Sarkar, A. (2015). *Practical geography: A systematic approach* (3rd ed.). Orient BlackSwan.
19. Shukla, S., & Mishra, A. (2016). Morphometric analysis of a watershed using GIS. *Applied Water Science, 6*(1), 11–20.
20. Slocum, T. A., McMaster, R. B., Kessler, F. C., & Howard, H. H. (2009). *Thematic cartography and geovisualization* (3rd ed.).

DEC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Fluvial Geomorphology		
Course Code	25PG-GEO-106		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Explain the processes, dynamics, and evolution of fluvial systems. 2. Interpret fluvial landforms using geomorphological models and concepts. 3. Analyze river basin morphology and channel dynamics using GIS and remote sensing. 4. Apply morphometric and spatial techniques to assess fluvial processes and hazards.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Introduction to Fluvial Geomorphology:** Nature, scope, and development of fluvial geomorphology, Drainage basins: structure, function, and hydrological significance, Stream flow mechanics: discharge, velocity, and energy gradients, Sediment transport: competence, capacity, load types.	15

II	**River Morphology and Landforms:** Channel patterns: straight, meandering, braided, anabranching, Channel geometry and classification (e.g., Rosgen method), Erosional and depositional landforms: floodplains, levees, terraces, alluvial fans, deltas, Channel response to tectonics, climate, and anthropogenic change	15
III	**Contemporary Issues and Applied Fluvial Geomorphology:** River regulation: dams, embankments, channelization and their geomorphic impacts, River hazards: bank erosion, floods, sedimentation, Tools and techniques: use of remote sensing, GIS, DEMs, and hydrological modelling, Case studies from Indian and global river systems (e.g., Ganga, Brahmaputra, Amazon).	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Delineation of a Drainage Basin (01) 2. Estimation of Stream Discharge (02) 3. Understanding and Analyze the Hydrograph and interpret the Catchment Response (02) 4. Mapping and Interpretation of Fluvial Landforms (02) 5. Channel Migration and Floodplain Change Detection (02) 6. Calculate the Hydraulic Power of different Streams (02)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Knighton, D. (2014). *Fluvial forms and processes: A new perspective* (2nd ed.). Routledge.
2. Schumm, S. A. (2005). *River variability and complexity*. Cambridge University Press.
3. Bridge, J. S. (2003). *Rivers and floodplains: Forms, processes, and sedimentary record*. Blackwell.
4. Kondolf, G. M., & Piégay, H. (Eds.). (2003). *Tools in fluvial geomorphology*. Wiley.
5. Brierley, G. J., & Fryirs, K. A. (2005). *Geomorphology and river management*. Blackwell Publishing.
6. Kale, V. S. (2014). *Landscape processes and landforms of India*. Springer.
7. Wohl, E. (2014). *Rivers in the landscape: Science and management*. Wiley-Blackwell.
8. Chorley, R. J., Schumm, S. A., & Sugden, D. E. (1984). *Geomorphology*. Methuen.
9. Thorne, C. R., Hey, R. D., & Newson, M. D. (Eds.). (1997). *Applied fluvial geomorphology for river engineering and management*. Wiley.
10. Richards, K. S. (1982). *Rivers: Form and process in alluvial channels*. Methuen.

DEC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Social and Spatial Inequalities		
Course Code	25PG GEO 107		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Critically analyze the dimensions and drivers of social and spatial inequalities at multiple scales. 2. Examine the role of geography in shaping disparities related to income, health, education, caste, gender, ethnicity, and space. 3. Apply spatial and statistical tools to identify and map inequalities using secondary datasets and GIS techniques. 4. Interpret policies and development strategies in addressing socio-spatial disparities.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Theoretical Foundations and Dimensions of Inequality:** Concepts: inequality, marginality, exclusion, deprivation, and justice, Theories of social inequality: Marxist, liberal, structuralist, postcolonial and feminist perspectives, Types of inequalities: economic, social, political, and spatial, Historical and contemporary processes producing uneven development.	15

II	**Patterns and Determinants of Social and Spatial Inequalities:** Rural-urban divides and intra-urban inequalities, Caste, ethnicity, religion, gender, and class as spatial categories, Regional disparities in income, education, health, and infrastructure, Migration, gentrification, and displacement.	15
III	**Mapping and Addressing Inequalities:** Quantifying inequalities: Lorenz Curve, Gini Coefficient, Theil Index, GIS and Remote Sensing in inequality mapping, Development indicators and Human Development Index (HDI), Public policy, welfare state, inclusive planning, and social justice, Case studies: India (e.g., Aspirational Districts), global South, and global North.	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Mapping socio-economic indicators: Use Census/NSSO data to create thematic maps of literacy, poverty, and employment in GIS. (02) 2. Regional disparities analysis: Visualize inter-regional inequalities using choropleth and graduated symbol maps (02) 3. Gini Coefficient and Lorenz Curve: Calculate and interpret income inequality using statistical tools. (02) 4. Caste/gender segregation mapping: Use GIS to identify spatial segregation based on caste or gender. (01) 5. HDI calculation and mapping: Compute Human Development Index and visualize disparities across districts. (01) 6. Case study with secondary data: Conduct spatial inequality analysis using datasets from NITI Aayog, NFHS, or Census (02)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		
Class Participation	05	Class Participation	Nil	**Theory: 50** **Practicum: 20**
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Dorling, D. (2015). *Inequality and the 1%*. Verso Books.
2. Harvey, D. (2006). *Spaces of global capitalism: Towards a theory of uneven geographical development*. Verso.
3. Sen, A. (1999). *Development as freedom*. Oxford University Press.
4. Massey, D. (1994). *Space, place, and gender*. Polity Press.
5. Smith, N. (2010). *Uneven development: Nature, capital, and the production of space* (3rd ed.). University of Georgia Press.
6. Tilly, C. (1998). *Durable inequality*. University of California Press.
7. NITI Aayog. (2021). *SDG India Index and Dashboard 2020–21*. Government of India.
8. UNDP. (2020). *Human development report 2020: The next frontier—Human development and the Anthropocene*. UNDP.
9. Reardon, S. F., & Bischoff, K. (2011). *Income inequality and population density in US metropolitan areas: 1970–2000*. Demography, 48(1), 143–168.
10. Sen, A., & Drèze, J. (2013). *An uncertain glory: India and its contradictions*. Penguin Books.

DEC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Principles and Practices of Disaster Risk Reduction		
Course Code	25PG GEO 108		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand theoretical foundations, terminologies, and paradigms in disaster risk reduction (DRR). 2. Critically examine natural and anthropogenic disasters and their spatial dimensions. 3. Apply geographic methods and geospatial technologies for hazard mapping and vulnerability assessment. 4. Evaluate disaster mitigation, preparedness, and policy frameworks with a focus on the Sendai Framework and SDGs.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Foundations of Disaster Risk Reduction:** Concepts: hazard, risk, vulnerability, resilience, and capacity, Types of disasters: natural, anthropogenic, and hybrid, Paradigm shift from response to risk reduction, UNDRR and the Sendai Framework for Disaster Risk Reduction (2015–2030).	15

II	**Spatial Dimensions of Disasters:** Physical and human-induced disaster-prone regions of India and the world, Geographic factors influencing vulnerability and exposure, Disaster mapping, zonation, and risk modelling, Urban risk, climate change, and cascading disasters.	15
III	**DRR Strategies, Policy, and Institutional Frameworks:** Structural and non-structural mitigation measures, Community-Based Disaster Risk Reduction (CBDRR), Role of NDMA, SDMA, UNDRR, Red Cross, and NGOs, Integration of DRR into development planning and climate resilience, Case studies: Cyclone Fani, Kerala Floods, Bhuj Earthquake, Bhopal Gas Tragedy etc.	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Hazard zonation mapping using GIS (e.g., earthquake or flood-prone areas). (02) 2. Preparation of disaster vulnerability maps using socio-economic and physical indicators. (02) 3. Temporal analysis of disaster events using historical data and trends (02) 4. Risk matrix and disaster severity indexing for selected case studies. (01) 5. Mapping critical infrastructure and service accessibility in disaster-prone zones. (01) 6. Case study analysis using NDMA/SDMA and UNDRR reports (Sendai indicators, resilience metrics)/ Report on Local Disasters (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/ Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Coppola, D. P. (2015). *Introduction to international disaster management* (3rd ed.). Butterworth-Heinemann.
2. Wisner, B., Gaillard, J. C., & Kelman, I. (Eds.). (2012). *Handbook of hazards and disaster risk reduction and management*. Routledge.
3. Alexander, D. (2000). *Confronting catastrophe: New perspectives on natural disasters*. Oxford University Press.
4. Smith, K., & Petley, D. N. (2009). *Environmental hazards: Assessing risk and reducing disaster* (5th ed.). Routledge.
5. UNDRR. (2015). *Sendai Framework for Disaster Risk Reduction 2015–2030*. United Nations.
6. NDMA. (2020). *National Disaster Management Plan*. Government of India.
7. Shaw, R. (2014). *Disaster risk reduction: Methods, approaches and practices*. Springer.
8. Cutter, S. L. (2006). *Hazards, vulnerability and environmental justice*. Earthscan.
9. Kelman, I., Mercer, J., & Gaillard, J. C. (2017). *The Routledge handbook of disaster risk reduction including climate change adaptation*. Routledge.
10. Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2004). *At risk: Natural hazards, people's vulnerability and disasters* (2nd ed.). Routledge.

DEC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Theories and Models of Regional Development		
Course Code	25PG GEO 109		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Critically evaluate classical and contemporary theories of regional development and planning. 2. Analyze spatial inequalities and regional disparities through quantitative and qualitative lenses. 3. Apply regional development models to real-world geographic contexts. 4. Utilize geospatial tools and regional indicators for planning and policy assessment.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Conceptual and Theoretical Foundations:** Concepts of region, regionalism, development, underdevelopment, and planning, Types of regions: formal, functional, planning, and perceptual, Classical theories: Growth Pole Theory (Perroux), Core-Periphery Model (Friedmann), Cumulative Causation (Myrdal), Rostow's Stages of Growth, Harrod-Domar and Lewis models.	15

II	**Contemporary Models and Approaches:** Dependency and World Systems Theory (Frank, Wallerstein), Sustainable Regional Development: Indicators, SDGs, and resilience, Human Development and Capability Approach (Sen), Spatial Inequality and Territorial Cohesion in a globalized context, Case studies from Global South and India.	15
III	**Regional Planning and Policy Framework:** Types of regional planning: sectoral, spatial, and integrated, Regional development strategies in India: Backward Region Grant Fund (BRGF), NITI Aayog's Aspirational Districts, Decentralized planning and participatory models, Role of institutions, infrastructure, and governance Critique of regional imbalances and policy performance in India.	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Mapping spatial disparities using HDI and per capita income at state levels (2) 2. Preparation of regional typologies using socio-economic indicators (2) 3. Application of Location Quotient (LQ) (01) 4. Calculation and interpretation of regional inequality using Coefficient of Variation and Gini Index (2) 5. Trend analysis of development indicators using Census/NFHS data (02) 6. Overlay of development programs (e.g., Aspirational Districts) with poverty/education/health maps. (01)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/ Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Friedmann, J. (1966). *Regional development policy: A case study of Venezuela*. MIT Press.
2. Myrdal, G. (1957). *Economic theory and underdeveloped regions*. Harper and Row.
3. Sen, A. (1999). *Development as freedom*. Oxford University Press.
4. Wallerstein, I. (2004). *World-systems analysis: An introduction*. Duke University Press.
5. Richardson, H. W. (1973). *Regional growth theory*. Macmillan.
6. Todaro, M. P., & Smith, S. C. (2020). *Economic development* (13th ed.). Pearson.
7. Glasson, J., & Marshall, T. (2007). *Regional planning* (5th ed.). Routledge.
8. NITI Aayog. (2021). *SDG India Index & Dashboard*. Government of India.
9. UNDP. (2020). *Human Development Report: The next frontier – Human development and the Anthropocene*.
10. Scott, A. J., & Storper, M. (2015). *The nature of cities: The scope and limits of urban theory*. International Journal of Urban and Regional Research, 39(1), 1–15.

DEC-01			
Session: 2025-26			
Part A - Introduction			
Name of Programme	M.Sc. Geography		
Semester	I		
Name of the Course	Foundations of Geospatial Technology		
Course Code	25PG GEO 110		
Course Type	DEC-1		
Level of the course	500-599		
Pre-requisite for the course (if any)	N.A.		
Course Learning Outcomes (CLO)	1. Understand the fundamental principles of geospatial technologies including GIS, GPS, and remote sensing. 2. Apply spatial data models and tools for real-world geographic problem-solving. 3. Use open-source and commercial GIS software for mapping, analysis, and decision support. 4. Critically evaluate geospatial applications in environment, disaster management, urban planning, and development.		
Credits	Theory	Practical	Total
	3	1	4
Teaching Hours per week	3	2	5
Internal Assessment Marks	20	10	30
End Term Exam Marks	50	20	70
Max. Marks	70	30	100
Examination Time	**3 hours**		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner shall prepare seven questions, selecting two questions from each of the three units, with consideration given to the Course Learning Outcomes (CLOs). Among these, Question No. 1 will be a compulsory question comprising four short parts, each carrying two marks, and collectively covering the entire syllabus. The remaining questions will be descriptive in nature, each carrying 14 marks. Examinees will be required to attempt four questions: the compulsory Question No. 1 and one question from each of the three units.

Unit	Topics	Contact Hours
I	**Fundamentals of Geospatial Technology:** Introduction to geospatial technologies: GIS, Remote Sensing, GPS, Web GIS, Spatial data types: raster vs. vector, attributes and metadata, Coordinate systems: Geographic vs. projected; UTM, WGS84, transformations, Open-source and proprietary geospatial software: QGIS, ArcGIS, Google Earth Engine.	15

II	**Spatial Data Models and Processing:** Spatial databases and data formats (Shapefile, GeoTIFF, KML, GPKG), Topology and spatial relationships, Geospatial data collection: digitization, GPS field data, crowdsourced platforms (OSM), Data quality, accuracy, and standards (FGDC, ISO).	15
III	**Applications and Contemporary Trends:** Applications: urban planning, environmental monitoring, disaster risk reduction, agriculture, and public health, Introduction to spatial analysis: overlay, buffer, proximity, raster operations, Emerging trends: AI in GIS, drone mapping, cloud-based platforms (GEE, ArcGIS Online), Ethical and legal considerations: geoprivacy, data sharing, licensing	15
IV	**Instructions for external practical examiner:** There will be three questions in all and candidate has to attempt two exercises. Distribution of marks for evaluation *Exercise = 10 marks File record = 5 marks Viva-Voce = 5 marks* **Exercises:** 1. Familiarization with GIS interface (QGIS/ArcGIS): Loading and visualizing raster and vector data (02) 2. Working with coordinate systems and projections: CRS assignment, transformation, and reprojection (02) 3. Digitization and editing of spatial features from toposheets or satellite imagery (02) 4. Attribute data handling and table joins: Querying and data management in GIS (02) 5. Georeferencing scanned maps using control points (02) 6. Buffering, overlay, and spatial query tools for spatial analysis (03)	30
Total Contact Hours		75

Suggested Evaluation Methods

Internal Assessment: 30				**End Term Examination: 70**
Theory: 20		**Practicum: 10**		**Theory: 50** **Practicum: 20**
Class Participation	05	Class Participation	Nil	
Seminar/presentation/assignment/quiz/class test etc.:	05	Seminar/ Demonstration/Viva-voce/Lab records etc.:	10	
Mid-Term Exam	10	Mid-Term Exam	Nil	

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of geographical information systems* (2nd ed.). Oxford University Press.
2. Chang, K. T. (2020). *Introduction to geographic information systems* (9th ed.). McGraw-Hill Education.
3. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information systems and science* (4th ed.). Wiley.
4. Schowengerdt, R. A. (2007). *Remote sensing: Models and methods for image processing* (3rd ed.). Elsevier.
5. Bolstad, P. (2019). *GIS fundamentals: A first text on geographic information systems* (6th ed.). Eider Press.
6. Tomlinson, R. (2007). *Thinking about GIS: Geographic information system planning for managers* (4th ed.). Esri Press.
7. Jensen, J. R., & Jensen, R. R. (2013). *Introductory geographic information systems*. Pearson.
8. Open Geospatial Consortium (OGC). (2021). *OGC Standards and Best Practices*. https://www.ogc.org
9. U.S. Geological Survey (USGS). (2020). *EarthExplorer and Landsat User Guide*. https://earthexplorer.usgs.gov