



SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

(Formerly University of Pune)

Two-Year Post Graduate Programme in Geography

Faculty of Science and Technology

Choice Based Credit System (CBCS)

Syllabi for

M. A. / M. Sc Geography

Department of Geography, Savitribai Phule Pune University

Syllabi as per guidelines of National Education Policy 2020

To be implemented from Academic Year 2023-2024

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

Department of Geography

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography

Title of the Programme: M.A. / M.Sc. Geography

Preamble:

National Education Policy 2020 lays particular emphasis on the development of creative potential of each individual. It is based on the principle that education must develop not only cognitive capacities - both the 'foundational capacities' of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving – but also social, ethical, and emotional capacities and dispositions. On behalf of the new education policy, Savitribai Phule Pune University has decided to change the syllabi of various faculties from June 2023. Taking into consideration the rapid changes in science and technology and new approaches in different areas of Geography and related subjects, the syllabus of M. A. / M. Sc. Semester - I and Semester- II (w.e.f. 2023-2024) Geography programme were prepared under the Choice Based Credit System (CBCS). The model curriculum as developed by NEP 2020 is used as a guideline for the present syllabi. The syllabi focus on credits related to major core, major elective, research methodology, internship / On job training (OJT) and research projects.

Aims and Objectives of the new curriculum:

- i. To update the curriculum as per the NEP 2020 guidelines.
- ii. To incorporate recent development in the field of Geography.
- iii. To enhance the quality and standards of knowledge of Geography.
- iv. To establish a comprehensive and inclusive platform that encourages exchange mobility and open dialogue among the fraternity of Indian geographers.
- v. To cultivate an aptitude for geography in students who demonstrate potential for advanced studies and creative endeavors within the field.
- vi. Regardless of whether a student decides to leave after the first year, they will still be presented with job opportunities that match their acquired skill set.
- vii. Building confidence in students for empowering themselves with different aspects of Geography that are required for various branches of sciences and humanities.
- viii. To impart knowledge that will enable students to pursue higher studies and engage in research work within their areas of interest.
- ix. Provide job-oriented skills to the students with multiple entry and exit option.

- x. To inculcate interdisciplinary and multidisciplinary approach in the curriculum.
- xi. To enhance employability and entrepreneurship skill among the students.
- xii. To foster research and innovative skills among the students.

Name of the Programme: M. A. / M. Sc. Geography

Programme Specific Outcome (PSO):

On completion of the Two-year Post Graduation in Geography, students will:

1. possess an enriched and comprehensive knowledge of Geography and its practical applications across various disciplines.
2. develop a strong sense of environmental values, being well-informed about sustainable development goals, as well as various cross-cutting issues affecting our planet.
3. augment their skills in spatial analysis through the application of statistical techniques, geospatial tools, and by keeping abreast of emerging trends, theories, and models in the field.
4. be able to analyze, compare, and critically evaluate concepts and content relevant to competitive examinations and global contexts, nurturing a deeper understanding of global issues.
5. demonstrate knowledge and expertise in field excursions, advanced surveying techniques, and digital map-making, aiding them to interpret and represent geographical data effectively.
6. be proficient in research writing, preparing manuscripts, and designing research projects.
7. develop essential employability and entrepreneurship skills, making them well-prepared for market jobs or for establishing their own endeavours in relevant fields.
8. apply geographical knowledge, tools, and techniques to address various geo-environmental and human challenges, contributing to effective problem-solving.
9. recognize the significance of resource management, regional planning, and sustainable development, ensuring responsible and informed decision-making.
10. prioritize diverse emerging issues, trends and techniques effectively in real-time geographical problems, leading to positive contributions to both society and the environment.

Savitribai Phule Pune University, Pune

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography (Level 6.0)
Department of Geography, Savitribai Phule Pune University

M. A./ M. Sc. Geography (Year I, Semester I)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits		
					T	P			
6.0	First Semester	Major Core	GEO 501	Fundamentals of Geomorphology	02	--	02		
			GEO 502	Fundamentals of Climatology	02	--	02		
			GEO 503	Fundamentals of Economic Geography	02	--	02		
			GEO 504	Fundamentals of Population and Settlement Geography	02	--	02		
			GEO 505	Introduction to Statistical Methods in Geography	02	--	02		
			GEO 506	Practicals in Physical Geography	--	02	02		
			GEO 507	Practicals in Human Geography	--	02	02		
			Total credits related to Major Core					10	04
		Group A							
				GEO 511	Geography of India	02	--	02	
				GEO 512	Practicals in Cartographic Techniques	--	02	02	
		Group B							
				GEO 513	Introduction to Remote Sensing	02	--	02	
				GEO 514	Practicals in Remote Sensing and Map Interpretation	--	02	02	
		Group C							
				GEO 515	Disaster Management	02	--	02	
				GEO 516	Basics of Geospatial Techniques: Practical	--	02	02	
		Total Credits related to Major Electives					02	02	04
				Research Methodology	GEO 521	Research Methodology	04	--	04
		Semester I- Total Credits					16	06	22

Vertical Group (Semester - I)	Credit for Theory	Credit for Practical	Total Credit
Total Credits related to Major Core	10	04	14
Total Credits related to Major Electives	02	02	04
Research Methodology	04	--	04
Total Credits	16	06	22

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Syllabi as per NEP 2020 for M.A. / M.Sc. Geography
Department of Geography, Savitribai Phule Pune University

M. A./ M. Sc. Geography (Year I, Semester II)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits
					T	P	
6.0	Second Semester	Major Core	GEO 531 – 538	Special Core – 1 (Theory) (Select any one as per specialization) GEO 531: Coastal Geomorphology GEO 532: Synoptic Climatology GEO 533: Agricultural Geography GEO 534: Population Geography GEO 535: Environmental Geomorphology GEO 536: Regional Climatology GEO 537: Geography of Resources GEO 538: Population Resources and Planning	04	--	04
			GEO 541 – 548	Special Core – 1 (Practicals) (Select any one as per specialization) GEO 541: Coastal Geomorphology: Practical GEO 542: Synoptic Climatology: Practical GEO 543: Agricultural Geography: Practical GEO 544: Population Geography: Practical GEO 545: Environmental Geomorphology: Practical GEO 546: Regional Climatology: Practical GEO 547: Geography of Resources: Practical GEO 548: Population Resources and Planning: Practical	--	02	02
			GEO 551	Geographical Thought	02	--	02
			GEO 561 - 568	Special Core – 2 (Theory) (Select any one as per specialization) GEO 561: Fluvial Geomorphology GEO 562: Applied Climatology GEO 563: Geography of Tourism GEO 564: Geography of Rural Settlement GEO 565: Regional Geomorphology of India GEO 566: Urban Climatology GEO 567: Environmental Economic Geography GEO 568: Settlement Planning and Management	04	--	04

			Special Core – 2 (Practicals) (Select any one as per specialization) GEO 571: Fluvial Geomorphology: Practical GEO 572: Applied Climatology: Practical GEO 573: Geography of Tourism: Practical GEO 574: Geography of Rural Settlement: Practical GEO 575: Regional Geomorphology of India: Practical GEO 576: Urban Climatology: Practical GEO 577: Environmental Economic Geography: Practical GEO 578: Settlement Planning and Management: Practical	---	02	02	
			Total credits related to Major Core	10	04	14	
	Major Elective (Select any one group)	Group A					
		GEO 581	Geography of Health	02	--	02	
		GEO 582	Surveying: Practical	--	02	02	
		Group B					
		GEO 583	Geography of South Asia	02	--	02	
		GEO 584	Digital Cartography: Practical	--	02	02	
		Group C					
		GEO 585	Environmental Geography	02	--	02	
		GEO 586	Bivariate Statistical Methods	--	02	02	
		Group D					
		GEO 587	Introduction to Geographical Information System	02	--	02	
		GEO 588	Practicals in Geographical Information System	--	02	02	
			Total Credits related to Major Electives	02	02	04	
	On Job Training	GEO 591	On Job Training (Student should complete on job training not less than 60 clock hours)			04	
		Sem. II Total Credits = Major Core + Major Elective + OJT			12	06	22

Vertical Group (Semester - II)	Credit for Theory	Credit for Practical	Total Credit
Total credit related to Major Core	10	04	14
Total Credits related to Major Electives	02	02	04
On Job Training	--	--	04
Total Credits	12	06 + 04	22

Savitribai Phule Pune University, Pune

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography (Level 6.5)

Department of Geography, Savitribai Phule Pune University

M. A. / M. Sc. Geography (Year II, Semester III)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits
					T	P	
6.5	Third Semester	Major Core	GEO 601 - 604	Special Core – 3 (Theory) (Select any one as per specialization from following) GEO 601: Tropical Geomorphology GEO 602: Monsoon Climatology GEO 603: Geography of Development GEO 604: Geography of Migration	04	--	04
			GEO 611- 614	Special Core – 3 (Practicals) (Select any one as per specialization from following) GEO 611: Tropical Geomorphology: Practical GEO 612: Monsoon Climatology: Practical GEO 613: Geography of Development: Practical GEO 614: Geography of Migration: Practical	--	02	02
			GEO 621	Essentials of Watershed Management	02	--	02
			GEO 631- 634	Special Core – 4 (Theory) (Select any one as per specialization from following) GEO 631: Geomorphology: Theoretical and Applied GEO 632: Agro-Meteorology GEO 633: Contemporary Economic Geography GEO 634: Urban Geography	04	--	04
			GEO 641 - 644	Special Core - 4 (Practicals) (Select any one as per specialization from following) GEO 641: Geomorphology - Theoretical and Applied: Practical GEO 642: Agro-Meteorology: Practical GEO 643: Contemporary Economic Geography: Practical GEO 644: Urban Geography: Practical	--	02	02
			Total credit related to Major Core				

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits		
					T	P			
6.5	Third Semester	Major Elective (Select any one group)	Group A						
			GEO 651	Political Geography	02	--	02		
			GEO 652	Regional Planning	02			02	
			Group B						
			GEO 653	Multivariate Statistics in Geography	02	--	02		
			GEO 654	Multivariate Statistics in Geography: Practicals	--	02		02	
			Group C						
			GEO 655	Introduction to Python Programming	02	--	02		
			GEO 656	Introduction to Python Programming: Practicals	--	02		02	
			Group D						
			GEO 657	Plant Geography	02				
			GEO 658	Zoogeography	02				
			Research Project	GEO 661	Research Project			04	
Sem. III- Total Credits=Major Core+ Major Elective + RP							22		

Vertical Group (Semester - III)	Credit for Theory	Credit for Practical	Total Credit
Total credit related to Major Core	10	04	14
Total Credits related to Major Electives	02/04	02/00	04
Research Project	----	----	04
Total Credits	12/14	06 / 04 + 04	22

Savitribai Phule Pune University, Pune

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography
Department of Geography, Savitribai Phule Pune University

M. A. /M. Sc. Geography (Year II, Semester IV)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits	
					T	P		
6.5	Fourth Semester	Major Core	GEO 671	Physical Oceanography	02	--	02	
			GEO 672	Oceanography: Marine Resources and Management	02	--	02	
			GEO 673	Geography of Soils	02	--	02	
			GEO 674	Geography of Sustainable Development	02	--	02	
			GEO 675	Advances in Geography (Select any one as per specialization from following) A. Advances in Physical Geography B. Advances in Human Geography	--	02	02	
			GEO 676	Applied Geography: Field Study	--	02	02	
			Total credit related to Major Core				08	04
		Major Elective (Select any one group)	Group A					
			GEO 681	Advance Surveying: Theory	02	--	02	
			GEO 682	Advance Surveying: Practicals	--	02	02	
			Group B					
			GEO 683	Social Geography	02	--	02	
			GEO 684	Cultural Geography	02	--	02	
			Group C					
			GEO 685	Advances in RS and GIS	02	--	02	
			GEO 686	Advances in RS and GIS: Practicals	--	02	02	
		Total Credits related to Major Electives				02	02	04
		Research Project	GEO 691	Research Project: Dissertation				06
Sem. IV Total Credit = Major Core + Major Elective + RP				10	06	22		

Vertical Group (Semester - IV)	Credit for Theory	Credit for Practical	Total Credit
Total credit related to Major Core	08	04	12
Total Credits related to Major Electives	02/04	02/00	04
Research Project			06
Total Credits	10/12	06/04+06	22

Year-I

Semester-I

GEO 501: Fundamentals of Geomorphology (Credits-2)

Course Objectives:

1. To learn basic concepts and theories of Geomorphology, Processes, and landforms with respect to time and scale.
2. To understand the exogenic and endogenic forces responsible for landform formation.
3. To learn different types of landforms and landscape environments.
4. To make acquaint students with concepts related to geomorphological applications.

Topic No.	Topic Name	Number of Lectures
1	The Dynamic Earth Surface: The changing continents, Oceans, Diastrophism and Catastrophism	5
2	The material of the Earth's crust: Rocks and Minerals	4
3	Processes on the Earth's surface: Denudation processes- Erosion and Weathering.	8
4	Landforms on the Earth's surface: Fluvial, Coastal, Aeolian landforms	6
5	Landforms on the Earth's surface: Karst, Glacial and Structural landforms, Introduction to Planetary Geomorphology	7

Course Outcomes:

By the end of the course, the student will:

1. learn the fundamental concepts, processes, theories, and changing nature of the subject.
2. understand the origin and evolution of landforms in different environmental conditions including Fluvial, Coastal, Aeolian, Glacial and Karst landscapes.
3. acquire important knowledge of the application of geomorphology.

Suggested Readings:

1. Kale, V. S., & Gupta, A. (2010). Introduction to Geomorphology. Hyderabad: Universities Press.
2. Ollier, C. D. (1981). Tectonics and Landforms. London: Longman.
3. Singh, S. (2002). Geomorphology, Allahabad: Prayag Pustak Bhawan.
4. Strahler, A. H., & Strahler, A. N. (1992). Modern Physical Geography, New Jersey: John Wileyand Sons.
5. Tarbuck, E. J., & Lutgens, F. K. (2009). Earth Science. New Jersey: Prentice Hall.

GEO 502: Fundamentals of Climatology (Credits-2)

Course Objectives:

1. To introduce students to basic principles of climatology, atmospheric phenomena, weather systems and climate change.
2. To grasp key concepts about atmosphere, its layering, composition, solar and terrestrial radiation, greenhouse effect and heat budget.
3. To understand how different weather elements are measured and factors that affect them.
4. To learn about climate change, how it is detected and its causes.

Topic No.	Topic Name	Number of Lectures
1	The Atmospheric Sciences: Meteorology and Climatology, Nature and Scope of Climatology, Development of Climatology	3
2	Earth's Atmosphere: Evolution, Structure and Chemical Composition of Atmosphere, Ionosphere	5
3	Solar and Terrestrial Radiation, Electromagnetic Spectrum, Latitudinal and Seasonal Variation, Effect of Atmosphere, Green House Effect and Heat Budget, Mechanisms of Heat Transfer	5
4	Temperature Measurements and Controls, Lapse Rate, Temperature Inversion, Types of Inversion	3
5	Atmospheric Pressure and Winds: Pressure Measurement and Distribution; Wind Observation, Measurement, Factors Affecting Wind; Geostrophic Wind and Gradient Wind, Local Winds, Models of General Circulation of the Atmosphere, Jet Stream, Cyclones and Anticyclones	7
6	Atmospheric Moisture: Hydrological Cycle, Forms of Condensation, Precipitation, Types of Precipitation, Measurement of Humidity	4
7	Climate Change: The Climate System, Detection of Climate Change, Natural Causes, Anthropogenic Causes	3

Course Outcomes:

By the end of the course, the student will:

1. know the fundamentals of climatology and its development as a science and branch of geography and know difference between climatology and meteorology.
2. understand different terms in climatology, climatic elements, their measurements and factors that affect them.
3. know the evolution of atmosphere, its composition, structure.

4. possess knowledge of solar and terrestrial radiation, factors that affect it, and also greenhouse effect and heat budget.
5. possess knowledge about general circulation of the atmosphere, relation between pressure and wind, atmospheric moisture and its measurement, air masses, fronts.
6. understand the concept of climate change, its causes.

Suggested Readings:

1. Lal, D. S. (1998). Climatology. Allahabad: Chaitanya Publishing House.
 2. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). The Atmosphere: An Introduction to Meteorology. New Jersey: Pearson Prentice Hall.
 3. Oliver, John E. & Hidore, John J. (2003). Climatology: An Atmospheric Science. Delhi: Pearson Education.
 4. Singh, S. (2005). Climatology. Allahabad: Prayag Pustak Bhawan.
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GEO 503: Fundamentals of Economic Geography (Credits-2)

Course Objectives:

1. To provide students with a comprehensive understanding of various economic systems, including capitalism, socialism, and mixed economies.
2. To enable students to analyze the spatial patterns of economic activities at different scales, ranging from local to global. This includes understanding the location of industries, trade flows, and the factors influencing regional development.
3. To examine the processes and impacts of globalization and regional economic integration on economic geography. Students should understand how global economic forces shape local economies and how countries and regions interact through trade and investment.
4. To explore the relationship between natural resources, the environment, and economic activities. Students should gain insights into the exploitation and management of resources, as well as the environmental impacts of economic processes.

Topic No.	Topic Name	Number of Lectures
1	Definition, Nature and Scope of Economic Geography	2
2	Approaches to the Study of Economic Geography	2
3	Concepts and Principles in Economic Geography	5
4	Economic Landscape and Economic Systems	4
5	Modes of Transport and Cost of Transport	3
6	Trade Theories	5
7	Models of Industrial Location	5
8	Industrial Regions	4

Course Outcomes:

By the end of the course, the student will:

1. develop skills in analyzing spatial data to understand the distribution of economic activities.
2. be able to analyze complex economic issues, identify problems, and propose appropriate solutions.
3. be able to apply economic theories and concepts to real-world situations. This includes

- utilizing quantitative and qualitative research methods to investigate economic phenomena.
4. understand the interconnectedness of economies and the implications of economic geography on different regions and countries.
 5. be able to effectively communicate their understanding of economic geography through oral presentations, written reports, and class discussions.
 6. Illustrate classification of economies and evaluate the impact of economic policies.

Suggested Readings:

1. Hartshorne, T. A., & Alexander, J. W. (2010). *Economic Geography*. New Delhi: PHI Learning.
 2. Knox, P., Agnew, J., & McCarthy, L. (2008). *The Geography of the World Economy*. London: Hodder Arnold.
 3. Lloyd, P., & Dicken, B. (1972). *Location in Space: A Theoretical Approach to Economic Geography*. New York: Harper and Row.
 4. Siddhartha, K. (2000). *Economic Geography: Theories, Process and Patterns*, New Delhi: Kosalaya Publications.
 5. Smith, D. M. (1971). *Industrial Location: An Economic Geographical Analysis*, New York: John Wiley and Sons.
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GEO 504: Fundamentals of Population and Settlement Geography (Credits-2)

Course Objectives:

1. To introduce the students to the scope and importance of the discipline of Population and Settlement geography.
2. To get clear idea of the evolution and the scope of the discipline, past, present and future scenario of population trends
3. To understand the concepts related to age-sex structures, and rural-urban composition
4. To get acquainted with the concepts of site and situation, classification of settlement, basic models and theories along with examples.

Topic No.	Topic Name	Number of Lectures
1	Population Geography: Definition, Scope, Nature, Approaches, Relation with Other Branches, and Data Sources	4
2	Growth and Distribution of Population: World & India	3
3	Population Dynamics: Fertility, Mortality, Migration and Nuptiality	4
4	Models in Population Geography: DTM, Gravity Model	4
5	Settlement Geography: Definition, Scope, Nature, Relation with other disciplines	4
6	Rural and Urban Settlement Geography: Definition, Concepts, Types, Pattern and Shapes	4
7	Factors affecting: Site and Situation, Classification of Settlement, and Dispersion and Nucleation of settlement	3
8	Models in Settlement Geography: Origin and Morphology	4

Course Outcomes:

By the end of the course, the student will:

1. understand the basic concepts in population and settlement geography
2. acquire knowledge about the population distribution in the world, factors affecting population distribution.
3. identify patterns and processes of population and settlement growth.
4. evaluate the factors influencing the growth of population and settlement.

Suggested Readings:

1. Bhende, A. & Kanitkar, T. (2019). Principles of Population Studies. Mumbai: Himalaya Publishing House.
 2. Chandana, R. C. & Sidhu, M. S. (1980). Introduction to Population Geography. New Delhi: Kalyani.
 3. Clarke, J. F. (1965). Population Geography. Oxford: Pergamon Press.
 4. Garnier, B. (1966). Geography of Population. London: Longman.
 5. Julfikar Hussain. (2021) Settlement Geography. Notion Press
 6. Mandal, R. B. (1979). Introduction to Rural Settlement. New Delhi: Concept Publishing Company.
 7. Nag Prithvish & Debnath G. C. (2021). Population Geography. Bharati Prakashan
 8. Sawant, S. B. (1994). Population Geography. Pune: Mehta Publishing House.
 9. Sivaramakrishnan, K. C., Kundu, A., & Singh, B. N. (2005). Handbook of urbanization in India: an analysis of trends and processes. Oxford University Press.
 10. Singh, R. Y. (1994). Geography of Settlement, Jaipur: Rawat Publication.
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GEO 505: Introduction to Statistical Methods in Geography (Credits-2)

Course Objectives:

1. To familiarize students with basic concepts of statistical methods
2. To acquaint the students with techniques of data analysis
3. To develop a strong foundation in statistical methods and their application to geographical research
4. To increase student's capacity to analyze and interpret statistical data.

Topic No.	Topics	Number of Lectures
1	Introduction: Nature of Geographical Data, Scales of Measurement Types of Data: Primary and Secondary, Discrete and Continuous Scales, Frequency distribution and its Graphical Representation	6
2	Concept and Measures of Central Tendency: arithmetic mean, median and mode, Selection of correct average for representing data	5
3	Concept of dispersion, Absolute and Relative measures of dispersion	5
4	Skewness and Kurtosis: Concept and Types	4
5	Time Series Analysis: Moving Averages	3
6	Concept and types of correlation Concept of regression: Simple and multiple regression, Use of correlation and regression in geographical research	7

Course Outcomes:

By the end of the course, the student will:

1. understand the basic principles of statistics in the context of geography.
2. apply appropriate descriptive statistical technique to analyze geographical data.
3. interpret statistical results effectively.
4. evaluate the use of descriptive statistics in geographical research.

Suggested Readings:

1. Croxton, C., Cowden, D. J., & Klein, S. (1967). Applied general statistics. Prentice Hall, New Jersey.
2. Frank, H., & Althoen, S. C. (1994). Statistics: Concepts and applications. Cambridge University Press.
3. Hammond, R., & McCullagh, P. S. (1985). Quantitative techniques in geography: an introduction. Clarendon Press, Oxford University Press.

4. Mann, P. S. (2020). Introductory statistics. John Wiley & Sons.
 5. O'Brien, L. (2005). Introducing quantitative geography: measurement, methods, and generalized linear models. Taylor & Francis.
 6. Rogerson, P. A. (2019). Statistical methods for geography: a student's guide. Sage Publications, London.
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GEO 506: Practicals in Physical Geography (Credits-2)

Course Objectives:

1. To acquaint the students with the role of geomorphic techniques in geography as the scientific method for understanding landforms.
2. To study the various aspects of profile analysis.
3. To focus on various climatic diagrams.
4. To understand the concept of water budget.

Topic No.	Topics	Number of Practicals
Section A: Geomorphology		
1	Profile Analysis: Longitudinal, Superimposed, Projected and Composite, Intervisibility of Terrains	4
2	Slope and Aspect Maps	3
Section B: Geomorphology		
1	Wind Rose Diagram (Simple and Compound), Climographs, Hythergraphs, Circular Graphs: Climatograph	5
2	Water Budget Diagram	3

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. understand the different types of profile analysis.
2. examine the slope and aspects maps to understand topographical variations.
3. learn important applied aspects of climatology with the help of climatic diagrams.
4. Construct water budget diagram.

Suggested Readings:

1. King, C. A. M. (1966): Techniques in Geomorphology, Edward Arnold Ltd., London
2. Lutgens, F. K. and Tarbuck, E. J. (2010): The Atmosphere: An Introduction to Meteorology, Pearson Prentice Hall, New Jersey
3. Miller, A. A. (1953): The Skin of the Earth, Methuen and Co. Ltd., London

4. Monkhouse, F. J. and Wilkinson, H. R. (1964): Maps and Diagrams: Their Compilation and Construction, Methuen and Co. Ltd., London
 5. Singh, S. (1998): Geomorphology, Prayag Pustak Bhawan, Allahabad
 6. Strahler, A. N. (1964): Quantitative Geomorphology of Drainage Basins and Channel Networks, In: Handbook of Applied Hydrology, Ven Te Chow, Ed., Section 4-II, McGraw-Hill Book Company, New York
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GEO 507: Practicals in Human Geography (Credits-2)

Course Objectives:

1. To impart adequate knowledge and data representation skills.
2. To enhance the understandings framing the questionnaire, data collection, application of models and report writing.

Topic No.	Topic Name	Number of Practicals
Section A: Population and Settlement Geography		
1	Methods of Representing Population and Settlement Data	2
2	Application of Models Using Data: Dependency Ratio, Spatial Interaction Models: Potential Model, Gravity Model	3
3	Methods of Field Study: Preparation of Questionnaire /Interview Schedules and Report Writing	2
Section B: Economic Geography		
4	Methods of Representing and Mapping of Economic Data	3
5	Measures of Transport Network	3
6	Location Quotient	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. understand the various concepts and methods of Human Geography.
2. apply practical knowledge for the analysis of project work as well as research.
3. apply models to different geographical situations.

Suggested Readings:

1. Chorley, R. J., & Hagget, P. (1972). Socio-economic Models in Geography. London: Methuen and Co.
2. Liendsor, J. M. (1997). Techniques in Human Geography. London: Routledge.
3. Lloyd P., & Dicken, B. (1972). Location in Space: A Theoretical Approach to Economic Geography. New York: Harper and Row.
4. Monkhouse, F. J., & Wilkinson, H. R. (1971). Maps and Diagrams. London: Methuen and Co.
5. Wood, A., & Roberts, S. (2011). Economic Geography: Places, Network and Flows. London: Routledge.

GEO 511: Geography of India (Credits-2)

Course Objectives:

1. To provide an in-depth understanding of physiography, drainage and climatic condition of India.
2. To get acquainted with the knowledge of demographic, social and cultural attributes of India.
3. To understand the role of agriculture in Indian economy along with contemporary issues faced in India.

Topic No.	Topic Name	Number of Lectures
1	India: Location, Extent and Administrative Divisions	2
2	Major Physical Regions I: Geology, Physiography and Soil	5
3	Major Physical Regions II: Drainage, Climate, and Vegetation	5
4	Religion, Language and Races	5
5	Population in India: Characteristics and Challenges	5
6	Role of Agriculture in Indian economy; Multinationals and Liberalization; International Trade.	4
7	Contemporary Issues: Energy crisis, Water Security	4

Course Outcomes:

By the end of the course, the student will:

1. explore the diverse physical, social and cultural aspects the country.
2. understand the inter-play between agriculture and industry along with international trade that shapes Indian economy.
3. apply the knowledge of global issues to that are applicable to India.

Suggested Readings:

1. Dutta, R., & Sundaram, K. P. M. (2002). Indian Economy. S. New Delhi: Chand Publications.
2. Kale, V. S. (2014). Landscapes and Landforms of India, Dordrecht: Springer.
3. Khullar D. R. (2011). India A Comprehensive Geography, Ludhiana: Kalyani Publishers.
4. Sharma, H. S., & Kale, V. S. (2009). Geomorphology in India, Allahabad: Prayag Pustak Bhavan.
5. Shivkumar, A. K., Panda, P., & Ved, R.R. (2013). Handbook of Population and Development in India, Oxford: Oxford University Press.

6. Singh, G. (2010). A Geography of India, Delhi: Atma Ram and Sons.
 7. Singh, R. L. (1993). India: A Regional Geography. Varanasi: National Geographical Society of India.
 8. Spate, O. H. K. (1954). A General and Regional Geography, London: Methuen publisher.
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GEO 512: Practicals in Cartographic Techniques (Credits-2)

Course Objectives:

1. Introduce students with various cartographic techniques.
2. To understand the basic components of map and its attributes.
3. To get trained with map scales and projections.

Topic No.	Topic Name	Number of Practicals
1	Nature and Scope of Cartographic Techniques: History and Development and its Importance in GIS Representations.	2
2	Scales, Data and their Representation: Conversion types, Enlargement and reduction of Maps, 2D and 3D diagrams; Map Characteristics: Scale, Accuracy, Extent, Database, and Topology	2
3	Map Projections: Construction of Cylindrical, Conical, Zenithal, and modified	4
4	Plots: Semi-log and log on X and Y axis, Whisker and box methods, Scatter plot	4
5	Maps and their types: Choropleth, Isopleth Dot, Map Features: Point, Line, and Polygon	3

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. acquire skills in map-making and spatial representation of geographical data.
2. create two-dimensional and three-dimensional diagrams that will assist in analysing information.
3. utilize the principles of projection and scales for map-making

Suggested Readings:

1. Singh, R. L. (1979): Elements of Practical Geography, Kalyani Publishers, New Delhi
2. Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. Guptill, S. C. (1995): Elements of Cartography, Wiley, New York
3. Ramamurthy, K. (1982): Map Interpretation, Rex Printers, Madras
4. Gupta, K. K. Tyagi, (1992): Working with maps, Survey of India Publication, DST, New Delhi
5. Understanding Map Projection (2003-2004): GIS by ESRI, Redlands
6. Shyam Bhatia (1963): Elementary Map Work Metropolitan book co. pvt. ltd.

GEO 513: Introduction to Remote Sensing (Credits-2)

Course Objectives:

1. To gain knowledge about remote sensing and aerial photography technique, the process, electromagnetic radiation and its use for remote sensing, different platforms, orbits, sensors and cameras.
2. To learn key concepts like atmospheric windows, blackbody and radiation laws.
3. To get familiarize with Indian Remote Sensing Program.

Topic No.	Topic Name	Number of Lectures
1	Remote Sensing: Definition, Principle, History, Stages and Types, Advantages of Remote Sensing, Platforms, Satellites – Types and Orbits	6
2	Electromagnetic Radiation (EMR): Characteristics, EMR Spectrum, Blackbody, Radiation Laws	5
3	Interaction of EMR with Atmosphere and Earth's Surface: Reflection, Absorption, Transmission, Scattering and Refraction. Atmospheric Windows	5
4	Sensors and Scanning Systems, Sensor Performance Parameters, MSS and DEM Images, FCC and TCC	4
5	Fundamentals of Aerial Photography, Aerial Cameras, Geometric Characteristics of Aerial Photographs	4
6	Photo Scale, Image Displacement, Parallax and Stereoscopy, Elements of Photo Interpretation, Digital Photogrammetry	3
7	Indian Remote Sensing Satellites – Indian Remote Sensing Program, Satellite Series, Sensors, Resolution	3

Course outcome:

By the end of the course, the student will:

1. gain knowledge about basics of remote sensing, its stages, different platforms, electromagnetic spectrum, black body and radiation laws.
2. understand how electromagnetic radiation interacts with atmosphere, Earth's surface.
3. possess knowledge about aerial photography, measurements from photographs, satellite image, interpretation.

Suggested Readings:

1. Campbell, J. B. (2002), Introduction to Remote Sensing. London: Taylor and Francis.
2. Joseph, G. (2003). Fundamentals of Remote Sensing, Hyderabad: University Press.
3. Ollier Lillesand, T. M., & Ralph, K. W. (2008). Remote Sensing and Image Interpretation. Singapore: John Wiley and Sons.

4. Sabins, F. F. (1996). Remote Sensing: Principles and Interpretation, San Francisco: W. H. Freeman and Company.
 5. Tempfi, K., Kerle, N., Huurneman, G., & Janssen, L. F. (Eds) (2009). Principles of Remote Sensing – An Introductory Text Book. Netherlands: The International Institute for Geoinformation Science.
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GEO 514: Practicals in Remote Sensing and Map Interpretation (Credits-2)

Course Objectives:

1. To introduce students to different types of colour composite image and their interpretation.
2. To acquaint students with Survey of India toposheets and their interpretation.
3. To familiarize students with different methods of determining aerial photograph scale, determination of object height and satellite data formats.

Topic No.	Topic Name	Number of Practicals
1	Introduction of SOI toposheets, Indexing, Signs and Symbols, Interpretation of Toposheets	5
2	Interpretation of Satellite Image, Identification of Ground Features, Deriving Land Use and Land Cover Map	3
3	Geometry of Aerial Photograph, Determination of Scale of Aerial Photograph – Different Methods	2
4	Interpretation of Aerial Photograph: Stereopair and Single Image	2
5	Procurement of Satellite Data, Satellite Data Products and Formats	1
6	Estimation of Object Height from Single Vertical Aerial Photograph and Stereopair	1
7	Onscreen Demonstration of Handling Satellite Data with Image Processing Software	1

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course outcome:

By the end of the course, the student will:

1. equipped with the understanding of remote sensing data and its use, particularly satellite images and aerial photographs.
2. trained in calculation of scale of aerial photograph and related basic estimations.

Suggested Readings:

1. Campbell, J. B. (2002), Introduction to Remote Sensing. London: Taylor and Francis.
2. Joseph, G. (2003). Fundamentals of Remote Sensing, Hyderabad: University Press.
3. Ollier Lillesand, T. M., & Ralph, K. W. (2008). Remote Sensing and Image Interpretation. Singapore: John Wiley and Sons.
4. Sabins, F. F. (1996). Remote Sensing: Principles and Interpretation, San Francisco: W. H. Freeman and Company.
5. Tempfi, K., Kerle, N., Huurneman, G., & Janssen, L. F. (Eds) (2009). Principles of Remote Sensing – An Introductory Text Book. Netherlands: The International Institute for Geoinformation Science.

GEO 515: Disaster Management (Credits-2)

Course Objectives:

1. To introduce students the concept of disaster and its connection with Geography.
2. To acquaint the students with the six stages of Disaster Management and their application in different areas as well as their management.
3. To make the students aware of the need for protection and disaster management as well as the use of geospatial technology in Disaster Management.

Topic No.	Topic Name	Number of Lectures
1	Disaster: Meaning, Types- natural and manmade disasters and Stages of Disaster Management	3
2	Preparedness: Concept of preparedness. Public Awareness and Training. Early Warning System for different disasters.	4
3	Risk assessment: Meaning, and calculation of risk, Identification and quantification of Potential Hazards and Vulnerabilities, Potential impact of various disasters	4
4	Response and Emergency Management: Meaning, Response during and after disaster event, setting up of emergency services.	3
5	Mitigation and Risk Reduction: Measures of Mitigation and Risk Reduction, Structural and Non-structural Measures,	4
6	Recovery and Rehabilitation: Long-term rehabilitation efforts. Economic, Social, and Environmental Aspects of Recovery.	4
7	Role of Geography in Disaster Management: Hazard mapping, Resource Allocation, rehabilitation planning	4
8	Geospatial Technology in Disaster Management: Preparedness and Planning, Disaster Mapping, Recovery and Rehabilitation	4

Course Outcomes:

By the end of the course, the student will:

1. understand all the types of natural and manmade disasters.
2. educate all the stages and their disaster-wise severity for the prevention of disasters.
3. develop the ability in the field of management, planning and use of advanced technology in Disaster Management.

Suggested Readings:

1. Alexander, D. E. (2013). Natural Disasters. Springer.
2. Coppola, D. P. (2015). Introduction to International Disaster Management. Butterworth-Heinemann.

3. Haddow, G. D., Bullock, J. A., & Coppola, D. P. (2017). Introduction to Emergency Management. Butterworth-Heinemann.
 4. Kreps, G. A., & Drabek, T. E. (Eds.). (2016). Social Vulnerability to Disasters. CRC Press.
 5. Rodriguez, H., Quarantelli, E. L., & Dynes, R. R. (Eds.). (2007). Handbook of Disaster Research. Springer Science & Business Media.
 6. Wisner, B., Gaillard, J. C., & Kelman, I. (2012). Handbook of Hazards and Disaster Risk Reduction. Routledge.
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GEO 516: Basics of Geospatial Techniques: Practicals (Credits-2)

Course Objectives:

1. To introduce students to basics of remote sensing and geographical information systems.
2. To familiarize students with satellite image and aerial photo interpretation.

Topic No.	Topic Name	Number of Practicals
1	Remote Sensing: Definition, Principle, History, Stages and Types, Advantages of Remote Sensing, Platforms, Satellites – Types and Orbits	2
2	Electromagnetic Radiation (EMR): Characteristics, EMR Spectrum, Blackbody, Radiation Laws	2
3	Interaction of EMR with Atmosphere and Earth's Surface: Reflection, Absorption, Transmission, Scattering and Refraction, Atmospheric Windows	2
4	GIS: Definition, History and Development, Advantages of GIS	1
5	Geographical Data Models: Raster and Vector, Spatial and Non-Spatial, Types of Attribute Data, Topology	3
6	Elements of Image Interpretation and Interpretation of Satellite Image	3
7	Scale of Aerial Photograph, Interpretation of Aerial Photograph	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. become familiar with fundamentals of remote sensing and geographical information systems.
2. acquire basic knowledge of photo and image interpretation.

Suggested Readings:

1. Burrough, P. A., & McDonnell, R. A. (1998). Principles of Geographical Information Systems. New York: Oxford University press Inc.
2. Campbell, J. B. (2002), Introduction to Remote Sensing. London: Taylor and Francis.
3. Chang, K. T. (2008). Introduction to Geographic Information Systems. Avenue of the Americas, McGraw-Hill,
4. Environmental Systems Research Institute, Inc. (1998). Understanding GIS: The ARC/INFO Method. Redlands: ESRI Press
5. Joseph, G. (2003). Fundamentals of Remote Sensing, Hyderabad: University Press.
6. Ollier Lillesand, T. M., & Ralph, K. W. (2008). Remote Sensing and Image Interpretation. Singapore: John Wiley and Sons.

GEO 521: Research Methodology (Credits-2)

Course Objectives:

1. To develop research aptitude among the students.
2. To provide comprehensive understanding of the technique involved in conducting research.
3. To develop creative and critical thinking skills among the students.
4. To enhance the ability of students to conduct research ethically and meticulously.
5. To prepare the students for future research endeavors.

Topic No.	Topic Name	Number of Lectures
1	Methods of Geographical Studies	4
2	Research: Definition, Types (Pure and Applied), Classification	6
3	Routes of Explanation: Inductive and Deductive	4
4	Hypothesis, Theories, Laws and Models	6
5	Research Question, Objectives and Significance of Research	4
6	Research Design: Data Collection and Analysis	6
7	Recent Trends in Geographical Research: Physical and Human Geography	6
8	Ethics in Scientific Research: Plagiarism, Copyrights	4
9	Scientific Journals (Impact Factor, Citation)	4
10	Intellectual Property Rights	5
11	Presentation of Research Findings: Report Writing, Presentation and Formatting	6
12	Research Proposal	5

Note: a) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. develop research aptitude among the students through comprehensive understanding of core concepts in research, review of research.
2. find the research questions, statement of research problem and frame the aims and objectives of the research.
3. frame research methodology and select appropriate methods.

4. prepare research reports and presentation for publication ethically.
5. able to creative and critical thinking abilities essential for research among the students.

Suggested Readings:

1. Gomez, B., & Jones, J. P. III (2010). Research Methods in Geography: A Critical Introduction. John Wiley and Sons.
 2. Goudie, A. (Ed) (2004): Encyclopedia of Geomorphology, Routledge, London
 3. Gregory, D., Johnston, R., Pratt, G., Watts, M. & Whatmore, S. (2009). The Dictionary of Human Geography. Singapore: Wiley-Blackwell.
 4. Montello, D. and Sutton, P. (2013). An Introduction to Scientific Research Methods in Geography and Environmental Studies. SAGE Publications.
 5. Warf, B. (Ed) (2006). Encyclopedia of Human Geography. London: SAGE Publication
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Year-I Semester-II

GEO 531: Coastal Geomorphology (Credit-4)

Course Objectives:

1. To make the students acquainted with basic concepts of and related to coast, shore and shore zones, coastline, coastal zones and coastal environment.
2. To understand the waves, tides and currents and related concepts.
3. To know the characteristics of coastal sediments, their transportation, and deposition.
4. To understand coastal processes and landforms of erosion, deposition and construction.
5. To know the coastal environment concerning hazard management, and coastal zone management.

Topic No.	Topic Name	Number of Lectures
1	Coastal Environment: An Introduction Coasts and coastlines, importance of coasts	3
2	Coastal Energy: Waves- formation, properties, energy, Classification; Tides- causes, classification, Models; Coastal Currents- Types and importance	9
3	Coastal Processes: Erosion- Process types, causes and effects; Coastal Deposition: Process, causes and effects	5
4	Coastal Sediments: Sediment Dynamics, Types, Sediments in different coastal Environment.	4
5	Coastal Landforms of Erosion and their importance- Sea Cliff, Caves, Stacks, Shore platform	6
6	Coastal Landforms of Deposition and their importance- Beaches, Sandbars, Salt marshes, Tidal flats, Coastal dunes and Deltas	8
7	Classification of Coasts—Primary and Secondary	6
7	Coastal Geomorphology Modelling: Numerical and Conceptual models	6
8	Coastal Hazards and Mitigation Strategies: Storm surges and Flooding, Erosion of Coast, Tsunamis, Sea level rise	4
9	Human Impacts on Coastal Geomorphology: Coastal Development, Engineering projects, Residential and Recreational Activities.	4
10	Coastal Management and Conservation: Coastal zone management plans, policies and Practices, Integrated Coastal Zone Management (ICZM), CRZ Policy	5

Course Outcomes:

By the end of the course, the student will:

1. be acquainted with concepts related to coast, shore and shore zones, coastline, coastal zones and coastal environment.
2. understand the cause and characteristics of waves, tides and currents and their importance in a coastal environment.

3. know the characteristics of coastal sediments and related environmental conditions.
4. understand coastal processes like erosion, deposition and construction and landforms.
5. understand the coastal environment for hazard management and coastal zone management.

Suggested Readings:

1. Bird, E. C. F. (2020). Coastal geomorphology: An introduction (2nd ed.). John Wiley & Sons.
 2. Cowell, P. J., & Thom, B. G. (2021). Introduction to coastal processes and geomorphology (3rd ed.). Cambridge University Press.
 3. Hesp, P. (2019). Coastal dunes: Ecology and conservation. Cambridge University Press.
 4. Leatherman, S. P., & Booth, D. B. (Eds.). (2020). Coastal erosion and wetland change in Louisiana: A digital atlas illustrating land loss and wetland change in coastal Louisiana. Springer.
 5. Masselink, G., & Hughes, M. (Eds.). (2020). Coastal geomorphology: An introduction. Oxford University Press.
 6. Schwartz, M. L. (2019). Coastal geomorphology: An introduction (2nd ed.). Rowman & Littlefield Publishers.
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GEO 532: Synoptic Climatology (Credits-4)

Course Objectives:

1. The prime objective of the course is to train students in various key concepts of synoptic climatology.
2. To learn about atmospheric motion, its stability and the role played by different lapse rates in atmospheric stability.
3. To acquire knowledge of air masses and fronts, their classification and weather associated.
4. To gain an understanding of how cyclones form, how precipitation occurs and about weather patterns.
5. To comprehend forecasting techniques and application of climatology knowledge in different fields.

Topic No.	Topic Name	Number of Lectures
1	Introduction, Definition, Scope of Synoptic Climatology, Weather Observations and Analysis, Synoptic Charts	4
2	Synoptic Scale Motions – Global Scale, Synoptic Scale, Meso Scale, Laws of Motion, Atmospheric Forces	4
3	Synoptic Charts and Maps, Atmospheric Stability: Dry Adiabatic Lapse Rate and Saturated Adiabatic Lapse Rate, Changes in Stability, Factors Affecting Stability	8
4	Air Masses: Characteristics, Source Regions, Identification and Modification, Major Air Masses of World and the Associated Weather	6
5	Fronts: Frontogenesis, Frontolysis, Characteristics of Fronts, Polar Front Theory, Frontal Types: Cold, Warm, Stationary and Occluded Fronts, Frontal Weather	7
6	Cyclones and Anticyclones: Wave Cyclone, Tropical Cyclone – Origin, Structure, Life Cycle, Rossby Waves and Western Disturbances, Anticyclones: Cold and Warm Core Systems, Anticyclonic Weather	10
7	Weather Patterns: Precipitation Processes: Ice Crystal Theory, Collision Coalescence Theory, Heat and Cold Waves- Classification, Occurrence in India, Thunderstorms- Origin, Stages of Development and Structure, Tornadoes - Development	9
8	Synoptic Scale Forecasting: Types – Short, Medium and Long Range, Methods – Climatological, Synoptic, Trend, Persistence, Analog, Numerical Weather Prediction	5
9	Application of Synoptic Climatology in Pollution Studies, Aviation and Navigation, Meteorological Factors Affecting Air Pollution	7

Course Outcomes:

By the end of the course, the student will:

1. understand the nature of synoptic climatology, synoptic scale motions, synoptic charts.
2. develop understanding of atmospheric stability, different lapse rates.
3. possess advanced knowledge about air masses and their classification and modification.
4. comprehend frontogenesis, frontolysis, different types of fronts and frontal weather.
5. gain knowledge about cyclones anticyclones, their formation, structure and associated weather
6. will learn about precipitation processes, heat waves, forecasting and applications of synoptic climatology in various fields.

Suggested Readings:

1. Barry, R. G., & Perry, A. H. (1973). Synoptic Climatology: Methods and Applications. London: Methuen and Co. Ltd.
 2. Navarra, J. G. (1979). Atmosphere, Weather and Climate. Philadelphia: W. B. Saunders Company.
 3. Petterson, S. (1969). Introduction to Meteorology. New York: McGraw Hill.
 4. Rama Sastry, A. A. (1984). Weather and Weather Forecasting. Publications Division, Ministry of Information and Broadcasting, Government of India, New Delhi
 5. Stringer, E. T. (1972). Foundations of Climatology. New York: W. H. Freeman and Company.
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GEO 533: Agriculture Geography (Credits-4)

Course Objectives

1. To make students aware of the nature scope and origin of the discipline
2. To cover the history present status and future prospects of the agriculture in India and world
3. To analyze the effects of economic physical and social factors on agriculture
4. To learn about the classification perspectives on types of agriculture
5. To explore the relationship between agriculture hunger in food security
6. To study the prospects of globalization and agriculture

Topic No.	Topic Name	Number of Lectures
1	Nature, Scope and Significance of Agricultural Geography, Various Approaches to Study of Agricultural Geography	6
2	Origin and Dispersal of Agriculture	4
3	Physical and Economic Factors Affecting Agriculture, Land Classification	6
4	Basis of Agricultural Classification, Agricultural Types: Intensive, Subsistence, Extensive, Commercial and Plantation Agriculture	8
5	New Perspectives on Types of Agriculture	4
6	Agricultural Regionalization	8
7	Measures of Agricultural Productivity	6
8	Agricultural Land Use Models: Critical Review, Contemporary Perspective	8
9	Crisis of Agriculture, Aspects of Food Security and World Patterns of Hunger	6
10	Globalization and Agriculture	4

Course Outcomes:

By the end of the course, the student will:

1. learn about the evolution, nature and scope of the discipline in its entirety.
2. learn about the contemporary status and relevance of agriculture as an economic activity
3. learn about the types, both, conventional and modern, of Agriculture and their importance.
4. realize the importance of sustainable agriculture and its positive impact on reducing food insecurity.

Suggested Readings:

1. Grigg, D. (1995). An Introduction to Agricultural Geography. London: Routledge.
2. Hussain, M. (1978). Agricultural Geography. Jaipur: Rawat Publication.

3. Singh, J., & Dhillon, S. S. (1994). Agricultural Geography. New Delhi: Tata McGraw Hill Publishing Co. Ltd.
 4. Symons, L. (1970). Agricultural Geography. London: G. Bell and Sons Ltd.
 5. Vaidya, B. C. (1997). Agricultural Land use in India. New Delhi: Manak Publications.
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GEO 534: Population Geography (Credits-4)

Course Objectives:

1. To provide in-depth understanding of population geography.
2. To understand levels, trends and differentials of population dynamics.
3. To learn advanced models and theories and its applications, role of geospatial technology in policy and planning.

Topic No.	Topic Name	Number of Lectures
1	Introduction: Definitions, Nature and Scope, Historical Development, Approaches to Study of Population Geography	5
2	Population Structure and Characteristics	6
3	Theories of Population Growth: Malthus, Optimum Population Theory, Density Principle, Logistic Law, Diet Principle	6
4	Concepts of Mortality, Fertility and Nuptiality, Theories of Fertility: Social capillarity, Cultural Lag, Theory of change and response, Theory of inter-generational wealth flow	8
5	Concepts, Theories of Migration: Ravenstien's Law, Lee's Migration Framework	6
6	Contemporary Population trends: Transitions of Fertility, Mortality and Migration.	6
7	Contemporary Population Issues: Aging, Educational, Population Growth, Displacement	6
8	Climate Change and Population Dynamics	6
9	Population as Recourse: Dose Population hinders Development?	5
10	Population and Health Policies in India and Initiatives at Global Level, Role of Population in Public Health	6

Course Outcomes:

By the end of the course, the student will:

1. get acquainted with the approaches to study population geography, various key concept along with dynamic nature and scope, evolution of Population Geography.
2. comprehend about levels, trends and differentials of population dynamics.
3. be able to criticize and evaluate the implications of key changes in the world's population and associated theories and practice through time.
4. recognize various population issues and evaluate population polices with implication.

Suggested Readings:

1. Aggarwal, S. M. (1974): India's Population Problems, McGraw Hill Publishing Co. Ltd., New

Delhi

2. Berelson, B. (1974): Population Policy in Developed Countries, MacMillan, London
 3. Bhende, A. A. and Kanitkar, T. (2011): Principles of Population Studies, Himalaya Publishing House, Mumbai
 4. Chandana, R. C. (2013): Population Geography, Kalyani Publications, Delhi
 5. Coale, A. J. and Hoover, E. M. (1958): Population Growth and Economic Development in Low Income Countries, Amit Publishers, New Delhi
 6. Desoza, A. A. (1983): Indian Population Problem in Perspective and Social Action, Concept Publications, New Delhi
 7. Hazel, B. R. (1994): Population Geography, Singapore Publishers Pvt. Ltd., Singapore
 8. Rao, V. K. R. V. (1966): Education and Human Resource Development, Allied Publishers, Bombay
 9. Stockwell, E. G. (1968): Population and People, Quadrangle Books, Chicago
 10. UN (1962): Demographic Aspects of Manpower, Report 1, Sex and Age Patterns of Participation in Economic Activities, Population Studies No. 33, New York
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GEO 535: Environmental Geomorphology (Credits-4)

Course Objectives:

1. To understand the role of Geomorphology in the assessment of Environment.
2. To study the characteristics of landforms and Process in the Resources Management.
3. To Understand the Geomorphological Impact due to Natural processes and human activities.

Topic No.	Topic Name	Number of Lectures
1	Introduction to Environmental Geomorphology, Anthropocene: Man as a Geomorphological Agent	5
2	Geomorphological Resources: Geomorphological raw material in construction, Geomorphology and Natural Resources-Soil, Landforms as assets, Geomorphological Impact Assessment (GIA)	8
3	Geomorphology in Land Capability Classification Physiographic Zonation of Land Surface	7
4	Geomorphology in Watershed Management	6
5	Geomorphological Hazards and Environmental Damages: Soil Erosion, Water erosion, Degradation of Land surface, Models of Soil Erosion, Damages caused by Landslides	8
6	Slope Instability: Causes and Effects, Mitigation measures	6
7	Geomorphology and Forest Resources: Distribution, Forest fire	4
7	Geomorphological Impacts- Agriculture, Recreation, Engineering projects.	6
8	Geodiversity, Geomorphosites: Importance and Human Impact	4
9	Geoconservation: Need and Techniques	6

Course Outcomes:

By the end of the course, the student will:

1. be able to understand the role of Geomorphology in Environmental assessment.
2. acquire the skill of assessment of Geomorphological parameters and their role in Environmental analysis.
3. get knowledge of 'How to apply knowledge of Geomorphology?' to address the environmental problems.

Suggested Readings:

1. Anderson, R. S. (2010). Geomorphology: The Mechanics and Chemistry of Landscapes. Cambridge University Press.
2. Goudie, A. (2001). Nature of the Environment (4th Edition), Blackwell Publishers Ltd. Oxford, UK.

3. Goudie, A. (2013). Human Impact on Natural Environment (7th Edition), Wiley-Blackwell Publishers, West Sussex, UK.
 4. Knighton, D. (2014). Fluvial Forms and Processes: A New Perspective. Routledge.
 5. Montgomery, D. R. (2003). Soil Erosion and Agricultural Sustainability. Proceedings of the National Academy of Sciences, 100(20), 11157-11161.
 6. Panizza M. (2001) – Geomorphosites: concepts, methods and example of geomorphological survey. Chinese Science Bulletin, 46, Suppl. Bd, 4-6.
 7. Richards, K. S. (2013). Rivers: Physical, Fluvial, and Environmental Processes. John Wiley & Sons.
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GEO 536: Regional Climatology (Credits-4)

Course Objectives:

1. To explore the climatic characteristics, patterns, and variability of various climatic regions of the world.
2. To understand the factors influencing regional climate, analyzing climate data, and interpreting climatic phenomena within a geographical context.
3. To emphasize the application of climatological principles in regional and environmental planning.

Topic No.	Topic Name	Number of Lectures
1	Introduction to Regional Climatology, Historical Development and Significance	4
2	Climate Classification Systems: Climates of the World	6
3	Climatic Features of Tropical Regions: Atmospheric Circulation, Tropical Cyclones (origin, structure and life cycle) Climatic Features of Temperate Regions: Atmospheric Circulation, Air masses and fronts, Frontal Weather, Extratropical Cyclones (origin and life cycle)	6
4	Regional Temperature patterns and Variability, Temperature anomalies, heat wave and cold wave, drivers influencing regional temperature variability	6
5	Regional Precipitation patterns and Variability: Precipitation Processes, Precipitation extremes, droughts and monsoon patterns	5
6	Daily Weather and Atmospheric Stability: Temperate and Tropical Regions	4
7	Regional Climatology of India, Agro-climatic classification	5
8	Urbanization and Regional Climate: Urban heat island effect, LULC change and climate	5
9	Regional Climate change and variability, Impacts of Regional Climate changes: Ecosystem and Biodiversity impacts, Socio-economic impacts (agriculture, water resources, human health and communities) Vulnerability and Risk Assessment, Climate Adaptation and Mitigation Strategies Assessment of Climate Change over the Indian Region (Temperature and Precipitation Changes in India, Droughts and Floods, Extreme Storms and Sea Level Rise, Indian Ocean Warming, Climate Change over Himalayas)	10
10	Application of Regional Climatology in regional planning and environmental planning, Tourism Climate Index, Holiday Climate Index	9

Course Outcomes:

By the end of the course, the student will:

1. understand the principles and concepts of regional climatology.
2. gain knowledge of the major climatic systems, regional climatic classification and the impacts of climate change on different regions.
3. identify the drivers affecting regional climate.
4. apply climatological knowledge in regional planning and environmental management.

Suggested Readings:

1. Awasthi, A. (1995). Indian climatology. APH Publishing Corporation.
 2. Blair, T. A. (1942). Climatology: general and regional. Prentice Hall, New York.
 3. Chatterjee, S. B. (1953). Indian climatology: Climostatics: climatic classification of India, with special reference to the monsoons.
 4. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). The Atmosphere: An Introduction to Meteorology. New Jersey: Pearson Prentice Hall.
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GEO 538: Population Resources and Planning (Credits-4)

Course Objectives:

1. To familiarize the students with the geographical importance of population resources and planning with definition, concepts and role of population resource.
2. To impart the knowledge on scarcity and unemployment, poverty and its effect on population development.
3. To use information, theories, concepts and skills to solve problems of Manpower planning by understanding population potential.
4. To give opportunity to students to develop an opinion and back it up with reasoning and evidence with the help of Policies and SDGs.

Topic No.	Topic Name	Number of Lectures
1	Introduction: definition, nature and scope, concepts, Role of population resource	4
2	Scarcity of skilled labour and unemployment in India	6
3	Poverty and its effects on Population Development	6
4	Technological advancement and population development	5
5	Population Potential for population resource planning	6
6	Manpower management in India: Training and Development	5
7	Models for Population development: Lewis, Rosenstein Rodan	5
8	Manpower planning: sector wise, multi-level	6
9	Transformation of status and roles of women and men in labours, Demographic implications of recent changes in gender roles, families and household	6
10	Case studies of manpower development in developed and developing nations	5
11	Sustainable development goals and its implications for population Development: Ageing, Migration, Poverty Eradication	6

Course Outcomes:

By the end of the course, the student will:

1. learn various key concept along with dynamic role of population resource planning.
2. be able to discover and understand scarcity of skilled manpower, poverty like issues along with understanding of population potential.
3. be able to do the critical appraisal of theories and models for manpower planning.
4. apprehend with various regional and global issues of population resources.

5. be able to critically examine the policy and programmes related to manpower planning.

Suggested Readings:

1. Rao, V. K. R. V. (1966): Education and Human Resource Development, Allied Publishers, Bombay
 2. Shivkumar, A. K., Panda, P. and Ved, R.R. (2013): Handbook of Population and Development in India, Oxford University Press, Oxford
 3. Stockwell, E. G. (1968): Population and People, Quadrangle Books, Chicago
 4. UN (1962): Demographic Aspects of Manpower, Report 1, Sex and Age Patterns of Participation in Economic Activities, Population Studies No. 33, New York
 5. UN (1973): The Determinants and Consequences of Population Trends, Vol. I, ST/SOA/SER.A/50, Population Studies No. 50, New York
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GEO 541: Coastal Geomorphology: Practicals (Credits-2)

Course Objectives:

1. To understand the coastal landforms and the landscape.
2. To study the characteristics of waves and tides in the field and through laboratory analysis.
3. To assess the coastal landforms and their characteristics, and human activities in the coastal environment.

Topic No.	Topic Name	Number of Practicals
1	Study of Coastal Landforms Using Topographic Maps and Satellite Images	2
2	Wave Analysis, Recording of Waves in the Surf Zone	3
3	Tide Data Analysis and Classification	3
4	Beach/ Dune/ Sand Bar Profiles	3
5	Coastal Sediments: Sample Collection and Analysis	2
6	Observations and Recording of Human Activities in Coastal Areas	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to interpret and understand the coastal landforms and their setup in the coastal regions.
2. learn to collect, analyse and interpret the wave and tide data.
3. be able to relate different human activities and their impact on coastal environment.

Suggested Readings:

1. Bloom, A. L. (2002). Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms, New Delhi: Prentice- Hall of India.
2. Carter, R. W. G. (1988). Coastal Environments, London: Academic press ltd.
3. Dackombe, R. V., & Gardiner, V. (1983). Geomorphological Field Manual, London: George Allen and Unwin.
4. Goudie, A. (1990). Geomorphological Techniques. London: Routledge.
5. King, C. A. M. (1972). Beaches and Coasts, London: Edward Arnold.
6. Pethick, J. (1984). An Introduction to Coastal Geomorphology. London: Arnold-Heinemann.
7. Smith, M. J., Paron, P., & Griffiths, J. (2011). Geomorphological Mapping. Amsterdam: Elsevier.

GEO 542: Synoptic Climatology: Practicals (Credits-2)

Course Objectives:

1. To make students understand working of different weather instruments.
2. To train students in mapping weather data and train them in field measurements of weather parameters.

Topic No.	Topic Name	Number of Practicals
1	Scientific Notation and Conversion in Different Units, Temperature Profile, Atmospheric Stability and Humidity	3
2	Instrumentation and Measurement Techniques of Weather Elements and Processing of Weather Data:	5
3	Station Model: Coding, Decoding and Plotting of Synoptic Data	3
4	Climatic Map Analysis: Daily Weather Reports, Preparation of Temperature and Pressure Distribution Maps	2
5	Field Work: Measurements with whirling psychrometer	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. understand the observation and measurement of weather parameters using various instruments.
2. be trained in field measurements and analysis of weather maps.

Suggested Readings:

1. Navarra, J. G. (1979). Atmosphere, Weather and Climate, Philadelphia: W. B. Saunders Company.
2. Jarraud, M. (2008). Guide to meteorological instruments and methods of observation (WMO-No. 8). World Meteorological Organisation: Geneva, Switzerland, 29.

GEO 543: Agriculture Geography: Practicals (Credits-2)

Course Objectives:

1. To introduce students with the concept and practice of agricultural regionalization.
2. To teach them various agricultural regionalization techniques.
3. To make them aware about the importance of such techniques for sustainable agricultural development.
4. To make them aware of applications of such techniques in Indian agricultural context.

Topic No.	Topic Name	Number of Practicals
1	Methods of Crop Concentration and Diversification: Bhatia, Jasbir Singh, Gibbs and Martin	5
2	Crop Combination Techniques: Weaver, Thomas, Rafiullah	5
3	Measurement of Agricultural Efficiency: Bhatia and Kendell	5

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. learn about the concepts of agricultural regionalisation and methods of performing them.
2. learn about the concept of crop combination, concentration and diversification along with intensity and efficiency of cropping.
3. learn How physical and economic factors shape agricultural land use and derive profit or losses.

Suggested Readings:

1. Ali, M. (1979). Dynamics of Agricultural Development in India. New Delhi: Concept Publication.
2. Hussain, M. (1978). Agricultural Geography, Jaipur: Rawat Publication.
3. Singh, J., & Dhillon, S. S. (1994). Agricultural Geography. New Delhi: Tata-McGraw Hill Publication.
4. Yeats, M. H. (1978). An Introduction to Quantitative Analysis in Human Geography, Chicago: John and John Company.

GEO 544: Population Geography: Practicals (Credits-2)

Course Objectives:

1. To enable students to describe and analyze the framework of population dynamics.
2. To acquire to calculate and interpret different indicators affecting spatially population dynamics.

Topic No.	Topics	Number of Practicals
1	Rate of Population Change, Population Projection	4
2	Basic Measures of Fertility and Mortality	4
3	Construction of Life Table	3
4	Singulate Mean Age at Marriage	2
5	Collection of Data on a Given Problem and Report Writing	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. get acquainted with the various techniques of population estimates.
2. utilize different measures related to population dynamics, singulate mean age at marriage and life table with relevance.
3. learn to collect, analyse and interpret the data and report writing.

Suggested Readings:

1. Agarwala, S. N. (1962). Age at Marriage in India, Allahabad: Kitab Mahal Pvt. Ltd.
2. Barclay, G. W. (1958). Techniques of Population Analysis, New York: John Wiley and Sons.
3. Mandal, R. B., Uyanga, J., & Prasad, H. (2007), Introductory Methods in Population Analysis, New Delhi: Concept Publishing Company.
4. Pathak, K. B., & Ram, F. (2013). Techniques of Demographic Analysis, Mumbai: Himalaya Publishing House.
5. Shryock, H. S. (1970). The Methods and Materials of Demography, New York: Academic Press.
6. Siegel, J. S., & Swanson, D. A. (2004). The Methods and Materials of Demography. Boston: Academic Press.
7. Taylor, P. J. (1977). Quantitative Methods in Geography. Boston: Houghton Mifflin Co.
8. Wilkinson, F. J., & Monkhouse, H. R. (1966). Maps and Diagrams: Their Compilation and Construction. London: Metheun and Co.

GEO 545: Environmental Geomorphology: Practicals (Credits-2)

Course Objectives:

1. To understand the Practical application of Geomorphology in the Environment Management.
2. To understand and assess relief, slope and other characteristics of land surface and processes in the resources and watershed management.
3. To apply Geomorphology knowledge in impact assessment studies.

Topic No.	Topics	Number of Practicals
1	Geomorphic mapping for landforms, processes and material	2
2	Relief and slope mapping for land capability classification	2
3	Geomorphic techniques in watershed management	2
4	Soil and water erosion analysis: basin-scale erosion assessment	2
5	Slope stability assessment: slope angle, length, curvature and material analysis. Geomorphic impact analysis of slopes	2
6	Assessment of slope and relief for forest fire events	1
7	Geomorphological impact assessment: related to tourism, dam reservoirs and other engineering projects.	2
8	Geodiversity assessment, identification of geomorphosites and their mapping	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. help the students to understand techniques of landscape and environment assessment.
2. develop skill to do impact assessment of different natural process and human induced effects.
3. learn geomorphological techniques and will be able to apply suitable land and water conservation method
4. be trained to carry out Geomorphic Impact Assessment.

Suggested Readings:

1. Anderson, R. S. (2010). Geomorphology: The Mechanics and Chemistry of Landscapes. Cambridge University Press.
2. Goudie, A. (2001). Nature of the Environment (4th Edition), Blackwell Publishers Ltd. Oxford, UK.
3. Goudie, A. (2013). Human Impact on Natural Environment (7th Edition), Wiley-Blackwell Publishers, West Sussex, UK.

4. Knighton, D. (2014). *Fluvial Forms and Processes: A New Perspective*. Routledge.
 5. Montgomery, D. R. (2003). Soil Erosion and Agricultural Sustainability. *Proceedings of the National Academy of Sciences*, 100(20), 11157-11161.
 6. Panizza M. (2001) – Geomorphosites: concepts, methods and example of geomorphological survey. *Chinese Science Bulletin*, 46, Suppl. Bd, 4-6.
 7. Richards, K. S. (2013). *Rivers: Physical, Fluvial, and Environmental Processes*. John Wiley & Sons.
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GEO 546: Regional Climatology: Practicals (Credits-2)

Course Objectives:

1. To provide students with a comprehensive understanding of climate classification schemes.
2. To identify various climatic patterns, such as heat waves, cold waves, and rainfall patterns.
3. To develop skills among students in applying statistical methods to analyze climate data.

Topic No.	Topics	Number of Practicals
1	Climate Classification Schemes: Modified Köppen-Geiger and Thornthwaites's classification scheme	5
2	Identification of Heat Waves and Cold Waves	2
3	Temperature Indices: Mean Temperature (Daily, monthly and annual), Temperature Range (Daily and annual) Rainfall Indices: Consecutive Dry Days, Consecutive Wet Days, Effective Rainfall	3
4	Trend Analysis: Linear Regression, Mann-Kendall (Manual and Excel)	3
5	Field Work	2

- Note: a) For 2 credits 2 hours practical per week.
b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. identify climatic regions of the world using different climatic classification schemes.
2. identify and analyze heat and cold waves based on temperature data and specific threshold criteria.
3. compute various temperature and precipitation indices and interpret their implications for climate analysis.
4. apply trend analysis techniques to assess long-term trends in temperature and precipitation data.

Suggested Readings:

1. Blair, T. A. (1942). *Climatology: general and regional*. Prentice Hall, New York.
2. Chatterjee, S. B. (1953). *Indian climatology: Climostatics: climatic classification of India, with special reference to the monsoons*.
3. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). *The Atmosphere: An Introduction to Meteorology*. New Jersey: Pearson Prentice Hall.
4. Oliver, J. E. (1981). *Climatology: Selected Applications*, V. H. Winston and Sons, London
5. Thornthwaite, C. W., & Mather, J. R. (1957). *Instructions and tables for computing potential evapotranspiration and the water balance*, Drexel Institute of Technology, Laboratory of Climatology.

GEO 548: Population Resources and Planning: Practicals (Credits-2)

Course Objectives:

1. To impart adequate skills so as to enable the students to take up career in the field of population resource planning.
2. To developed the ability of estimating population potential for population resources using different methods.
3. To developed the analysing skill of the students to measure the scope of population resource planning.

Topic No.	Topics	Number of Practicals
1	Human development index	3
2	Multi-dimensional Poverty Index	3
3	Gender related development index, Physical Quality of Life Index	4
4	Application of Models for population resource development	3
5	Collection of data on a given problem and report writing	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the knowledge basic measures of population resource planning.
2. possess knowledge about estimation on scarcity and population potential.
3. be acquainted with skill of analysing various planning strategies and framing policies.

Suggested Readings:

1. Mandal, R. B., Uyanga, J. and Prasad, H. (2007): Introductory Methods in Population Analysis, Concept Publishing Company, New Delhi
2. Taylor, P. J. (1977): Quantitative Methods in Geography, Houghton Mifflin Co., Boston
3. Shryock, H. S. (1970): The Methods and Materials of Demography, Academic Press, New York
4. Wilkinson, F. J. and Monkhouse, H. R. (1966): Maps and Diagrams – Their Compilation and Construction, Methuen and Co., London

GEO 551: Geographical Thought (Credits-2)

Course Objectives:

1. To develop the philosophical and historical aptitude among students in the context of evolution and development of geographical ideas, theme, dichotomies, approaches and knowledge.
2. To aware the students about recent trends and explanations in geography.
3. To critically evaluate the nature of geography as spatial science with changing space and time.

Topic No.	Topic Name	Number of Lectures
1	Geographical Knowledge of the Ancient and Medieval Period: Greek, Roman, Arab and Indian Contribution	7
2	Contribution of Modern Geographers: Major Schools and Scholars	5
3	Regional Vs Systematic; Environmentalism Vs Possibilism	3
4	Conceptual Development: Areal Differentiation, Regional Synthesis, Locational and Spatial Analysis	3
5	Quantitative Revolution; Behaviouralism	3
6	Marxism, Radicalism, Positivism, Humanism, Feminism and Welfare Approach,	6
7	Political Economy Perspective; Geography and Public Policy	3

Course Outcomes:

By the end of the course, the student will:

1. be able to visualize the basic theme, ideas, dichotomies and approaches of geographic knowledge with relation to historical juncture, varying schools and era of their emergence.
2. critically evaluate the nature of geography as spatial science with changing space and time and comprehend, correlate and connect geographical ideas and concepts with historical as well as contemporary context.

Suggested Readings:

1. Arild, H. J. (1999). Geography: History and Concepts. London: SAGE Publications.
2. Chorley, R. J. (Ed). Directions in Geography, London: Matheun and Co.
3. Dikshit, R. D. (1997). Geographical Thought: Contextual History of Ideas. New Delhi: Prentice Halls.
4. Goudie, A. (Ed) (2004). Encyclopedia of Geomorphology. London: Routledge.
5. Hussain, M. (1984). Evolution of Geographical Thought. Jaipur: Rawat Publications.
6. Richard, P. (1998). Modern Geographical Thought, Singapore: Blackwell.
7. Warf, B. (Ed) (2006). Encyclopedia of Human Geography. New Delhi: SAGE Publications.

GEO 561: Fluvial Geomorphology (Credits-4)

Course Objectives:

1. To introduce basic concepts of Fluvial Geomorphology.
2. To make the students aware of the forms and processes of streams and rivers.
3. To introduce the student mechanics and process of Fluvial erosion, transportation and deposition.
4. To acquire the knowledge about the concept of river Metamorphosis and Quaternary Fluvial systems.
5. To acquaint the students with the applications of Fluvial Geomorphology in different areas and environment.

Topic No.	Topic Name	Number of Lectures
1	Drainage Basin and Network: Laws of Drainage Composition, Basin Morphometry	6
2	Mechanics of Fluvial Erosion: Overland Flow, Throughflow and Groundwater Flow; Hydrographs	6
3	Open Channel Hydraulics: Classification of open channel flows, Hydraulic geometry (at-a-station and downstream), Stream Energy,	8
4	Channel Geometry: Bedrock and Alluvial Rivers; Channel Classification Schemes	6
5	Concept of Grade: Graded Profile, Dynamic Equilibrium, rejuvenation	6
6	Fluvial erosional processes and Forms: Geomorphic implications of knickpoints and potholes, Riverbank failure, Bank erosion measurement and hazard assessment	6
7	Sediment Transport: Suspended and Bedload	4
8	Fluvial deposition processes and Forms: Flood plains, River terraces; Anabranching Channels: factors, types and mechanisms of braiding and anabranching stream development; Channel avulsion: Causes, processes, stages and case studies	8
9	River Metamorphosis: Concept and parameters; Quaternary fluvial systems; Climate change and Fluvial geomorphology	8
10	River Channel Management and restoration	2

Course Outcomes:

By the end of the course, the student will:

1. understand with the various basic concepts in Fluvial Geomorphology.
2. understand various basic concepts of Fluvial Geomorphology like laws of drainage composition, channel geometry, mechanics of fluvial erosion-transportation-deposition, open channel hydraulics etc.

3. acquire the knowledge of Fluvial erosional and depositional processes with special reference to Flood plains and River terraces.
4. understand the significance of the river channel management.

Suggested Readings:

1. Charlton, R. (2008). Fundamentals of Fluvial Geomorphology, Routledge, Oxon.
 2. Chow, V. T. (1964). Handbook of Applied Hydrology, McGraw Hill Book Co. New York.
 3. Downs P. W. and Gregory K. J. (2004). River Channel Management, Arnold, London.
 4. Fryirs, K. A. and Brierley, G. J. (2013). Geomorphologic Analysis of River Systems, Wiley-Blackwell, Chichester.
 5. Kale, V. S. and Gupta, A. (2010). Introduction to Geomorphology, Universities Press, Hyderabad.
 6. Kondolf, G. M. and Piegay, H. (2003). Tools in Fluvial Geomorphology, Wiley, Chichester.
 7. Leopold, L. B., Wolman, M. G. and Miller, J. P. (1964). Fluvial Processes in Geomorphology, W. H. Freeman, San Francisco.
 8. Robert, A. (2003). River Processes- An Introduction to Fluvial Dynamics, Arnold, London.
 9. Schumm, S. A. (1977). Fluvial Systems, Wiley, New York.
 10. Small, R. J. (1978): The Study of Landforms: A Textbook of Geomorphology, Cambridge University Press, Cambridge
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GEO 562: Applied Climatology (Credits-4)

Course Objectives:

1. To understand the Nature and scope of Applied Climatology as well as Atmospheric concern and awareness.
2. To study the relationship between Climate and Physical and Biological Environment.
3. To realize the impact of climate on societal systems like agriculture, transport sector, recreational activities, energy or power requirement and insurance sector Industrial and commercial activities as well as human health which are affected directly and indirectly by climatic parameters.
4. To acquire knowledge about Climate Change, Urban Climate, GEC, and its Adaptation and Mitigation.

Topic No.	Topic Name	Number of Lectures
1	Nature and Scope of Applied Climatology: Sources of Climatological Data, Atmospheric Concern, Climate Impact Assessment and Awareness	4
2	Climate and Natural Systems: Lithosphere, Hydrosphere, Biosphere, Cryosphere	10
3	Climate and Agriculture: Using Climate Information to Improve Agricultural System- Making Efficient Use of Rainfall, Developing Resilience, Managing the Extremes—Droughts and Floods, The Decision-Making Process— Dealing with Risk and Complexity, Providing Climate Technology to Farmers, Communicating New Ideas and Practices	4
4	Climate and Industrial and Commercial Activities	4
5	Climate and Transportation: Air transport, water transport, and land transport (roads and railways)	4
6	Climate and Health (Mountain sickness, Hypothermia, Hyperthermia, Human comfort, V.B.D. Air pollution-related health effects, Extreme weather-related health effects, Water and food-borne diseases, Allergies	5
7	Climate and Recreational Activities and Tourism: weather-dependent sports, Weather – interference sports. Climate–dependent tourism and attractiveness-dependent tourism, Religious tourism	5
8	Climate and the Energy Requirement	3
	Climate and Insurance Sector	3
9	Urban Climate and Global Environment Change: Adaptation and Mitigation	5
10	Climate Change: Theories, Methods to Reconstruct the past climate - (Dendrochronology, Pollen grain analysis, Isotope analysis – Ice core investigation, and ocean floor sediment analysis); Past, Present, and Future Scenarios, Impacts, Future Strategies, and Adaptations. (IPCC Reports-different climate change models), Climate services to achieve SDGs-Climate Action (SDG No. 13)	10

Course Outcomes:

By the end of the course, the student will:

1. be educated about Climate has a huge impact on our societal systems like agriculture, transportation, tourism, energy requirement, insurance sector, etc.
2. synthesize the effects of climatic variability on human health as the human body can survive well only in certain suites of climatic conditions.
3. Learn about Climate Change: Data Sources, Methods, and Theories. Past, Present, and Future Scenarios, Impacts, Future Strategies, and Adaptations

Suggested Readings:

1. Doorenbos, J. (1977). Guidelines for predicting crop water requirements. FAO (United Nations)
 2. Oliver, J. E. (1973). Climate and Man's Environment: An Introduction to Applied Climatology, New York: John Wiley and Sons.
 3. Thompson, R.D., & Allen, P. (1997). Applied Climatology: Principles and Practice. London: Routledge
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GEO 563: Geography of Tourism (Credits-4)

Course Objective:

1. To equip the students with the Knowledge of tourism Geography and to lay emphasis on the importance of geography in travel and tourism.
2. This course will give an overview of concept of tourism and the basics of tourism industry.
3. The course aims to impart the fundamental knowledge of Geography and its linkages and anthropological aspects of tourism.
4. To understand the impact of tourism on physical and human environments

Topic No.	Topic Name	Number of Lectures
1	Definition, Nature and Scope of Geography of Tourism, Relation between Geography and Tourism	4
2	Factors Affecting Tourism: Physical, Economic and Socio-cultural, Technology	6
3	Tourism Products and Types of Tourism: Natural, Cultural, Heritage and Emerging tourist destination	8
4	Infrastructure and Support System for Tourism: Accommodation, Transport and Tour operator, Tourism services	8
5	Development and Planning for Tourism: Planning approaches, Types of Planning, Scale of Planning	8
6	Economic, Social, Physical and Cultural Impacts of Tourism	8
7	Theories in Tourism Studies: Butler's Model of Tourism Development, Doxy's Index	8
8	Tourism Development in India	6
9	Globalization and Tourism	4

Course Outcomes:

By the end of the course, the student will:

1. be able to describe about the importance of geography in tourism and tourism potential hotspot in the various tourism generating regions in India.
2. be well-equipped to explain the nature and unique characteristics of the tourism.
3. understand the numerous dimensions of the tourism.

Suggested Readings:

1. Bhatia, A. K. (1991). International Tourism - Fundamentals and Practices. New Delhi: Sterling Publisher.

2. Bhatia, A. K. (1996). *Tourism Development: Principles and Practices*. New Delhi: Sterling Publisher Ltd.
 3. Das, M. (1999). *India: A Tourist Paradise*. New Delhi: Sterling Publishers.
 4. Lew, A. A., Hall, C. M., & Williams, A. M. (ed) (2014). *Tourism*. Hoboken: Wiley-Blackwell.
 5. Pearce, D. G. (1987). *Tourism Today: A Geographical Analysis*. Harlow: Longman.
 6. Robinson, H. (1996). *A Geography of Tourism*. London: Macdonald and Evans.
 7. Smith, L. J. S. (2010). *Tourism Analysis: A Handbook*. Sydney: Halstead Press.
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GEO 564: Geography of Rural Settlement (Credits-4)

Course Objectives:

1. To impart the knowledge related definition, concepts, development and paradigm shift.
2. To developed the ability of classifying rural settlement on different basis along with types, patterns.
3. To comprehend the knowledge of spatial distribution, changing morphology and segregation, rural dwellings and house types.
4. To enable the students to critically understand the development of amenities and infrastructure of rural settlement geography.

Topic No.	Topic Name	Number of Lectures
1	Introduction: definition, nature, scope and paradigm shift	4
2	Evolution and development of rural settlement from ancient to 21 st Century	6
3	Size and Spacing of Rural Settlements: Factors with examples	5
4	Types, Pattern of Rural Settlements: Based on Size and Shape, Factors responsible for development	5
5	Changing morphology and segregation of rural settlements	5
6	Spatial distribution of rural settlements: World and India	5
7	Rural dwelling and house types in India: Factors, Regional patterns	5
8	Ruralization in Indian scenario	6
9	Development of amenities and infrastructure in rural India	6
10	World scenario of development of rural settlements	4
11	Role of GIS and RS in rural Settlements	4

Course Outcomes:

By the end of the course, the student will:

1. learnt various key concept, development along and paradigm shift in geography of rural settlement.
2. be able to discover and understand spatial distribution and changing forms with the help of critical appraisal of segregation, rural dwellings and house types.
3. apprehend with various issues of rural settlement development.

Suggested Readings:

1. Alam, M. and Gopi, K. N. (1982): Settlement System of India, Oxford and IBH Publication, New Delhi

2. Haggett, P. (1965): Locational Analysis in Geography, Edward Arnold, London
 3. Mandal, R. B. (2001): Introduction to Rural Settlement, Concept Publishing Company, New Delhi
 4. Singh, R.Y. (1994): Geography of Settlements, Rawat Publications, Jaipur
 5. Woods, M. (2005): Rural Geography, Sage Publication, London
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GEO 565: Regional Geomorphology of India (Credits-4)

Course Objectives:

1. To know the geomorphological set up of India
2. To understand the landscape diversity in India
3. To understand and interpret different landform assemblage of Geomorphic region of India.

Topic No.	Topic Name	Number of Lectures
1	Introduction to Regional Geomorphology with reference to Elevation and Landforms	4
2	Introduction to Major Geomorphological Divisions of India	4
3	Significance of the Two Mega Features of India: Western Ghats and Himalayas	5
4	Variation in Relief in Geomorphological Divisions, Relief Variation in Mountains, Plateaus and Plains of India, Mountain Systems in India.	5
5	Plateau Regions: Formation of the Deccan Traps and Geology; Physiographic Divisions and Geology, Chhota Nagpur, Hadauti and Shillong Plateaux	6
6	Geomorphology of Himalayas with special reference to Tectonics, Glacial features and landslides	4
7	Geomorphology of Western Ghats, Tectonics, with special reference to Deccan Trap.	4
8	Geomorphology of Great Indian (Thar) Desert	4
9	Form, process and evolution of Ganga-Brahmaputra and Godavari Plains	4
10	Geomorphology of the Andaman and Nicobar, Rameswaram and Lakshadweep Islands	4
11	Major Drainage Systems of India: Rivers draining in Bay Bengal and Arabian Sea	4
12	Ganga, Brahmaputra, Mahanadi, Subarnarekha Drainage system	4
13	Indus, Narmada, Tapi System and West-flowing Rivers	4
14	Peninsular Rivers: Godavari, Krishna, Cauvery, Pennar, Palar and Vaigai Systems	4

Course Outcomes:

By the end of the course, the student will:

1. understand landform diversity of India
2. help the students in better understanding of the impact of landscape on human activities throughout India.
3. gain thorough knowledge of the geomorphic regions of the country.

Suggested Readings:

1. Kale, V. S. (2002). Fluvial geomorphology of Indian rivers: an overview. *Progress in physical geography*, 26(3), 400-433.
 2. Kale, V. S. (Ed.). (2014). *Landscapes and landforms of India*. Springer.
 3. Kale, V.S.(ED.) (2017): *Atlas of Geomorphosites in India*, Indian Institute of Geomorphologists, Allahabad, India.
 4. Owen, L. A. (2014). Himalayan landscapes of India. *Landscapes and landforms of India*, 41-52.
 5. Sharma H.S. and Kale V.S. (Eds.) (2009): *Geomorphology in India*, Prayag Pustak Bhavan, Allahabad, India
 6. Singh, L. P., Parkash, B., & Singhvi, A. K. (1998). Evolution of the lower Gangetic Plain landforms and soils in West Bengal, India. *Catena*, 33(2), 75-104.
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GEO 566: Urban Climatology (Credits-4)

Course Objectives:

1. To explore the interactions between urban environments and climate systems.
2. To make students aware of problems of urban climates related to urban heat island and urban air quality.
3. To acquaint students with concepts related to urban hydrology, urban planning and design.
4. To provide students with an in-depth understanding of interactions of urban climates with global climate change.

Topic No.	Topic Name	Number of Lectures
1	Introduction and Development of Urban Climatology, Concept and properties of 'Urban Surface'	4
2	Air flow, Radiation and Energy Balance in cities, Microclimates, Local Climate Zones (LCZ's), Difference in Urban-Rural Climate	5
3	Urban Heat Island: Concept and types (Surface, Canopy Layer, Boundary Layer and Subsurface Heat Island)	6
4	Urban Hydrology: Water Balance of Urban Hydrologic Units, Urban Effects on components of Water Balance	6
5	Urban Air Quality: Air Pollution, Smog, Temperature Inversion, Modelling Urban Air Pollution, Regional and Global effects of urban air pollution	6
6	Urban Climate and Human Health: Human Energy Balance, Thermal Stress, Thermal Comfort, Effects of air pollution on human health	6
7	Urban Planning and Design: Concept of Climate-Sensitive Design, Green spaces and land use planning, Climate controls on individual buildings, streets and urban blocks	6
8	Cities and Global Climate Change: Land cover change, Greenhouse gases, Monitoring Climate change in Urban environments, Projecting Future Climates in Cities, Urban Climate Modelling	8
9	Urban Climate Change Adaptation and Mitigation: Vulnerability and Risk Assessment of Cities, Climate-resilient urban planning, Urban growth Management, Sustainable Cities and Communities (SDG-11)	7
10	Cities of India, Heat Wave and Action Plan Implementation in Indian Cities	6

Course Outcomes:

By the end of the course, the student will:

1. understand the fundamentals of urban climatology and its relevance to urban areas.
2. analyze and interpret urban climate data, including temperature, humidity, and air quality.
3. identify the drivers of urban climate change and their impacts on cities.

4. apply knowledge of urban climatology to assess and plan for sustainable urban development.

Suggested Readings:

1. Oke, T. R., Mills, G., Christen, A., & Voogt, J. A. (2017). *Urban climates*. Cambridge University Press.
 2. Landsberg, H. E. (1981). *The urban climate*. Academic press.
 3. Pearlmutter, D., Calfapietra, C., Samson, R., O'Brien, L., Ostoić, S. K., Sanesi, G., & del Amo, R. A. (2017). The urban forest. *Cultivating green infrastructure for people and the environment*, 7.
 4. Thompson, R. D., & Perry, A. H. (Eds.). (1997). *Applied climatology: principles and practice*. Psychology Press.
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GEO 568: Settlement Planning and Management (Credits-4)

Course Objectives:

1. To provide in-depth understanding of settlement planning and management with planning principles and processes.
2. To comprehend information and grasp meaning and linkages of settlement planning and management.
3. To use information, theories, concepts to solve problems of land use, land reforms and governance.
4. To make connections to recognize patterns and deeper meanings with application knowledge of settlement planning.
5. To make and justify a judgement on existing policies and role of regional authorities which will help for better settlement planning.

Topic No.	Topic Name	Number of Lectures
1	Planning Principles: Scope and Content; Origin and Evolution of Planning	4
2	Planning Process: Facets of Rural Societies; Planning for Rural Development Multi-Level Planning; PURA Initiative	6
3	Land Reforms and Rural Development: Land Reforms and Agrarian Class Structure in India; Globalization and Indian Peasantry	6
4	Rural Infrastructure Management: Importance; Economy and Rural Development; Linkages with Livelihood; Impact of Infrastructure upon Rural Development; Rural Development Programmes	8
5	Urban Planning: Impacts of Industrial Revolution; Contributions of Ebenezer Howard, Patrick Geddes, Tony Garnier, Lewis Mumford, Le-Corbusier and Others in Planning	6
6	Urban Policy and Planning: Goals of Urban Planning; Nature of Urban Policy; Neighbourhoods in Planning; Urban Renewal (JNNURM) and Its Aftermath; Role of NGOs in Planning; Urban Social Movements; Urban Architecture; Social Construction of Urban Landscape	8
7	Urban Land Use: Urban Morphogenesis; Critics of Classical Models and Recent Developments; Central Business District; Urban Landscape; Land Use Transformation; Ecological Models	6
8	Urban Governance and Management: Concept, Role of Urban Development Bodies and Local Bodies, Urban Governance and Indicators; Smart Cities, Liveable Cities	6
9	Settlement Policies and Planning: Policies and programmes for Rural and Urban Development, Role of Regional Developmental authority	5

Course Outcomes:**By the end of the course, the student will:**

1. learn various key concept, principals and process of settlement planning.
2. be able to discover and understand various linkages of planning with the help of information, theories and models to deal with various issues of settlement planning.
3. be able to critically evaluating the existing policy and programmes, role of regional authority related to settlement planning.

Suggested Readings:

1. Bourne, L. (Ed.) (1982). Internal structure of the city. New York: Oxford University Press.
 2. Chitambar, J.B. (1993). Introductory rural sociology. New Delhi: Wiley Eastern.
 3. Gallent, N. and Scott, N. (2017). Rural planning and development. Routledge.
 4. Gallion, A.B., Eisner, S., and Stoner, A. (1963). The urban pattern: city planning and design. New York: Van Nostrand.
 5. Hall, P.G. (1997). Cities of tomorrow: an intellectual history of urban planning and design in the twentieth century. New Jersey: Wiley Blackwell.
 6. Hudson, F.S. (1976). A geography of settlements. New York: Macdonald and Evans.
 7. Kaiser, E.J., Godschalk, D.R., and Chapin, F.S. (1995). Urban land use planning. Urbana: University of Illinois Press.
 8. Macionis, J. and Parrillo, V. (2010) Cities and urban life. PHI
 9. Mandal, R.B. (1988). Systems of rural settlements in developing counties. New Delhi: Concept Publishing Company.
 10. Ramchandran, R. (1997). Urbanization and urban systems in India. Oxford: Oxford University Press.
 11. Rao, R.N. (1986). Strategy for integrated rural development. New Delhi: B.R. Publication.
 12. Singh, K. (2009). Rural development: principles, policies and management. Sage Publications
 13. Sundaram, K.V. (1977). Urban and regional planning in India. New Delhi: South Asia Books.
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GEO 571: Fluvial Geomorphology: Practicals (Credits-2)

Course Objectives:

1. To acquaint the students with various practical techniques in Fluvial Geomorphology.
2. To learn the practical computation of drainage morphometric analysis, Hack's stream gradient index.
3. To familiarize the students about the computation of Hydraulic Geometry Equations.
4. To acquaint the students about the estimation of with Runoff, Sediment load, Sediment yield, Velocity, discharge, stream power, shear stress and shape analysis.
5. To acquire the field knowledge about the channel cross section, sedimentary sequences and facies.

Topic No.	Topics	Number of Practicals
1	Drainage Basin and Network morphometry. Longitudinal Profile of rivers and Hack's Stream Gradient Index	3
2	Calculation of Hydraulic Geometry Equations, Planform Analysis	3
3	Calculation of Runoff, Sediment Load and Sediment Yield	1
4	Estimation of Velocity and Discharge using Chezy and Manning Equation. Estimation of Unit Stream Power and Shear Stress	3
5	Hypsometric Curve and Integral of basin; Mapping of Channel bed materials using Zingg's shape analysis in the field	3
6	Measurement of Channel Cross-Section in the Field, Identification of fluvial erosional and deposition landforms in the field and also with special reference to India using toposheets and Satellite Imagery	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. understand the various applications and techniques of Fluvial Geomorphology.
2. be acquainted with the computation and estimation various Fluvial Geomorphology parameters.
3. acquire the practical knowledge of Fluvial Geomorphology.
4. utilize the acquired knowledge for identification of landforms using toposheets and satellite images.

Suggested Readings:

1. Charlton, R. (2008). Fundamentals of Fluvial Geomorphology, Routledge, Oxon.
 2. Chow, V. T. (1964). Handbook of Applied Hydrology, McGraw Hill Book Co. New York.
 3. Kale, V. S. and Gupta, A. (2010). Introduction to Geomorphology, Universities Press, Hyderabad.
 4. Kondolf, G. M. and Piegay, H. (2003). Tools in Fluvial Geomorphology, Wiley, Chichester.
 5. Leopold, L. B., Wolman, M. G. and Miller, J. P. (1964). Fluvial Processes in Geomorphology, W. H. Freeman, San Francisco.
 6. Robert, A. (2003). River Processes- An Introduction to Fluvial Dynamics, Arnold, London.
 7. Schumm, S. A. (1977). Fluvial Systems, Wiley, New York.
 8. Vaidyanadhan, R., & Subbarao, K. V. (2020). Landforms of India from Topomaps and Images- Revised Second Edition (Digital Edition) 2016. GSI Publications, 7(1).
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GEO 572: Applied Climatology: Practicals (Credits-2)

Course Objectives:

1. To equip students with the knowledge and skills to analyze climate data and understand its implications for architectural design and human comfort.
2. To acquaint students with various statistical methods for analyzing climate data, and techniques for retrieving land surface temperature from satellite imagery.

Topic No.	Topics	Number of Practicals
1	Climate and Architectural Analysis	2
2	Comfort Indices: Effective Temperature, Heat Index, Temperature-Humidity Index	2
3	Statistical Analysis of Climatic Data: Climatological Series, Frequency Distribution, Cumulative Distribution, Homogeneity of Data Series (Run's Test), Trend analysis (Linear Regression and Mann-Kendall)	6
4	Retrieval of Land Surface Temperature from Satellite Imageries, Relationship between NDVI and LST to study vegetation and thermal characteristics	3
5	Field Work	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to perform statistical analysis of climate data, including the calculation of climatological series and cumulative distribution.
2. evaluate the homogeneity of climate data series.
3. apply trend analysis to identify long-term climate trends and variability.
4. analyse the relationship between ndvi and lst to study the thermal characteristics of different land cover types.

Suggested Readings:

1. Oliver, J. E. (1981): Climatology: Selected Applications, V. H. Winston and Sons, London
2. Keith, S. (1975): Principles of Applied Climatology, Wiley the University of Michigan
3. Griffiths, J. F. (1966): Applied Climatology: An introduction, Oxford University Press, London
4. Hobbs, J. E. (1980): Applied Climatology: A Study of Atmospheric Resources, W. Dawson, University of California, California
5. Fitzroy, R. (2012): The Weather book, A manual of Practical Meteorology, Green, Longman, Cambridge

GEO 573: Geography of Tourism: Practicals (Credits-2)

Course Objective:

1. To provide comprehensive understanding of data interpretation and analysis regarding tourism.
2. To enable the students to prepare for the report writing based on observations.

Topic No.	Topics	Number of Practicals
1	Source of Data: Types of tourism data, National and International Sources	2
2	Perception Studies: Ranking, Satisfaction Index, Garet's Method	3
3	Evaluation of Tourism Potential / Carrying Capacity Analysis	4
4	Analysis of Tourism Impacts and Report Writing	6

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. enhance the analytical skills of data interpretation regarding tourism.
2. be acquainted with the report writing and analysis of various components of tourism geography.

Suggested Readings:

1. Kaul, R. K. (1985). Dynamics of Tourism and Recreation, New Delhi: Inter India.
2. Pearce, D. (1987). Tourism Today: A Geographical Analysis, New York: Longman Scientific and Technical.
3. Smith, L. J. S. (2010). Practical Tourism Research, CABI, Wallingford
4. Smith, L. J. S. (2010). Tourism Analysis: A Handbook, Sydney: Halstead Press.

GEO 574: Geography of Rural Settlement: Practicals (Credits-2)

Course Objectives:

1. To inculcate the skill of measuring basic indices of rural settlement.
2. To developed the ability of classifying rural settlement using different methods.
3. To developed the analysing skill of the students to measure the rural spacing.

Topic No.	Topics	Number of Practicals
1	Methods of concentration of rural settlements	3
2	Chi-square test for environmental factors responsible for pattern variation of settlements	3
3	Measurement of shape (pattern) of rural settlements	3
4	Methods for measuring spacing of settlements	3
5	Collection of data on given problem and report writing	3

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the knowledge basic measures of rural settlement.
2. possess knowledge about classification methods based on various factors.
3. be acquainted with skill of analysing various factor affecting settlement.

Suggested Readings:

1. Haggett, P. (1965): Locational Analysis in Geography, Edward Arnold, London
2. Mandal, R. B. (2001): Introduction to Rural Settlement, Concept Publishing Company, New Delhi
3. Wilkinson, F. J. and Monkhouse, H. R. (1966): Maps and Diagrams: Their Compilation and Construction, Methuen and Co., London

GEO 575: Regional Geomorphology of India: Practicals (Credits-2)

Course Objectives:

1. To develop the skill of understanding the setup of geomorphic regions.
2. To interpret and appraise the landscape at regional level.
3. To understand the role of impact of human activities on geomorphic landforms and environment.

Topic No.	Topics	Number of Practicals
1	Identification of Geomorphic regions using Satellite images and /or Maps	2
2	Interpretation of Himalayan Region with Respect to Glacial Features	2
3	Interpretation of Plateau regions with reference to relief and drainage	2
4	Identification of different coastal features and regional variation	2
5	Regional elevation profiles: Preparation and Interpretation	2
6	Demarcation of Great Thar Desert and Interpretation of Desert Landscape	1
7	Drainage basin analysis of River systems of different geomorphic regions	2
8	Demarcation and Interpretation of Geomorphology of Islands	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. understand the assemblage of landforms and the landscape.
2. be able to visualize the regional geomorphology.
3. understand the importance of landforms and regional geomorphology.
4. be able to understand and interpret river drainage basins of India.

Suggested Readings:

1. Chorley, R. J. (Ed.). (2019). Spatial analysis in geomorphology. Routledge.
2. Goudie, A. (Ed.). (2003). Geomorphological techniques. Routledge.
3. Prasad, G. (2007). Trends and techniques of geomorphology. Discovery Publishing House.

GEO 576: Urban Climatology: Practicals (Credits-2)

Course Objectives:

1. To provide students with a comprehensive understanding of climate analysis.
2. To understand principles and calculations of comfort indices to assess thermal comfort in buildings and urban spaces.
3. To apply remote sensing techniques to map Local Climate Zones and understand urban microclimates.

Topic No.	Topics	Number of Practicals
1	Climate and Architectural Analysis	2
2	Comfort Indices, Heat and Cold Wave Analysis	3
3	Mapping of Local Climate Zones using Satellite Imageries	2
4	Retrieval of Land Surface Temperature from Satellite Imageries Relationship between NDVI and LST to study urban vegetation and thermal characteristics	3
5	Impervious Surface Estimation Techniques, Urban Land Use Land Cover Mapping	3
6	Field Work	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. To explain the significance of climate analysis in architectural designs and human comfort.
2. To analyze heat and cold wave events and their implications in urban areas.
3. To retrieve land surface temperatures from satellite imagery and interpret its variations across urban areas.

Suggested Readings:

1. Oke, T. R., Mills, G., Christen, A., & Voogt, J. A. (2017). *Urban climates*. Cambridge University Press.
2. Landsberg, H. E. (1981). *The urban climate*. Academic press.
3. Pearlmutter, D., Calfapietra, C., Samson, R., O'Brien, L., Ostoić, S. K., Sanesi, G., & del Amo, R. A. (2017). The urban forest. *Cultivating green infrastructure for people and the environment*, 7.
4. Thompson, R. D., & Perry, A. H. (Eds.). (1997). *Applied climatology: principles and practice*. Psychology Press.

GEO 578: Settlement Planning and Management: Practicals (Credits-2)

Course Objectives:

1. To impart adequate skills so as to enable the students to take up career in the field of Settlement planning and management.
2. To developed the skills of settlement planning using different methods and technology.
3. To developed the evaluating skill of exiting planning policies.

Topic No.	Topics	Number of Practicals
1	Participatory Methods of Data Collection: Rapid Rural Appraisal; PRA and PLA; Focus Group Discussion; Buzz Group Analysis Method, GPS and Mapping of Primary Data: Social and Resource Mapping, Village Information Map Using GPS	2
2	Remote Sensing and GIS in Rural Planning: Preparation of Thematic Maps at Village Level, Administrative Map, Land Use/ Land Cover	3
3	Techniques of Urban Planning: Dominant and Distinctive (Nelson's Ternary); Quality of Life Index for Urban Residential Areas; Sopher's Index of Disparity	3
4	Qualitative Methods in Urban Research: Urban Ethnography – Interview, FGDs, Satisfaction Index, Content Analysis: Policy/Planning Reports and Documents	2
5	Mapping the Built Environment (Using RS & GIS Techniques): Mapping of Urban Land Cover and Land Use; NDVI, Urban Expansion; Attribute Data Interfaces, Mapping of Services: Network Analysis	3
6	Case Study and Report Writing	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the skill of collecting data for settlement planning and management.
2. gain the skill of computing basic indices of settlement planning and management.
3. be sophisticated with handling the data using appropriate methods and software's.
4. be able to perform advance level planning and management techniques using various software.

Suggested Readings:

1. Chisholm, M. (1967). Rural settlement and land use. New York: John Wiley.
2. Gallion, A.B., Eisner, S., and Stoner, A. (1963). The urban pattern: city planning and design. New York: Van Nostrand.

3. Hall, P.G. (1997). Cities of tomorrow: an intellectual history of urban planning and design in the twentieth century. New Jersey: Wiley Blackwell.
 4. Kaiser, E.J., Godschalk, D.R., and Chapin, F.S. (1995). Urban land use planning. Urbana: University of Illinois Press.
 5. Narayanasamy, N. (2009). Participatory rural appraisal: principles, methods and application. Sage Publications.
 6. Ramchandran, R. (1997). Urbanization and urban systems in India. Oxford: Oxford University Press.
 7. Rao, R.N. (1986). Strategy for integrated rural development. New Delhi: B.R. Publication.
 8. Sundaram, K.V. (1977). Urban and regional planning in India. New Delhi: South Asia Books.
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GEO 581: Geography of Health (Credits-2)

Course Objectives:

1. To familiarize the students with the geographical importance of Health.
2. To impart the knowledge on human ecology of diseases, spread and origin of different disease, major public health issues raising due to geographical factors.
3. To make and justify a judgement on policies and planning with special reference to Indian Health Care Delivery System.

Topic No.	Topics	Number of Lectures
1	Introduction, Definition, Development and Significance, Dualism between Medical and Health Geography	4
2	Human Ecology of Disease, Landscape Epidemiological Approaches, Social and Spatial Epidemiological Perspectives on Health Transition	4
3	Developmental Changes and Human Health: Context of Population Change, Mobility and Exposure, Urbanization and Health, Emerging Diseases	3
4	Geographical Perspective on Health Care Provisions in Developed and Developing Countries, Spatial Aspects of Health Care Planning	3
5	Climate Change and Pollution Syndrome: Toxic Hazards of Natural and Economic Origins, Globalization and Perception of Health Hazard	4
6	Poverty, Hunger, Morbidity and Health	4
7	Health Policies in India, Reproductive and Child Health, Millennium Development Goals and SDGs	4
8	Indian Health Care Delivery System: Public and Private Sectors, Accessibility, Utilization and Health Service Planning	4

Course Outcomes:

By the end of the course, the student will:

1. learn various key concept with spatial perspectives on health importance.
2. be able to explore and understand Human ecology of diseases, spread and origin of disease, Developmental Changes and Human Health.
3. get acquainted with the health care provisions, major public health issues raising due to geographical factors globally.
4. be able to critically examine the health policy and programmes with health care delivery system.

Suggested Readings:

1. Brown, T., McLafferty, S., Moon, G. (2010). A Companion to Health and Medical Geography, UK: Wiley Blackwell.

2. Curtis, S. (2004). Health and Inequality: Geographical Perspectives. London: Sage Publications.
 3. Hazra, J. (Ed.) (1997). Health Care Planning in Developing Countries. Calcutta: University of Calcutta.
 4. May, J. M. (1959). Ecology of Human Diseases. New York: M.D. Publications.
 5. Meade M., & Earickson R. (2006). Medical Geography. Jaipur: Rawat Publications.
 6. Misra R. P. (2007). Geography of Health: a treatise on geography of life and death in India, New Delhi : Concept Publishing company.
 7. Pati, B. and Harrison, M. (2009). The Social History of Health and Medicine in Colonial India, London : Routledge.
 8. Philips, D. R. (1990). Health and Health Care in Third world, London: Longman.
 9. Stamp, L. D. (1964). Geography of Life and Death, Ithaca: Cornell University.
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GEO 582: Surveying: Practicals (Credits-2)

Course Objectives:

1. To provide students with a strong foundation in surveying principles, methodologies and equipment.
2. To relate theoretical knowledge of surveying to resolve real problems.
3. To establish horizontal and vertical control by traversing and triangulation.

Topic No.	Topics	Number of Practicals
1	Introduction to Surveying and Leveling	1
2	Dumpy Level Survey: Rise and Fall Method, Collimation Level Method, Profile Drawing and Contouring	6
3	Theodolite Survey: Intersection Method, Tacheometric Method, Contouring	6
4	GPS: Road Mapping	2

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. develop skills necessary for accurate and efficient surveying in field.
2. be able to handle dumpy level and theodolite instruments.
3. acquire skills to handle GPS for mapping roads.

Suggested Readings:

1. Basak, N. N. (1994). Surveying and Levelling. Delhi: Tata McGraw-Hill Education.
2. Bhavikatt, S. S. (2009). Surveying and Levelling. New Delhi: I. K. International.
3. Kanetkar, T. P., & Kulkarni, S.V. (1960). Surveying and Leveling- Part I and II. Pune: A. V. Ghriha Prakashan.
4. Pugh, J. C. (1975). Surveying for Field Scientists. London: Methuen and Co.
5. Roy, S. K. (2004). Fundamentals of Surveying. New Delhi: PHI Learning.

GEO 583: Geography of South Asia (Credits-2)

Course Objectives:

1. To understand the complex relationship between the countries which have been counted in South Asia.
2. To study the Physiographic aspects of the region as well as the contemporary issues related to the various natural resources and also boundary disputes.
3. To examine the social, cultural, economic, and political system of the region and its contemporary status.

Topic No.	Topics	Number of Lectures
1	South Asia as a Region, Strategic Importance	2
2	Physical Aspects: Physiographic Divisions, Climate, Soil, Major River System, Natural Vegetation	6
3	Cultural Framework: Language, Religion, Ethnicity and issues	6
4	Urbanization, Population, Poverty and Development	6
5	Border Related Issues: Territorial Disputes and Trans-Boundary River Water Issues.	5
6	South Asia in Global Economy	3
7	SAARC: Role, Challenges and Potentialities in Regional Integration	2

Course Outcomes:

By the end of the course, the student will:

1. understand the strategic importance of the South Asia.
2. know about the socio-economic and political status of the South Asia among the students.
3. be aware about the various social, cultural, and political issues and within the country and with the countries in South Asia.

Suggested Readings:

1. Bradnock, R. W. (2016). The Routledge Atlas of South Asian affairs. London: Routledge Publication.
2. Farmer, B. H. (1993). An Introduction to South Asia. London: Routledge Publications.
3. Gonsalves, F., & Jetly, N. (1999). The Dynamics of South Asia: A Regional Co-operation and SAARC. New Delhi: Sage.
4. Johnson, B. L. C (1981). South Asia. Exeter: Heinemann Educational Books Ltd.
5. Mollinga, P. A. (2000). Water for Food and Rural Development Approaches and Initiatives in

South Asia, New Delhi: Sage.

6. Shafi, M. (2000). Agriculture Geography of South Asia. New Delhi: McMillan India.
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GEO 584: Digital Cartography: Practicals (Credits-2)

Course Objectives:

1. To impart adequate professional knowledge and computer skills so as to enable the students to take up career in the field of Geospatial Technology.
2. To introduce to the students a new Geospatial Technology of Digital Cartography.
3. To gain an understanding of cartographic software to produce accurate appropriate convincing and creative cartographic and graphic images.

Topic No.	Topics	Number of Practicals
1	Introduction to Cartography, Elements of Cartography	1
2	Basics of Digital Cartography	2
3	Application of Digital Cartography: Hardware and software for Digital cartography; Representation of geospatial data: histogram, bar graphs, line graphs, scatter diagram, pie diagram and trend line in MS Excel; Preparation of located diagrams & thematic maps in QGIS	6
4	Application of computer assisted cartography in the various fields e.g. earth sciences, environmental sciences, natural resources, regional development and planning, management, agriculture, forestry, disaster management, water resources, urban planning etc.	4
5	Data Collection, Application of digital cartography and Report Writing	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the knowledge about basic knowledge and computer skills of digital cartography.
2. possess knowledge about new geospatial technology of digital cartography.
3. be acquainted with skill of data management and graphical representation digitally.

Suggested Readings:

7. Cromley, R.G.(1992): Digital Cartography, Prentice-Hall, New York.
8. Dent, B.D.(1999): Cartography- Thematic Map Design, 5th Edition, WCB McGraw Hill, Boston.
9. Kraak M. J.and Ormeling. F (2004): Cartography: Visualization of Spatial Data, Pearson Edu. pvt Ltd. (Singapore) Inelian Branch, New Delhi.

10. Mishra, R.P. (1973): Fundamentals of Cartography, Prasaranga, University of Mysore.
 11. Monkhouse, F.J.R. & Wilkinson H.R.(2000):Maps and Diagrams, Methuen &Co. London.
 12. Monmonier, M.S. (1982): Computer Assisted Cartography: Principles and Prospects, Prentice Hall.
 13. Raise, Erwin (1962): Principles of Cartography, McGraw-Hill, New York.
 14. Rampal, K.K.(1993): Mapping and Compilation, Concept Publishing Co. New Delhi.
 15. Robinson, H. et al (1995): Elements of Cartography, 6th Edition, John Wiley & Sons, New York.
 16. Sarkar, A (2009): Practical Geography: A Systematic Approach, Orient Longman, Kolkatta.
 17. Slocum, T.A.et al.(2008): Thematic Cartography and Geovisualization , 3rd Edition, Prentice Hall.
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GEO 585: Environmental Geography (Credits-2)

Course Objectives:

1. To learn about the earth system and its components.
2. To learn about the ecosystem concept and its structure.
3. To study Ecosystem Management at the national and international level
4. To study Pollution and various legal provisions, laws, rules, and Acts for Air, Water, and noise pollution.
5. To understand National and International Efforts for the Conservation and Protection of the Environment

Topic No.	Topics	Number of Lectures
1	Environmental Geography: Introduction, Scope, Concepts, Principles and Approaches	5
2	Structure and Function of Ecosystem	4
3	Air, Water, Soil and Noise Pollution: Sources, Effects, and Remedies	8
4	Human-Environment Relationships: Historical Progression, Adaptation; Environment and Development; Human Rights	8
5	National and International Efforts for Conservation and Protection of Environment	5

Course Outcomes:

By the end of the course, the student will:

1. understand different types of ecosystems, food chains, and food webs in an ecosystem and energy flow in the ecosystem.
2. learn about the status of biodiversity in India.

Suggested Readings:

1. Chandna, R. C. (2002). Environmental Geography. Ludhiana: Kalyani.
2. Cunningham, W. P. & Cunningham, M. A. (2004). Principles of Environmental Science: Inquiry and Applications, New Delhi: Tata McGraw Hill.
3. Goudie, A. (2001). The Nature of the Environment, Oxford: Blackwell.
4. Miller, G. T. (2004). Environmental Science: Working with the Earth, Singapore: Thomson Brooks Cole.
5. Singh, S. (1997). Environmental Geography, Allahabad: Prayag Pustak Bhawan.
6. UNEP (2007). Global Environment Outlook: GEO4: Environment for Development, United Nations Environment Programme.

GEO 586: Bivariate Statistical Methods (Credits-2)

Course Objectives:

1. To provide students with a strong foundation in statistical methods for bivariate data analysis.
2. To acquaint the students with the concepts of covariance, correlation and regression.
3. To analyze residuals to assess the adequacy of regression models and identify potential patterns and outliers.
4. To train the students in various techniques of Inferential Statistics.

Topic No.	Topics	Number of Practicals
2	Bivariate Analysis: Covariance, Correlation and Regression (Linear, Exponential, Power- Law, Logarithmic), Explained Variance, Residuals, Mapping of Residuals	5
3	Probability: Normal, Binomial and Poisson Distributions	3
4	Inferential Statistics: Sample and Population, Sampling Distribution, Hypothesis Testing: Formulation, Rejection Rule, One and Two-Tailed Tests, Significance Level, Degrees of Freedom, Type I and Type II Errors	2
5	Student's T-Test, ANOVA: One-Way, Two-Way (Single and Multiple Entry), Chi-Square Test: One-Way and Two-Way	5

- Note:
- a) For 2 credits 2 hours practical per week.
 - b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. Apply bivariate statistical methods in geographical analysis by interpreting relationships between two variables.
2. Calculate and interpret explained variance and residuals to evaluate the goodness of fit in regression models.
3. Differentiate between sample and population data, and understand the concept of sampling distribution in inferential statistics.
4. Formulate and conduct hypothesis testing using different statistical tests.

Suggested Readings:

1. Frank, H., & Althoen, S. C. (1994). Statistics: Concepts and Applications. Cambridge: Cambridge University Press.
2. Hammond, R., & McCullagh, P. (1991). Quantitative Techniques in Geography. Oxford: Clarendon Press.
3. Mann, P. S. (2007). Introductory Statistics. New Delhi: John Wiley and Sons.
4. Rogerson, P. A. (2010): Statistical Methods for Geography, Sage Publications, London

GEO 587: Introduction to Geographical Information System (Credits-2)

Course Objectives:

1. To introduce students to geographic information system (GIS).
2. To learn databases, data models and map projections.
3. To acquire knowledge about data models and database management systems.

Topic No.	Topics	Number of Lectures
1	GIS: Definition, History and Development, Advantages of GIS, Applications	4
2	Components of GIS, Tasks/Functions of GIS	3
3	Geographical Data Models: Raster and Vector, Spatial and Non-Spatial, Types of Attribute Data, Topology	6
4	Coordinate Systems, Map Projections – properties, Classification, Aspects. Shape of Earth – Ellipsoid, Geoid. Datum,	6
5	Database Management System: Database Modelling, Models – Hierarchical, Network, Relational	6
6	Digital Elevation Model (DEM), Digital Terrain Model (DTM), Digital Surface Model (DSM)	3
7	Decision Support System (DSS)	2

Course Outcomes:

By the end of the course, the student will:

1. become familiar with fundamentals of GIS, its elements, spatial and non-spatial data.
2. acquire basic understanding of coordinate system, map projections, GIS data models.

Suggested Readings:

1. Burrough, P. A., & McDonnell, R. A. (1998). Principles of Geographical Information Systems. New York: Oxford University press Inc.
2. Chang, K. T. (2008). Introduction to Geographic Information Systems. Avenue of the Americas, McGraw-Hill,
3. Environmental Systems Research Institute, Inc. (1998). Understanding GIS: The ARC/INFO Method. Redlands: ESRI Press.
4. Goodchild, M. F. (2003). Geographic Information Science and System for Environmental Management. Annual Review of Environment and Resource 28: 493-519

GEO 588: Practicals in Geographical Information System (Credits-2)

Course Objectives:

1. To train students in handling QGIS software and using it for creating different raster and vector based thematic maps.
2. To train students in analysis of digital elevation model (DEM), building topology, buffer analysis.

Topic No.	Topics	Number of Practicals
1	Introduction to Digitizing in QGIS: Georeferencing, Making a Base Map, Creating Shapefile with Point, Line and Polygon Feature,	3
2	Adding Attribute Data, Making Classes for Different Attribute Data (Classified Map), Generating Layout with Legend, Saving and Editing Shapefiles, Projects	3
3	Digital Elevation Model: Generating Maps of Slope, Aspect, Contour, Relief, Hillshade	3
4	Buffer Analysis	2
5	Building Topology, Data Query	2
6	Using different tools in QGIS: Raster Calculator, Reproject, Spatial Analyst	2

Note: a) For 2 credits 2 hours practical per week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. become familiar generation of maps by creating shapefiles.
2. acquire different skills such as building topology, query analysis, raster and vector-based tools.

Suggested Readings:

1. Burrough, P. A., & McDonnell, R. A. (1998). Principles of Geographical Information Systems. New York: Oxford University press Inc.
2. Chang, K. T. (2008). Introduction to Geographic Information Systems. Avenue of the Americas, McGraw-Hill,
3. Environmental Systems Research Institute, Inc. (1998). Understanding GIS: The ARC/INFO Method. Redlands: ESRI Press.
4. Goodchild, M. F. (2003). Geographic Information Science and System for Environmental Management. Annual Review of Environment and Resource 28: 493-519

GEO 591: On Job Training (Credits-4)

Course Objectives:

1. To give hands-on experience and practical training to students in different sectors related to geography
2. To develop marketable skills among students
3. To expose students to different industrial, educational and research institutes and future employers
4. To apply their knowledge in real situations
5. To gain experience in writing technical reports

Guidelines
<ul style="list-style-type: none"> • For on-job training, the students will be attached with the local institutions and employing establishments, which have laboratory/workshop, other related facilities and where adequate supervision by qualified personnel will be available. • A student is expected to spend not less than 60 working hours on On-job training and related activities. • On-job training will be carried in the summer vacation after the students complete their second semester examinations. • Students need to provide the confirmation letter from the organization or the institute where they have joined for on-job training. • The continuous evaluation of the students' performance in the on job-Training will be carried out with the assistance of the personnel of training institutions/employing establishments where this training will be imparted. • The proof of completion of on-job training (work experience certificate and field report) should be submitted during examination to the parent institution, duly issued and signed by the concerned training authority.

Course Outcomes:

By the end of the course, the student will:

1. embrace different pathways of learning, including experiential learning
2. understand the social, economic and administrative considerations that influence the working environment of different organizations
3. learn new strategies like time management, multi-tasking and new skills
4. get an opportunity to meet new people and learn networking skills

Savitribai Phule Pune University, Pune

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography (Level 6.5)

Department of Geography, Savitribai Phule Pune University

M. A. / M. Sc. Geography (Year II, Semester III)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits
					T	P	
6.5	Third Semester	Major Core	GEO 601 - 604	Special Core – 3 (Theory) (Select any one as per specialization from following) GEO 601: Tropical Geomorphology GEO 602: Monsoon Climatology GEO 603: Geography of Development GEO 604: Geography of Migration	04	--	04
			GEO 611- 614	Special Core – 3 (Practicals) (Select any one as per specialization from following) GEO 611: Tropical Geomorphology: Practicals GEO 612: Monsoon Climatology: Practicals GEO 613: Geography of Development: Practicals GEO 614: Geography of Migration: Practicals	--	02	02
			GEO 621	Essentials of Watershed Management	02	--	02
			GEO 631- 634	Special Core – 4 (Theory) (Select any one as per specialization from following) GEO 631: Geomorphology: Theoretical and Applied GEO 632: Agro-Meteorology GEO 633: Contemporary Economic Geography GEO 634: Urban Geography	04	--	04
			GEO 641 - 644	Special Core - 4 (Practicals) (Select any one as per specialization from following) GEO 641: Geomorphology - Theoretical and Applied: Practicals GEO 642: Agro-Meteorology: Practicals GEO 643: Contemporary Economic Geography: Practicals GEO 644: Urban Geography: Practicals	--	02	02
			Total credit related to Major Core				

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits		
					T	P			
6.5	Third Semester	Major Elective (Select any one group)	Group A						
			GEO 651	Political Geography	02	--	02		
			GEO 652	Regional Planning	02		02		
			Group B						
			GEO 653	Multivariate Statistics in Geography	02	--	02		
			GEO 654	Multivariate Statistics in Geography: Practicals	--	02	02		
			Group C						
			GEO 655	Introduction to Python Programming	02	--	02		
			GEO 656	Introduction to Python Programming: Practicals	--	02	02		
			Group D						
			GEO 657	Plant Geography	02				
		GEO 658	Zoogeography	02					
	Research Project	GEO 661	Research Project			04			
Sem. III- Total Credits=Major Core+ Major Elective + RP							22		

Vertical Group (Semester - III)	Credit for Theory	Credit for Practical	Total Credit
Total credit related to Major Core	10	04	14
Total Credits related to Major Electives	02/04	02/00	04
Research Project	----	----	04
Total Credits	12/14	06 / 04 + 04	22

Savitribai Phule Pune University, Pune

Syllabi as per NEP 2020 for M.A. / M.Sc. Geography
Department of Geography, Savitribai Phule Pune University

M. A. /M. Sc. Geography (Year II, Semester IV)

Level	Semester	Group	Course Code	Course Name	Credits		Total Credits		
					T	P			
6.5	Fourth Semester	Major Core	GEO 671	Physical Oceanography	02	--	02		
			GEO 672	Oceanography: Marine Resources and Management	02	--	02		
			GEO 673	Geography of Soils	02	--	02		
			GEO 674	Geography of Sustainable Development	02	--	02		
			GEO 675	Advances in Geography (Select any one as per specialization from following) A. Advances in Physical Geography B. Advances in Human Geography	--	02	02		
			GEO 676	Applied Geography: Field Study	--	02	02		
			Total credit related to Major Core				08	04	12
		Major Elective (Select any one group)	Group A						
			GEO 681	Advance Surveying: Theory	02	--	02		
			GEO 682	Advance Surveying: Practicals	--	02	02		
			Group B						
			GEO 683	Social Geography	02	--	02		
			GEO 684	Cultural Geography	02	--	02		
			Group C						
			GEO 685	Advances in RS and GIS	02	--	02		
			GEO 686	Advances in RS and GIS: Practicals	--	02	02		
		Total Credits related to Major Electives				02	02	04	
				Research Project	GEO 691	Research Project: Dissertation			06
Sem. IV Total Credit = Major Core + Major Elective + RP					10	06	22		

Vertical Group (Semester - IV)	Credit for Theory	Credit for Practical	Total Credit
Total credit related to Major Core	08	04	12
Total Credits related to Major Electives	02/04	02/00	04
Research Project			06
Total Credits	10/12	06/04+06	22

Year-II

Semester-III

GEO 601: Tropical Geomorphology (Credits-4)

Course Objectives:

1. To make the students aware about the basic concepts of tropics, tropical environment and geomorphology.
2. To understand the impact of tropical environment on geomorphic processes.
3. To know the characteristics of tropical landforms and their formation.
4. To understand the typical landscape development in different types of tropical environment.
5. To know the impact of climate change on the processes and forms in the tropical region.

Topic No.	Topics	Number of Lectures
1	Introduction to Tropical Region: Tropics as Part of Gondwana, Its Special Features and Major Landforms; Tropical Hydrology: Climate; Rainfall Erosivity, Temperature, Winds, Tropical Disturbances and Water Balance; Role of Vegetation, Climatic Geomorphology and Morphogenetic Regions, Geomorphology in the Tropics	10
2	Weathering Processes and Profiles in Humid Tropical Environment	8
3	Duricrusts and Types: Laterite - Processes, Profiles and Landforms	6
4	Hillslopes, Pediments and Gullies	5
5	Rivers in Tropics: Discharge, Sediment Load, Cross-Sectional Characteristics and Floodplain Morphology	4
6	Tropical Coasts and Deltas	4
7	Distribution and Types of Karst in Tropics	3
8	Tropical Planation: Etchplain, Peneplain, Pediplain and Inselbergs	6
9	The Arid Tropics: Hydrology, Landforms and Aeolian Geomorphology	6
10	Quaternary Climate Changes and Landforms in Tropics	4
11	Anthropogenic Alteration of Geomorphic Processes in Tropics	4

Course Outcomes:

By the end of the course, the student will:

1. get knowledge of tropical region and important characteristics of the tropical environment with respect to geomorphology.
2. understand the characteristics of tropical landscape development, its uniqueness and importance of different tropical regions.
3. understand tropical processes like erosion, deposition and different landforms of tropical region.
4. be acquainted with the role of human activities in the alteration of geomorphic processes and the landscape.

Suggested Readings:

1. Budel, J. (1982). Climatic Geomorphology. Princeton: Princeton University Press.
2. Faniran, A., & Jeje, L. K. (1983). Humid Tropical Geomorphology. London: Longman.
3. Goudie, A. (1985). Duricrusts in Tropical and Sub Tropical Landscapes. Australia: Alien Unwin.
4. Goudie, A. S. (2004). (Eds.), Encyclopedia of Geomorphology, London: Routledge.
5. Gupta, A. (2011). Tropical Geomorphology. London: Cambridge University Press.
6. Joshi, V. U. (2022) An Introduction to Tropical Geomorphology, Mangalam Publication, New Delhi.
7. Thomas, M. F. (1994). Geomorphology in the Tropics: A study of Weathering and Denudation in Low Latitudes. Chichester: John Wiley and Sons.

GEO 602: Monsoon Climatology (Credits-4)

Course Objectives:

1. To familiarize with climate over South Asia and its spatial variation.
2. To expose students to driving mechanisms of monsoon, semi-permanent systems, interseasonal and interannual variability.
3. To acquaint students with forecasting of monsoon, climate change and its effects on Indian monsoon rainfall.

Topic No.	Topics	Number of Lectures
1	Introduction and Scope of Monsoon Climatology, Historical Background and Economic Importance	3
2	Tropical General Circulation over South Asia: Equatorial Trough, Trade Winds, ITCZ, Hailstorms, Dust Storms, Subtropical Highs – The Mascarene High, Jet Streams – Subtropical Westerly Jet Stream, Tropical Easterly Jet Stream, East-African Low-Level Jet	9
3	Different Concepts Regarding Origin of Monsoon, the Asian Monsoon: East and South Asian Monsoon, Classical Theory of Indian Monsoons	6
4	Monsoon Model: Driving Mechanism, Realistic Monsoon Model	5
5	Monsoon Climatology: Normal Temperature, Wind and Pressure, Dates of Onset and Withdrawal, Monsoon Rainfall, Winter Monsoon	5
6	Regional Aspects of Indian Monsoon: Semi-Permanent Systems – Heat Low, Monsoon Trough, Tibetan High, Upper Winds, Easterly Jet Stream	6
7	Interseasonal Variation: Active and Break Period, Depressions, Trough of Low Pressure, Mid – Tropospheric Disturbances, Offshore and Onshore Vortices, Effect of Orography, Break Monsoon Situations	7
8	Interannual Variation: Variability of Summer Monsoon Rainfall, Snow Cover, Meteorological Teleconnections: ENSO, SOI, IOD, NAO; Walker Circulation, the Role of Ocean and Upper Atmosphere, Epochal Pattern of Indian Summer Monsoon Rainfall, Trends in Monsoon Rainfall	10
9	Monsoon Forecast: Different Time Scales, Factors for Forecasting, Power Regression and Parametric Model, Contemporary Monsoon Forecasting System; MONEX and IIOE, Climate Change and Indian Monsoon	9

Course Outcomes:

By the end of the course, the student will:

1. strengthen the understanding of Indian monsoon, different theories and monsoon driving forces.
2. improve on their knowledge about rain bearing systems of monsoon and different teleconnections of monsoon rains.
3. fully comprehend interannual and intraseasonal variation of Monsoon.

Suggested Readings:

1. Das, P. K. (1991). Monsoons. New Delhi: National Book Trust.
2. Fein, J. S., & Stephens, P. L. (1987). Monsoons, New York: John Wiley and Sons.
3. Keshavmurty, K. N. (1992). The Physics of Monsoons. New Delhi: Allied Publishers Limited.
4. Pant, G. B., & Rupa Kumar, K. (1997). Climates of South Asia. Chichester: John Wiley and sons.
5. Thornthwaite, C. W., & Mather, J. R. (1957). Instructions and tables for computing potential evapotranspiration and the water balance.

**GEO 603: Geography of Development
(Credits-4)**

Course Objectives

1. To explore the various aspects of development from a geographic perspective.
2. To equip students with conceptual framework of development related to cultural, rural and urban milieu.
3. To assess and analyze various strategies and theories of development.
4. To understand and analyze various issues related to geographies of development.

Topic No.	Topics	Number of Lectures
1	Definition, Nature and Scope: Relation between Geography and Development	5
2	Concepts and Principles of Development: Growth and development, space, place and scale, Sustenance, Self-Esteem and Freedom Sustainable Development: Sustainability, Three pillars of SD Concept of Livelihood	6
3	Developed and Developing Economies: Classification and Characteristics	5
4	Culture and Development: Ethno-development, Right-based development, Gender and Development, Sexualities of development	6
5	Rural Agricultural Development: Biases, agriculture as growth engine, agro-politan approach	6
6	Urban Industrial Development: Urbanization and development, Urbanization and industrialization, Urbanization and SDGs, rural-urban interaction.	6
7	Poverty: Definition, Types, Indicators, World trend, Poverty and SDGs	6
8	Geographies of Inequities and Uneven Development: Positionality, network theory and scale jumping	6
9	Strategies of Development: Trade-not-aid, bottom-up and participatory development, Globalization, Modernization and Westernization	7
10	Theories of Development: Growth pole, Cumulative Causation, Dependency, Gunnar Myrdal, Keynesian model	7

Course Outcomes:

By the end of the course, the student will:

1. be able to identify contemporary development issues and their historical and geographical perspectives.
2. help students to discuss different theoretical approaches which are used to define, analyse and respond to development issues
3. be able to critically evaluate various dimensions of development and its interlinkages with geography.

Suggested Readings:

1. Desai, V., & Potter, B. R. (Eds.) (2011). *The Companion to Development Studies*. London: A Hodder-Viva Edition.
2. Dutta, R., & Sundaram, K. P. M. (2002), *Indian Economy*. New Delhi: S. Chand Publications.
3. Haynes, J. (2008). *Development Studies*. Polity Short Introduction Series.
4. Hodder, R. (2000). *Development Geography*. London: Routledge.
5. Peet, R. (2005). *Theories of Development*. Jaipur: Rawat Publications.
6. Potter, R. B., Binns, T., Elliot, J. A., & Smith, D. (1999). *Geographies of Development*. Landon: Longman.
7. UNDP (2002). *Human Development Report*. Oxford University Press. Oxford.

Course Objectives:

1. To provide in-depth understanding of migration concepts, types, theories and their application, spatial distribution and population change.
2. To equip students with the recent theoretical and empirical developments in the field of migration.
3. To provide better insights of migration with geographic and demographic significance.
4. To understand major issues of migration, consequences, and addressing policies.
5. To enable students to evaluate migration policies, to comprehend various laws and convention

Topic No.	Topics	Number of Lectures
1	Introduction: Definition, Nature, Scope, Significance and Concepts	5
2	Determinants of Migration, Incentives for Migration: Empirical Evidence and Current Significance	5
3	Theories of Migration and Application: Geographical, Sociological, Economic and Unifying	8
4	Typology of Migration: Fairchild, Peterson, Crane, Gonzalez, Gould and Prothero	5
5	Consequences of Migration and Current Issues	5
6	Migration and Its Geographical and Demographic Significance	5
7	International Migration: Problems and Prospects, Pattern of Migration, International Laws and Conventions, Environmental Issues and Migration, Health issues and Migration	8
8	Internal Migration: Problems and Prospects, Pattern of Migration, Internal Displacement, issues at origin and destination, Environmental Issues and Migration, Health issues and Migration	8
9	Refugee Migration: Global and National Pattern in Refugee Migration	6
10	Migration Polices: International Laws and Conventions	5

Course Outcomes:**By the end of the course, the student will:**

1. learn various key concepts along with dynamic nature of migration.
2. be able to discover and understand spatial distribution and population change with the help of critical appraisal of theoretical and empirical evidences of migration.
3. able to critically examine the impact of population redistribution and its significances.
4. comprehend various regional and global issues of migration. Such as Refugee and IDPs.
5. be able to critically examine the policy and programmes related to migration policies.

Suggested Readings:

1. Brown, A.A. ed. (1977). Internal Migration: A Comparative Perspective, New York: Academic Press.

2. Cohen, Robin (1996). *Theories of Migration*, Cheltenham: Edward Elga.
3. Demko, G. et. al (1977). *Population Geog: A Reader*. New York: McGraw Hill.
4. Harvey, David (1973). *Social Justice and City*. Baltimore: Edward Arnold and The Johns Hopkins University Press.
5. Jackson. J. A. (1969). *Migration*. Cambridge: University Press.
6. Jones,E.ed. (1975). *Readings in Social Geography*. Oxford: Oxford University Press.
7. Khadaria, B. (2010). *India Migration Report 2009: Past, Present and Future Outlook*. New Delhi: Cambridge University Press.
8. Kosinki, L.A. et.al.eds (1975). *People on The Mov.*, London: Methuen.
9. Oberai, A.S., & Singh, H.K.M. (1983). *Causes and Consequences of Internal Migration: A Study in the Indian Punjab*. Delhi: Oxford University Press.
10. O'Neill, B. C. O. (2001). *Population and Climate Change*. Cambridge: Cambridge University Press.

GEO 611: Tropical Geomorphology: Practicals (Credits-2)

Course Objectives:

1. To understand the Tropical environment.
2. To study the characteristics of tropical landforms in the field and through laboratory analysis.
3. To understand the impact of human activities in the tropical environment.

Topic No.	Topics	Number of Practicals
1	Bowen's and Golditch's Weathering Reaction Series Calculation and Interpretations of Chemical Weathering Indices	2
2	Clay Mineralogy, Listing of Important Clay Minerals and Their Properties	1
3	Universal Soil Loss Equations (USLE, RUSLE)	3
4	Sediment in Sections (Miall's Lithocode)	2
5	Field Study of Landscapes, Weathering Profiles, Laterite Profiles and Lithosections	4
6	Textural Analysis of the Sediments Collected During the Field Trip	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to interpret and understand the tropical environment, related landscape and landforms.
2. will be able to estimate the soil losses using different models.
3. will understand different weathering processes and products and weathering profile zones.
4. learn to analyze and interpret the impact of different human activities on tropical environment.

Suggested Readings:

1. Budel, J. (1982). Climatic Geomorphology. Princeton: Princeton University Press.
2. Faniran, A., & Jeje, L. K. (1983). Humid Tropical Geomorphology. London: Longman.
3. Goudie, A. (1985). Duricrusts in Tropical and Sub Tropical Landscapes. Australia: Alien Unwin.

4. Goudie, A. S. (2004): (Eds.), Encyclopedia of Geomorphology, Routledge, London
System for the ARIES AUV, Monterey, California: Naval Postgraduate School;
Springfield
5. Gupta, A. (2011). Tropical Geomorphology. London: Cambridge University Press.
6. Thomas, M. F. (1994). Geomorphology in the Tropics: A study of Weathering and
Denudation in Low Latitudes. Chichester: John Wiley and Sons.

GEO 612: Monsoon Climatology: Practicals (Credits-2)

Course Objectives:

1. To study the Indian Daily Weather Report (IDWR) during the Monsoon season and comprehend various synoptic features.
2. To train the students in preparation of rainfall, temperature and pressure distribution maps.
3. To understand the use of Tephigram for estimating various meteorological parameters and total precipitable water in the atmosphere

Topic No.	Topics	Number of Practicals
1	Study of Indian Daily Weather Report (IDWR), Preparation of Report About the Monsoon Activity During A Particular Week with Respect to Temperature, Rainfall, Semi-Permanent System and Their Outlook. Note: Based on Map Discussion	4
2	Preparation of Temperature and Pressure Distribution Maps	2
3	Preparation of Rainfall Distribution Maps for Meteorological Subdivisions of India	1
4	Tephigram: Calculate the height of any pressure level from the mean sea level. Find out the thickness between two standard isobaric levels, Locate and find out different meteorological parameters like LCL, CCL, LFC, EL, Tc, Tw, Θ , Θ_w , Θ_E , TE RH, Tv, W, To Study stability/instability of the atmosphere – positive area (CAPE) AND Negative Area (CINE), Mean Isotherm method, Temperature correction to thickness, Dry adiabat and Pseudo adiabat. Computation of Total Precipitable Water in the Atmosphere	6
5	Areal Precipitation: Thiessen Polygon Method	1
6	Field Work	1

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. learn to read and understand Indian Daily Weather Report.
2. be trained in making distribution maps of various weather parameters.
3. be skilled in using Tephigram for understanding vertical variation in atmosphere with respect to different meteorological parameters.

Suggested Readings:

1. Daily and weekly weather reports of the India Meteorological Department

GEO 613: Geography of Development: Practical (Credits-2)

Course Objectives:

1. To enhance the existing understandings of the student regarding the measures of development.
2. To focus on the indices regarding human and regional development along with the preparation of analytical survey report to assess the development of an area.
3. To make students knowledgeable about various methods to measure developmental indices.

Topic No.	Topics	Number of Practicals
1	Indices of Human Development: HDI, Alkire-Foster Method Standard of Living and Deprivation Index	4
2	Indices of Regional Development: Lorenz Curve, Composite index	4
3	Field Work: Collection of Demographic and Socio-Economic Data at Household Level from Primary and / or Secondary Sources and Preparation of an Analytical Survey Report to Assess the Development of an Area	7

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. develop skills to analyze different stages of development in the region.
2. be able to interrogate development measures, indicators, reports and policies of the particular region.
3. understand the area-based approach to development.

Suggested Readings:

1. Lawson, V. A. (2007). Making Development Geography. London: Hodder Arnold.
2. Liensor, J. M. (1997). Techniques in Human Geography. New York: Routledge.

GEO 614: Geography of Migration: Practical (Credits-2)

Course Objectives:

1. To explore and hunt the different data sources of migration.
2. To enable students with basic measures and their applications.
3. To learn advance analysis techniques like direct and indirect estimation, LTSR, Residual method, component method.

Topic No.	Topics	Number of Practicals
1	Basic Measures of Migration: Rate and Ratio Application of Models: Michael Todaro	2
2	Direct Estimates of Net Migration: Place of Birth and Last Residence, Duration of Residence and Place of Residence on a Specific Date before the Census	3
3	Indirect Estimates of Net Migration: National Growth Rate Method and Residual Method: Vital Statistics Method Survival Rate Method: Life Table Survival Rate (LTSR) and Census Survival Rate Method	4
4	Inter-Censal Net Migration by Residual Method, Inter-Censal Cohort Component Method, Inter-Censal Component Method for estimating the total volume of net immigration, Estimates of Net Immigration of Alien Population, Estimates of National Abroad	4
5	Field Work: Collection of Data on a Given Problem and Report Writing	2

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to explore and understand various data sources.
2. get acquainted with the basic measures of migration.
3. be sophisticated with advance techniques to address the various key issues at regional and global level.
4. be able to do analytical techniques of migration data and critically examine the policy and programmes related to migration.

Suggested Readings:

1. Jacob S. Siegel & David, A. Swanson, (2004). The Methods and Materials of Demography, Second Edition, USA: Elsevier Science.
2. John Weeks (2005). Population: An Introduction to Concepts and Issues, Wordsworth Learning, Singapore 9th edition.
3. K. B. Pathak. and F. Ram (2016). Techniques of Demographic Analysis, Himalaya Publishing House.

4. Mitra R. G., (2002). Understanding Patterns of Migration from Census 2001 Data, Population Stabilization and Development, Council of Cultural Growth and Cultural Relations, Cuttack.
5. Shryock, Henry S. Jacob S. Siegel and Associate, (1980). The Methods and Materials of Demography Vol.1 U.S. Bureau of the Census, Washington D.C.
6. Todaro, Michael P. (1976). Internal Migration in Developing Countries, International Labour Office, Geneva.
7. United Nations, (1974). Methods of Measuring Internal Migration, Manual VI, UN, New York.
8. United Nations, (1979). Trends and Characteristics of International Migration since 1950 Demographic Studies No. 64, UN, New York.
9. United Nations, (1983). Determinants and Consequences of Population Trends, Vol 1, UN, New York, Chapter-VI.

GEO 621: Essentials of Watershed Management (Credits-2)

Course Objectives:

1. To make the students aware about the fundamental concepts of watershed management and its significance in sustainable natural resource management.
2. To analyze the geomorphological and hydrological characteristics of watersheds, including drainage basins, networks, and channel morphology.
3. To identify and address issues in water resources management, including point source and non-point source pollution, erosion, water scarcity, flooding, and drinking water protection.
4. Implement soil and water conservation measures to mitigate the impacts of land use activities on watershed health.

Topic No.	Topics	Number of Lectures
1	Watershed: concept and significance of watershed-based development	2
2	Watershed characteristics: geomorphology and hydrology; drainage basin, network and channel morphology	6
3	Watershed hydrology: hydrologic cycle, water balance, climate and precipitation, soils and infiltration, interception and evapotranspiration, groundwater, streamflow and runoff, water quality, aquatic ecosystems (eutrophication, habitat disturbance, etc.)	8
4	Watershed resource appraisal: physical, hydrological, land use/cover Land capability classification	4
5	Watershed management and planning: objectives, integrated watershed management, sustainable watershed management Human aspects of watershed management: Participatory resource appraisal	3
6	Issues in water resources: point source pollution, agricultural and urban non-point source pollution, erosion, water scarcity, flooding, drinking water protection, wastewater treatment and septic systems	4
7	Soil and water conservation measures	3

Course Outcomes:

By the end of the course, the student will:

1. understand the concepts of watershed management and its effect on land, water, and ecosystem resources
2. evaluate the impact of watershed characteristics on water quality and aquatic ecosystems.

3. be able to conduct a comprehensive appraisal of watershed and human resources, considering physical, hydrological, and land use factors.
4. be acquainted with the soil and water conservation measures to protect and enhance watershed health and resilience.

Suggested Readings:

1. Brooks, K. N., Folliott, P. F. & Magner, J. A. (2012): Watershed management issues. Hydrology and the Management of Watersheds, Wiley-Blackwell, Oxford
2. Cech, T. V. (2018). Principles of Water Resources: History, Development, Management, and Policy. John Wiley and Sons, New York
3. Heathcote, I. W. (2009). Integrated Watershed Management: Principles and Practice. John Wiley and Sons, New York.
4. Murty, J. V. S. (2013). Watershed management. New Age International Publishers.
5. Mutreja, K. N. (1986). Applied Hydrology. Tata McGraw-Hill Pub. Co. Ltd., New Delhi.

GEO 631: Geomorphology – Theoretical and Applied (Credits-4)

Course Objectives:

1. To get acquainted with the knowledge of various basic concepts, theories, techniques and models of Geomorphology.
2. To learn the theoretical and applied background of the Geomorphology.
3. To introduce students Climatic Geomorphology and Tectonic Geomorphology like applied branches.
4. To make the students acquainted with the concept of Geoparks and Geomorphosites.

Topic No.	Topics	Number of Lectures
1	History of Geomorphology. Nature and Objectives of Applied Geomorphology. Paradigms in Geomorphology. General System Theory	8
2	Concepts: Uniformitarianism, Neocatastrophism equilibrium, Complex response, Geomorphic thresholds	7
3	Space and time in geomorphology, Time: Cyclic, graded, steady. Magnitude and frequency. Spatial scales: Micro, meso and macro	6
4	Climatic Geomorphology and Tectonic Geomorphology	4
5	Theories, techniques and fieldwork (including field experiments) in geomorphology	4
6	Geomorphometry: General and specific, fractals in Geomorphology	5
7	Applied Geomorphology: Nature and objectives, Roles of applied geomorphologist	6
8	Geomorphic hazards: fluvial, coastal, glacial and hillslope	8
9	Applied fluvial and coastal geomorphology, Dating techniques in Geomorphology	7
10	Geoheritage, Geoparks and Geomorphosites	5

Course Outcomes:

By the end of the course, the student will:

1. Understand the theoretical and applied nature of the Geomorphology.
2. acquire the knowledge of the landforms and the associated geomorphological processes that shape the Earth surface.
3. able to recognize and effectively evaluate the geomorphic hazards.

Suggested Readings:

1. Chorley, R. J., Schumm, S. A. and Sugden, D. E. (1984). Geomorphology. Methuen, London

2. Goudie, A. S. (1990). *Geomorphological Techniques*. Unwin Hyman Ltd., UK
3. Goudie, A. S. (Eds.) (2004). *Encyclopedia of Geomorphology*. Routledge, London
4. Gregory K. J. and Goudie, A. S. (2011). *Handbook of Geomorphology*. SAGE, London
5. Hails, J. R. (1977). *Applied Geomorphology*. Elsevier, Amsterdam
6. Hart, M. G. (1986). *Geomorphology, Pure and Applied*. George Allen and Unwin, London

GEO 632: Agro-Meteorology (Credits-4)

Course Objectives:

1. To extend and fully deploy knowledge of atmospheric and related processes to optimize agricultural Production.
2. Use weather and climate information to enhance or expand agricultural crops or increase crop production.
3. To study plants, energy and moisture-related agrometeorological elements, water loss, and measurements.
4. To study climate and biological hazards and use of RS and GIS in Agro meteorological research.

Topic No.	Topics	Number of Lectures
1	Nature and Scope of Agro-Meteorology, Agro-Climatology of Field Crops, Growth Stages and Factors affecting Growth Sub-periods (Sowing to Harvesting) of the Crops. Linkages with Forestry, Horticulture, and Animal Husbandry	6
2	Plants and Energy Related Agro-Meteorological Elements: Radiation, Laws of Radiation, Solar Radiation Interception by Plants, Photosynthetically Active Radiation (PAR), Solar Energy Utilization by Crops, Radiation Distribution in a Crop Canopy; Temperature - Cardinal, Optimum, Soil and Air Temperature, Frost: Damage and Control, Sensible Heat Flux, Growing Degree Days	6
3	Plants and Moisture Related Agro-Meteorological Elements: Soil moisture, Water stress, Field Capacity, Permanent Wilting Point, Available Water Content, Management Allowed Deficit, Effective Rainfall, Dry and Wet spells	6
4	Water Loss and its Measurement: Evaporation, Transpiration Factors affecting Evapotranspiration, PET	6
5	Climate and Biological Hazards: Weather Induced Diseases with Abrupt Occurrence and Wider Aerial Coverage - Their Causes, Impacts, Forewarning and Management	6
6	Application of RS and GIS in Agro-Meteorology: Introduction to the Role of Remote Sensing in Agriculture, Assessment of Crop Damage and Crop Progress, Horticulture, Cropping Systems Analysis, Demonstration of Technique for Forewarning Pests and Diseases; Environmental Impact Assessment of Agricultural System: Non-point source pollution, Impact of Climate Change on Agricultural System. National Mission: FASAL	6

7	Agro-Meteorological Database Management and its Application: Phenology-based agroclimatic analyses, Validation of dynamic crop growth simulation models, Providing Agromet Advisories to farmers for contingency planning by linking with medium range weather forecast research and operational programs	4
8	Agro-Climatic Classification and Crop weather calendar	4
9	Drought - Types, Causes, Concepts, Indices, Impact on Agricultural Production, Identifying crop-specific moisture stress periods, Droughts in India	6
10	Introduction to Dynamic Crop Simulation Modeling and crop yield forecasting	6
11	Agrometeorological Aspects of Extreme Weather Events: Adaptive Measures, Concepts, Policy Options, and Future Actions	2
12	Weather Forecasts and Agro Advisories: Need for Weather Forecasts for Agriculture	2

Course Outcomes:

By the end of the course, the student will:

1. be able to understand the forecasting weather and crop yield accurately.
2. be able to understand the control of the physical environment consists of prevailing frost, drought, growing wind breaks, adopting flood control measures, and modifying and controlling temperature and humidity in crop fields and animal houses.
3. be able to understand the application of meteorological information and data to enhance crop yields and reduce crop losses because of adverse weather. This has linkages with forestry, horticulture, and animal husbandry.

Suggested Readings:

1. Doorenbos, J. & Pruitt, W. O. (1977). Guidelines for Predicting Crop Water Requirements. FAO (United Nations)
2. Kakade, J.R. (1985). Agricultural Climatology. New Delhi: Metropolitan Book Co.
3. Mavi, H. S. (1996). Introduction to Agrometeorology. New Delhi: Oxford and IBH Publishing Co.
4. Mavi, H. S., & Tupper, G. J. (2004). Agrometeorology: principles and applications of climate studies in agriculture. CRC Press.
5. Thornthwaite, C. W. & Mather, J. R. (1957). Instructions and Tables for Computing Potential Evapotranspiration and Water Balance. Drexel Institute of Technology, Laboratory of Climatology
6. Wilhite, D. A., Sivakumar, M. V. K., & Wood, D. A. (2000, September). Early warning systems for drought preparedness and drought management. In Proceedings of an expert group meeting held in Lisbon, Portugal (Vol. 57).

GEO 633: Contemporary Economic Geography (Credits-4)

Course Objectives:

1. To impart the knowledge of process related to contemporary economic scenario and challenges and interrelated concepts.
2. To develop the aptitude to comprehend the various dimensions of the challenges at various geographical scale.
3. To enable the students to critically examine the contemporary economic scenario and challenges with spatial perspective

Topic No.	Topic	Number of Lectures
1	State and the Economy: Qualitative state, Welfare state, Development state, Reinventing the state	6
2	Geography of Consumption: Conceptualization, Spatialities, Socialities, and Objectivities of Consumption; Space, Place and Scale of Consumption	6
3	Geography of Multinational Corporations: Emergence, nature, development and impact of MNC's; Internationalization of Services	6
4	Geographies of Green Economy: Economic Geography and the Environment, Climate Change: Actions and Finance, Green Economy and Development: Conflicts and Opportunities.	7
5	Geographies of Inequities and Uneven Development: Geo-historical Process: North-south divide, Global South Uneven Development: Status and Challenges	7
6	Regional Economic Blocs and Geo-economics: Introduction to Geo-economics; Geo-economic Aspects of Regionalism	5
7	Globalization and Beyond: Commercial Cultures and Globalization, International Trade and Freight Distribution	7
8	SDG's Economic Dimension and Performance: Global and National levels	6
9	The Political Economy of India's Federal System: Structure, Distribution and Issues.	5
10	Alternative Economic Geographies: Spaces, Practices, An Alternative Network of Global Trade in Development	5

Course Outcomes:

By the end of the course, the student will:

1. study various key concepts, emerging trends and challenges in Economic Geography.
2. be able to learn and comprehend spatial distribution and changing forms of various spheres of political economies.

3. be able to critically analyse the process and impact of globalisation, green economies and related geopolitics
4. understand causes and various issues of uneven development in the contemporary world.

Suggested Readings:

1. Ayers, Jessica & David Dodman (2010). Climate change adaptation and development, I: the state of the debate. *Progress in Development Studies* 10 (2): 161-168.
2. Coe, N. M., Kelly, P. F., & Yeung, H. W. (2019). *Economic geography: a contemporary introduction*. John Wiley & Sons.
3. MacKinnon, D., & Cumbers, A. (2011). *Introduction to Economic Geography: Globalization, Uneven Development and Place* (2nd ed.). Routledge. <https://doi.org/10.4324/9781315847139>
4. MacKinnon, D., & Cumbers, A. (2018). *An Introduction to Economic Geography: Globalisation, Uneven Development and Place* (3rd ed.). Routledge. <https://doi.org/10.4324/9781315684284>
5. Mansvelt, J. (2005). *Geographies of consumption*. Sage Publications
6. Rao Govinda and Singh Nirvikar (2004). The Political Economy of India's Federal System and its Reform. <https://www.econstor.eu/bitstream/10419/83841/1/wp-566.pdf>
7. Rodrigue, J.-P. (2016). *The Geography of Transport Systems* (4th ed.). Routledge. <https://doi.org/10.4324/9781315618159>

GEO 634: Urban Geography (Credits-4)

Course Objectives:

1. To impart the knowledge of process of urbanization, related concepts, development and overall urban system.
2. To develop the ability of classifying urban regions on different criteria.
3. To enable the students to critically examine the theories and models related to Urban Geography.

Topic No.	Topic	Number of Lectures
1	Introduction: Why study Urban Geography? Concept, Nature and Scope	6
2	Origin and Evolution of cities: Preconditions for urban growth, Theories of urban growth, Early urban hearths, The spread of urbanism, Pre and Post-industrial urbanism. Residential segregation. Erickson's model of evolution	5
3	The global context of urbanization and urban change, causes of urban growth, settlement size, megacities and million cities, The urbanization cycle, A stage of urban development model	8
4	Regional perspective on urbanization and urban change: North America, Latin America and Caribbean, Western Europe, East and Central Europe, Asia and the Pacific, and Africa	5
5	Land use in the city: Urban morphogenesis, Ecological models of the city, Modifications of the classical urban models, Growth coalitions, Central Business district and Urban Sprawl	6
6	Urban neighborhood and livability: Theories of urban impact, residential satisfaction, the gentrified city, the suburban cities, the working-class city, theories of urban impact	6
7	Urban Problems: role of metropolitan governance, Ebenezer Howard and Garden city movement, Planning the better city, legal basis for planning, Social justice and welfare	6
8	Globalization and Glocalization: The localization of the global, Elements of the global city, The citadel, The enclave, The Ghetto	6
9	Sustainable development goals and urban development	6
10	Role of urban policies and urban problems	6

Course Outcomes:

By the end of the course, the student will:

1. learn various key concepts, development along and paradigm shift in geography of urban settlement.
2. be able to discover and understand spatial distribution and changing forms with the help of critical appraisal of classification, urban forms and urban system.
3. be able to discover and understand the process of urbanization, theories and model with critical appraisal.
4. comprehend various issues of urban development in contemporary world.

Suggested Readings:

1. Bose, A. (1980). India's Urbanisation. Tata McGraw Hill, New Delhi
2. Carter, H. (1979). The Study of Urban Geography. Arnold Heinemann, London
3. Hall, T. (2006). Urban Geography. Routledge, London
4. Pacione, M. (2009). Urban Geography. Routledge, New York
5. Ramchandran, R. (1997). Urbanization and Urban Systems in India. Oxford University Press, New Delhi
6. Siddharth, K. and Mukherjee, S. (2013). Cities, Urbanization and Urban System. Kosalaya Publishing, New Delhi

GEO 641: Geomorphology – Theoretical and Applied: Practicals (Credits-2)

Course Objectives:

1. To acquaint the students with the geomorphic mapping, fractal dimension, terrain classification etc. applications of Geomorphology
2. To study the facies analysis and mapping of landscape materials.
3. To learn the sedimentary sequences in the field.

Topic No.	Topics	Number of Practicals
1	Geomorphological mapping - Symbols	2
2	Mapping landscape materials: texture, shape, colour. Use of Munsell colour chart	4
3	Estimation of fractal dimension of a line	2
4	Exercises in terrain classification: Composite score method, Crofts (1973) critical slope for specified activates	4
5	Study of sedimentary sequences in the field. Study of facies and major sedimentary structures. Mialls' facies notations / lithocodes	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. acquire basic knowledge of applied geomorphology.
2. develop the research ability in the field of applied Geomorphology.

Suggested Readings:

1. Cooke, R. U. and Doornkamp, J. C. (1974). Geomorphology in Environment Management. Clarendon Press, London
2. Dackombe, R. V. and Gardiner, V. (1983). Geomorphological Field Manual. George Allen and Unwin, London
3. Goudie, A. (1990). Geomorphological Techniques. Unwin Hyman, London
4. Goudie, A. S. (Eds.) (2004). Encyclopedia of Geomorphology. Routledge, London

GEO 642: Agro-Meteorology: Practicals (Credits-2)

Course Objectives:

1. To understand the concept of evapotranspiration and its significance in agricultural water management.
2. To identify and understand crop phenological stages and their relationship with meteorological variables.
3. To learn and implement evapometric irrigation scheduling techniques for optimizing water use in agriculture.
4. To explore the application of agrometeorological techniques in crop management and decision-making.

Topic No.	Topics	Number of Practicals
1	Crop Water Requirement Estimation: Evapotranspiration concepts, Estimation of Potential Evapotranspiration and Crop Evapotranspiration, Crop Coefficient Curve	5
2	Crop Phenological Stages and Crop Weather Calendar	2
3	Computation of Weekly Water Balance	5
4	Computation of evapometric irrigation scheduling	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to estimate potential and crop evapotranspiration using various methods
2. identify and describe different crop phenological stages and their relationship with weather variables
3. compute weekly water balances incorporating meteorological data and crop water requirement
4. implement evapometric irrigation scheduling techniques to optimize irrigation scheduling based on crop water needs and environmental conditions

Suggested Readings:

1. Broner, I. (1989). Irrigation scheduling. Colorado State University Cooperative Extension.
2. Doorenbos, J. & Pruitt, W. O. (1977). Guidelines for Predicting Crop Water Requirements. FAO (United Nations)
3. Mavi, H. S. (1996). Introduction to Agrometeorology. New Delhi: Oxford and IBH Publishing Co.

4. Thornthwaite, C. W. & Mather, J. R. (1957). Instructions and Tables for Computing Potential Evapotranspiration and Water Balance. Drexel Institute of Technology, Laboratory of Climatology

GEO 643: Contemporary Economic Geography: Practicals (Credits-2)

Course Objectives:

1. To enhance the existing understandings of the student regarding the measures of unequal development and sustainable development.
2. Focuses on the indices regarding globalization and sustainable development along with the preparation of analytical survey report.
3. To help students identify key development challenges and disparities within and between countries or regions.
4. To help students identify and evaluate regional development strategies and policies.

Topic No.	Topics	Number of Practicals
1	Indices of Human Development: MDPI and Assessment of world Development of Report	3
2	Measurement of inequality: Gini Index	1
3	Sopher's disparity Index	2
4	Assessment of impact of globalization	2
5	Assessment of sustainable development	2
6	Preparation of an analytical survey report to assess the impact of globalization/ climate change/ localization of sustainable development/ trade in regional blocs/ related policies based on primary and / or secondary sources.	5

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. develop skills to analyse different levels of development and geo-economics characteristics in the region.
2. able to explore and understand various data sources.
3. be able to cross-examine economic measures, indicators, reports and policies of a particular region to global level.
4. develop skills in preparing analytical survey reports that assess contemporary economic issues.

Suggested Readings:

1. Lawson, V. A. (2007). Making Development Geography. London: Hodder Arnold.
2. Liendsor, J. M. (1997). Techniques in Human Geography. New York: Routledge.

GEO 644: Urban Geography: Practicals (Credits-2)

Course Objectives:

1. To inculcate the skill of measuring basic indices of urbanization.
2. To develop the ability of classifying urban region using different methods of urbanization
3. To develop analytical skill to comprehend advance methods of urbanization with field work exper.

Topic No.	Topics	Number of Practicals
1	Basic measures for urbanization	2
2	Calculation of CBD by Vance and Murphy method	3
3	Size of locality of residence of median inhabitant	3
4	Index of city distribution, methods of urban renewal, Bachi's Standard distance method, and and of urban sprawl (Entropy Method)	4
5	Field Work: Collection of data on a given problem and report writing	3
		15

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the knowledge of basic measures of urban settlement.
2. possess knowledge about calculation of CBD, urban renewal and entropy methods based on various factors.
3. acquaint himself with skill of analysing various factors affecting city distribution and size of locality.

Suggested Readings:

1. Pathak, K. B. and Ram, F. (2013): Techniques of Demographic Analysis, Himalaya Publishing House, Mumbai
2. Haggett, P. (1965): Locational Analysis in Human Geography, Edward Arnold, London
3. Siddharth, K. and Mukherjee, S. (2013): Cities, Urbanization and Urban System, Kisalaya Publishing Pvt. Ltd., New Delhi
4. Wilkinson, F. J. and Monkhouse H. R. (1966): Maps and Diagrams – Their Compilation and Construction, Methuen and Co., London
5. Hall, T. (2006): Urban Geography, Routledge, London
6. Pacione, M. (2009): Urban Geography- A Global Perspective, Routledge, London
7. Ramachandran, R. (1997) Urbanization and Urban Systems in India, Oxford University Press, Delhi

GEO 651: Political Geography (Credits-2)

Course Objectives:

1. To understand the theoretical foundations of Political Geography
2. To understand the spatial organization of states, nations and nation states
3. To examine the significance of frontiers and boundaries in Political Geography
4. To understand global strategic views and geopolitical issues
5. To discuss the geographical basis of Indian federalism, including the emergence of new states and boundary disputes

Topic No.	Topics	Number of Lectures
1	Definition, Nature, Scope and Approaches	3
2	Concepts in Political Geography: State, Nation and Nation-State,	3
3	Frontiers and Boundaries: Classification and Characteristics	4
4	Global Strategic Views: Mahan, Mackinder, Spykman and Cohen	5
5	Electoral Studies in Political Geography	3
6	Geographical Basis of Indian Federalism; Emergence of New States, International Boundary of India and Related Issues	4
7	Contemporary issues: Geopolitics of the Indian Ocean, Russia – Ukraine War, Israel-Palestine Conflict	5
8	Water Dispute in India: Interstate and International	3

Course Outcomes:

By the end of the course, the student will:

1. be able to define and explain the nature, scope, and various approaches used in the study of Political Geography
2. analyze the geopolitical significance of frontiers, boundaries, and borderlands in shaping political relationships and conflicts
3. analyze electoral studies within the context of political geography, including electoral systems and voting behaviour
4. examine the geopolitical dynamics of the Indian Ocean region and contemporary major conflicts in the world

Suggested Readings:

1. Adhikari, S. (1997). Political Geography. Jaipur: Rawat Publications.
2. Cox, K. (2002). Political Geography: Territory, State and Society. Wiley-Blackwell.
3. Dikshit, R. D. (1994). Political Geography. New Delhi: Tata McGraw Hill Publication.

4. Glassner, M. L., De Blij, H. J., & Yacher, L. (1980). *Systematic Political Geography*. John Wiley.
5. John, R. S. (2002). *An introduction to Political Geography*. Taylor & Francis.

GEO 652: Regional Planning (Credits-2)

Course Objectives:

1. To comprehend the concepts of regional planning
2. To analyze the historical development of regional planning with emphasis on the structure of the Five-Year Plans in India
3. To evaluate regional planning at various administrative levels
4. To investigate regional disparities in India and explore the natural and cultural dimensions influencing regional planning in India

Topic No.	Topics	Number of Lectures
1	Introduction to Regional Planning: Concepts, Nature and Scope	4
2	Historical Development of Regional Planning (Developed, Less Developed and India)	4
3	Regional, Techno-Economic and Diagnostic Surveys	4
4	Salient Features of Indian Five-Year Plans, NITI Aayog	5
5	State, District and Block Level Planning	3
6	Regional Planning and Disparities in India	3
7	Natural and Cultural Orientation of Regional Planning in India	3
8	Regional Development and Planning Strategies: Case Studies from Developed and Developing Countries	4

Course Outcomes:

By the end of the course, the student will:

1. be able to explain the significance of regional planning in addressing spatial disparities and promoting sustainable development
2. evaluate the effectiveness of past planning initiatives in addressing socio-economic challenges
3. assess the role of multi-level planning in achieving regional development goals
4. be able to critically assess the impact of natural and cultural factors on regional development

Suggested Readings:

1. Bhat, L. S. (1973). Regional Planning in India. Kolkata: Statistical Publishing Society.
2. Chand, M. and Puri, V. K. (2003). Regional Planning in India, New Delhi: Allied Publishers Pvt. Ltd.
3. Chandana, R. C. (2000). Regional Planning- A Comprehensive Text. Ludhiana: Kalyani Publisher.

4. Dube, K. N. (1990). Planning and Development in India, New Delhi: Asia Publishing House.
5. Friedmann, J., & Alonso, W. (1967). Regional Development and Planning: A Reader. New York: MIT Press.
6. Glasson, J., & Marshall, T. (2007). Regional Planning. New York: Routledge.
7. Govt. of India (1986). Regional Plan 2001: National Capital Region, NCRPB, Ministry of Urban Development, New Delhi.
8. India Year Book (2014). Publication Division, New Delhi.
9. Mishra, H. N. (2005). Regional Planning, Jaipur: Rawat Publication.
10. Mishra, R. P. (1992). Regional Planning, Concepts, Techniques, Policies and Case Studies, New Delhi: Concept Publication.
11. Mishra, R. P. (2002). Regional Planning in India. New Delhi: Concept Publication.

GEO 653: Multivariate Statistics in Geography (Credits-2)

Course Objectives:

1. To understand the importance of multivariate analysis in Geography
2. To apply elementary ideas of matrix algebra to understand multivariate techniques
3. To evaluate the effectiveness of each multivariate technique in understanding geographical phenomena, modeling relationships, identifying spatial trends, reducing dimensionality and making predictions

Topic No.	Topics	Number of Lectures
1	Geographical data and multivariate analysis, Types of data and variables in geographical research	3
2	Elementary ideas of matrix algebra: Associative law, Commutative law, Distributive law, Matrix transpose, Inverse, Determinants	4
3	Non-linear bivariate relationships	3
4	Multivariate analysis: Multiple regression and correlation	4
5	Trend surface analysis: Computation of linear trend, Ideas of quadratic and cubic surfaces	4
6	Principal component and Factor Analysis: Concept of Eigen values and Eigen vectors	6
7	Logistic Regression	3
8	Harmonic analysis: Fourier series, Application of harmonic analysis in geographical data analysis	3

Course Outcomes:

By the end of the course, the student will:

1. understand the principles and significance of multivariate statistical analysis in Geography
2. be able to apply various multivariate statistical methods in geographical research
3. analyze geographical data to analyze patterns, relationships and spatial trends using methods such as multiple regression, principal component analysis and trend surface analysis

Suggested Readings:

1. Acevedo, M. F. (2012). Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press, London
2. Johnston, R. J. (1978). Multivariate Statistics in Geography, Longman, London
3. Rogerson, P. A. (2010). Statistical Methods for Geography, Sage Publications, London
4. Summer, G. (1978). Mathematics for Physical Geographers, John Wiley, New York
5. Yeats, M. H. (1974). An Introduction to Quantitative Analysis in Human Geography, McGraw-Hill, New York

GEO 654: Multivariate Statistics in Geography: Practicals (Credits-2)

Course Objectives:

1. To apply the principles and concepts of matrix algebra in geographical data analysis
2. To use appropriate non-linear regression models to understand complex relationships in geographical data
3. To create meaningful interpretations of principal components and factor loadings and to evaluate their effectiveness in reducing dimensionality of geographical data

Topic No.	Topics	Number of Practicals
1	Exercises in matrix algebra: Basic operations, Determinants, Inverse, Simultaneous Equations	2
2	Exercises in non-linear bivariate relationships: 2 nd degree and 3 rd degree polynomials	3
3	Exercises in multivariate analysis: multiple regression and multiple correlation, generating linear trend surface using Trend Surface Analysis	3
4	Exercises in Principal Component and Factor Analysis, Interpretation of Scree Plot, Principal Components, Factor loadings and Component Scores	4
5	Exercises in Logistic Regression model and harmonic analysis	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. develop solutions using matrix algebra to solve simultaneous equations, compute determinants and find inverse of matrix
2. be able to apply multivariate statistical techniques to analyze geographical data and identify spatial patterns

Suggested Readings:

1. Acevedo, M. F. (2012). Data Analysis and Statistics for Geography, Environmental Science and Engineering, CRC Press, London
2. Johnston, R. J. (1978). Multivariate Statistics in Geography, Longman, London
3. Rogerson, P. A. (2010). Statistical Methods for Geography, Sage Publications, London
4. Summer, G. (1978). Mathematics for Physical Geographers, John Wiley, New York
5. Yeats, M. H. (1974). An Introduction to Quantitative Analysis in Human Geography, McGraw-Hill, New York

GEO 655: Introduction to Python Programming (Credits-2)

Course Objectives:

1. To gain a foundational understanding of Python Programming
2. To understand how to define and utilize functions for code modularity and reusability
3. To understand the applications of various essential Python libraries like NumPy, Pandas and Matplotlib for data analysis and visualization

Topic No.	Topics	Number of Lectures
1	Introduction to Python, Python Installation, Python Syntax	3
2	Python Variables and Data types, Input and Output	3
3	Python Comments: Single-line and multi-line comments Python Strings: String Methods	3
4	Python Numbers: Integer, Float and Complex Python Operators: Arithmetic, Comparison and Logical Operators	4
5	Python Booleans: True and False in Python, Boolean Operators	2
6	Python conditionals: if, else, nested if, elif statements,	3
7	Python loops: for loop and while loop, loop control statements (break, continue)	3
8	Python Functions: Defining Functions and Function Arguments	3
9	Python Modules: NumPy, Pandas and Matplotlib	6

Course Outcomes:

By the end of the course, the student will:

1. gain proficiency in fundamentals of Python programming, including its syntax, variables, and basic operations.
2. develop skills in implementing control flow structures such as conditionals and loops to manage program execution efficiently.
3. develop a theoretical understanding of Python libraries and their applications in data analysis.

Suggested Readings:

1. Beazley, D., & Jones, B. K. (2013). Python cookbook: Recipes for mastering Python 3. O'Reilly Media, Inc.
2. Hetland, M. L. (2017). Beginning Python: from novice to professional. Apress.

3. Lutz, M. (2010). Programming Python: powerful object-oriented programming. O'Reilly Media, Inc.
4. Mueller, J. P. (2023). Beginning programming with Python for dummies. John Wiley & Sons.

GEO 656: Introduction to Python Programming: Practicals (Credits-2)

Course Objectives:

1. To acquire practical experience with Python data types such as numbers, strings, lists, tuples, sets and dictionaries
2. To perform numerical operations and conduct data analysis using NumPy and Pandas
3. To develop skills in creating various types of plots using Matplotlib

Topic No.	Topics	Number of Practicals
1	Introduction: Basic Python Syntax, Writing basic python programs	2
2	Python variables: Variable declaration and operations	2
3	Python Data Types: Exercises with Numbers, Strings, Lists, Tuples, Sets and Dictionaries	2
4	Exercises with Python conditionals Exercises with Python loops	3
5	Python File Handling: Reading data from files, Writing data to files and handling file exceptions	2
6	Exercises for numerical operations using Numpy Exercises of data analysis using Pandas Exercises for data visualization using Matplotlib	4

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. be able to write basic Python programs using different variables and gain practical experience in using different Python operators
2. be proficient in using Python conditionals and loops to handle file input/output operations
3. develop proficiency in data analysis using NumPy and Pandas, and data visualization using Matplotlib, enabling them to analyze and visualize data from various sources.

Suggested Readings:

1. Beazley, D., & Jones, B. K. (2013). Python cookbook: Recipes for mastering Python 3. O'Reilly Media, Inc.
2. Hetland, M. L. (2017). Beginning Python: from novice to professional. Apress.
3. Lutz, M. (2010). Programming Python: powerful object-oriented programming. O'Reilly Media, Inc.
4. Mueller, J. P. (2023). Beginning programming with Python for dummies. John Wiley & Sons.

GEO 657: Plant Geography (Credits-2)

Course Objectives:

1. To examine the evolutionary processes, diversification and distribution of plant life on Earth
2. To understand the principles and methods of taxonomic, ecological, and climatic classification of plants.
3. To investigate the interaction of plants with their physical environment, including atmospheric and edaphic factors.
4. To explore the characteristics, distribution, and adaptations of plants in different biomes and their responses to environmental stresses.

Topic No.	Topics	Number of Lectures
1	Plant Geography: Scope and Evolution of Plants	3
2	Functioning and Development of Ecosystem	2
3	Plants and Their Classification: Taxonomic, Ecological and Climatic. Raunkiaer's and Grime's Classification	6
4	Plants and Their Environment	4
5	Plants and Atmospheric Factors	4
6	Plants and Edaphic Factors	4
7	Major Biomes of the World: Forests, Grasslands and Deserts	4
8	Anthropogenic Effects on Plants	3

Course Outcomes:

By the end of the course, the student will:

1. illustrate the structure and function of ecosystems, emphasizing the role of plants in energy flow and nutrient cycling.
2. be able to utilize Raunkiaer's and Grime's classification frameworks to categorize plant strategies and life forms.
3. assess the influence of atmospheric and edaphic factors on plant physiology, growth and distribution.
4. Analyze the effects of human activities on ecosystem health, and propose sustainable practices to protect plant diversity.

Suggested Readings:

1. Mathur, H. S. (2003). Essentials of Biogeography. Jaipur: Pointer Publishers.

2. Pears, N. V. (1977). Basic biogeography. London: Longman Group.
3. Robinson, H. (1972). Biogeography. London: MacDonald and Evans.
4. Seddon, B. A. (1971). Introduction to Biogeography. London: Gerald Duckworth and Co.
5. Tivy, J. (1993). Biogeography: A Study of Plants in the Ecosphere, London: Longman.

GEO 658: Zoogeography (Credits-2)

Course Objectives:

1. To provide a comprehensive overview of the historical development and diversification of animal species.
2. To study the unique characteristics of animals and their adaptations to various environments.
3. To explore the different zoo-geographical regions and their distinctive fauna.
4. To evaluate the impact of human activities on animal populations and their habitats.

Topic No.	Topics	Number of Lectures
1	Zoogeography: Scope and Evolution of Animals	5
2	Animal Characteristics, Environmental Adaptations; Camouflaging and Luminescence	5
3	Taxonomic Classification of Animals	6
4	Zoo-Geographical Regions of the World	4
5	Dispersal of Mammals, Birds, Reptiles, Fishes	6
6	Anthropogenic Effects on Animals	4

Course Outcomes:

By the end of the course, the student will:

1. be able to apply taxonomic classification systems based on the characteristics of different animals.
2. discuss the biogeographical factors that influence animal distribution in various zoo-geographical regions.
3. evaluate the ecological and evolutionary implications of dispersal mechanisms of mammals, birds, reptiles and fishes.
4. be able to assess human impacts on animal diversity and propose sustainable conservation practices.

Suggested Readings:

1. Darlington, P. J. (1957). Zoogeography: The Geographical Distribution of Animals, New York: John Wiley and Sons.
2. Mathur, H. S. (2003). Essentials of Biogeography, Jaipur: Pointer Publishers.
3. Pears, N. (1977). Basic Biogeography, London: Longman Group.
4. Robinson, H. (1972). Biogeography, London: MacDonald and Evans.
5. Seddon, B. A.(1971). Introduction to Biogeography, London: Gerald Duckworth & Co.

GEO 661: Research Project (Credits-4)

Course Objectives:

1. To familiarize students with the basics of field research and data collection methods.
2. To develop skills in data analysis using cartographic and / or computer-based tools.
3. To enhance report writing capabilities, following academic standards and formats.
4. To prepare students for more extensive scientific research projects in subsequent semesters.

Guidelines:

1. Each student will perform research project separately.
2. The project working hours should be 30 hours for each credit.
3. The student should select a topic relevant to his / her field of study that addresses a specific problem or question within the discipline.
4. The student should be regular and include timely updates on data collection, preliminary findings, and any challenges faced to his / her supervisor.
5. Students should complete at least one of the following objectives in their project:
 - a. Students can engage in activities like surveys, interviews, field observations or experiments to achieve their research objective.
 - b. Students can identify and utilize existing datasets and perform preliminary analysis to understand data trends and patterns.
 - c. Students may also analyze / critically assess a specific policy or an existing report related to their topic.
 - d. The student can also conduct a thorough literature review to understand the current state of research of his / her topic.
 - e. The students can apply appropriate statistical methods and / or use GIS software to analyze data and perform spatial analysis.
 - f. The student can also provide a detailed description of all the physical and human aspects of a selected study region.
6. The findings of the research work undertaken should be compiled in a report using proper formatting.
7. The student should adhere to ethical principles and standards in all aspects of their research.
8. Students will present their preliminary findings to an internal examiner midway through the semester. Feedback and insights provided by the examiner should be considered for further analysis and incorporated into the final report.
9. For the external assessment, the student should submit a final report, followed by a viva-voce.

Course Outcomes:

By the end of the course, the student will:

1. be able to identify and articulate a research topic that is relevant to their field of study.
2. be able to achieve their research objective through different methodological approaches
3. be familiar with the utilization of cartographic and computer tools to organize and / or present data.
4. be skilled in organizing their research findings in a structured and comprehensive report that meet academic standards.
5. develop necessary skills to conduct research effectively and contribute meaningfully to their field of study.

GEO 671: Physical Oceanography (Credits-2)

Course Objectives:

1. To explain the concepts and principles of physical oceanography.
2. To familiarize the student with oceanographic concepts and their significance including Oceanic waves, tides and currents, deposits, and Sea level change.
3. To study the behaviour and characteristics of global oceans.

Topic No.	Topics	Number of Lectures
1	Nature and scope, Age and origin of Oceans	3
2	Morphology of Major Ocean bottom	4
3	Ocean water Properties	5
4	Oceanic waves	2
5	Tides: Types and Theories	4
6	Ocean water circulation	4
7	Marine Deposits and Coral reefs	4
8	Sea Level change and its consequences	4

Course Outcomes:

By the end of the course, the student will:

1. acquainted with morphology of ocean bottom, origin of ocean and the properties of ocean water.
2. comprehend the causes, significance, and impacts of oceanic waves, tides, currents and Marine deposits in the ocean.
3. Understand the meaning of Sea level changes and their significance.

Suggested Readings:

1. Garrison, T. (1993). Oceanography – An Invitation to Marine Science. California: Wadsworth Publication Co.
2. Gross, G. M. (1990). Oceanography. New York: Macmillan Publication.
3. Joseph, W. S., & Parish, H. I. (1974). Introductory Oceanography, Tokyo: McGraw Hill.

4. Pinet, P. R. (2009). *Invitation to Oceanography*. Boston: Jones and Bartlett Publishers.
5. Stowe, K. S. (1979). *Ocean Science*, New York: John Wiley and Sons.
6. Thurman, H. V., & Trujillo, A. P. (1997). *Introductory Oceanography*, New Jersey: Prentice Hall.

GEO 672: Oceanography: Marine Resources and Management (Credits-2)

Course Objectives:

1. To learn basic concepts of oceanography, marine resources and management.
2. To understand issues related to marine resources.
3. To learn different aspects of resource management and conservation strategies.
4. To acquaint students with marine resource policy applications.

Topic No.	Topics	Number of Lectures
1	Introduction to Oceanography: Concepts of Oceans, Marine space, Physical, Chemical and Biological Oceanography	6
2	Marine Resources: Meaning, Living and Non-living resources and their Management	6
3	Marine Environment: Issues Pollution: Current status, impact and issues and their management.	5
4	Marine and coastal resource management: National and International Policies and community development	6
5	Marine Resources: Blue economy, SDG and uses of marine resources and Emerging issues	7

Course Outcomes:

By the end of the course, the student will:

1. understand the basics of Oceanography, managing and conserving marine resources.
2. be able to study marine resources and gain insights into marine resources.
3. be able to understand policies related to managing and conserving marine resources.
4. develop an understanding of management conservation of marine resources and issues related to marine resources.

Suggested Readings:

1. Basher, Z. and Costello, M.J. (2020). World Maps of Ocean Environment Variables, in Goldstein, M.I. DellaSala, D.A. (Editors): Encyclopaedia of the World's Biomes, Elsevier, Pages 479-493.
2. Freestone, D., Barnes, R. and Ong, D (2006). The Law of the Sea: Progress and Prospects (edited). Oxford University Press.
3. Green, D.R. Payne, J. L. (2017). Marine and Coastal Resource Management: Principles and Practice Edn.1, Routledge Publisher.
4. Norse E. A. and Crowder L.B. (2005). Marine Conservation Biology - The Science of Maintaining the Sea's Biodiversity, Island Press, Washington D.C.
5. UNESCO (2020) Global Ocean Science Report 2020. United Nations Educational, Scientific and Cultural Organization, Paris.

6. United Nations (2021). The Second World Ocean Assessment vol.-I, United Nations. New York.
7. World Bank and UNDESA (2017). The Potential of the Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries. World Bank, Washington DC.

GEO 673: Geography of Soils (Credits-2)

Course Objectives:

1. To get acquainted with the knowledge of Pedological and Edaphological approaches to Soil Studies including processes of soil formation, types of soil, and land classification; and management.
2. To introduce students physical and chemical properties of Soils and its significance for the plant growth.
3. To comprehend the devastating impact of deforestation and need of soil conservation and management.

Topic No.	Topics	Number of Lectures
1	Introduction to Soil Geography / Pedology, Soil origin and profile	4
2	Weathering and Pedogenesis, Soil forming processes and factors,	6
3	Primary and Secondary Minerals	6
4	Physical properties of Soils: Texture, Structure, Colour, Porosity and Permeability, Water holding capacity, Field capacity and Wilting point	6
5	Chemical properties of Soils: Clays minerals, Cation- Anion exchange, Humus, Organic matter, C:N ratio, pH and NPK; Factors influencing ion exchange and its significance	4
6	Soil Classification – Genetic, Introduction to Soil taxonomy	4

Course Outcomes:

By the end of the course, the student will:

1. be acquainted with origin and soil forming processes and the function of its minerals.
2. understand the importance and significance of soil forming processes, physical and chemical properties of soils.
3. acquire the knowledge about the environmental problems of the soils and their management.

Suggested Readings:

1. Birkeland, P. W (1999). Soils and Geomorphology. New York: Oxford University Press.
2. Brady, N. C., & Weil, R. R. (2008). The Nature and Properties of Soils. New Jersey: Prentice Hall.

3. Bridges, E. M., & Davidson, D. A. (1982). Principles and Applications of Soil Geography. London: Longman Group.
4. Daji, J. A. (1970). A Textbook of Soil Science. New York: Asia Publication House.
5. Miller, R. W., & Donahue, R. L. (1992). Soils: An Introduction to Soils and Plant Growth, New Delhi: Prentice-Hall of India.
6. Pitty, A. F. (1978). Geography and Soil Properties, London: Methuen and Co.

GEO 674: Geography of Sustainable Development (Credits-2)

Course Objectives:

1. To explore the contemporary global challenge of ensuring sustainability in both human societies and natural environments in the 21st century.
2. To address the human and natural systems and how interactions between these systems shape the world we live in.

Topic No.	Topics	Number of Lectures
1	Sustainable Development: Definition, Components, Limitations, and Historical Background	2
2	The Millennium Development Goals: National Strategies and International Experiences	5
3	Sustainable Regional Development: Need and examples from different Ecosystems	4
4	Inclusive Development: Education, Health; Climate Change: The role of higher education in Sustainable Development; The human right to health; Poverty and disease; Policies and Global Cooperation for Climate Change.	8
5	Sustainable Development Policies and Programmes: The proposal for SDGs at Rio+20; Illustrative SDGs; Goal-Based Development; Principles of Good Governance; National Environmental Policy,	8
6	Achieving social justice in India: Inclusive growth through Constitutional imperatives	3

Course Outcomes:

By the end of the course, the student will:

1. be able to identify how sustainability, both of societies and the environment, is one of the most significant issues in the world today.
2. demonstrate an understanding of the dimensions of sustainability, including cultural, environmental, economic, and political systems.
3. will communicate major ideas and issues on society and sustainability through various discussions and activities.

Suggested Readings:

1. Agyeman, J., Bullard, R. D., & Evans, B. (Eds.). (2003). Just sustainabilities: Development in an unequal world. MIT press.
2. Ayers, J., & Dodman, D. (2010). Climate change adaptation and development-I: the

- state of the debate. *Progress in Development studies*, 10(2), 161-168.
3. Brosius, J. P. (1997). Endangered forest, endangered people: environmentalist representations of indigenous knowledge. *Human ecology*, 25, 47-69.
 4. Lohmann, L. (2003). Re-imagining the population debate. *The Corner House Briefing*, 28, 1-20.
 5. Martínez-Alier, J., Pascual, U., Vivien, F. D., & Zaccai, E. (2010). Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. *Ecological economics*, 69(9), 1741-1747.
 6. Merchant, C. (1994). *Ecology. Atlantic Highlands*. N.J: Humanities Press.
 7. Osorio, L. A. R., Lobato, M. O., & Castillo, X. Á. D. (2005). Debates on sustainable development: towards a holistic view of reality. *Environment, development and sustainability*, 7, 501-518.
 8. Robbins, P. (2019). *Political ecology: A critical introduction*. John Wiley & Sons.

GEO 675: Advances in Geography (Credits-2)

Course Objectives:

Section A:

1. To acquaint students with various techniques of geotechnical analysis and their applications using DEM.
2. To learn different types of dating techniques and their applications in the Earth Science.
3. To learn advanced data analysis techniques using Microsoft Excel and other software tools.
4. To study different climate classification schemes and understand the factors influencing climate patterns and their global distribution.

Section B:

1. To impart advance professional knowledge of data analysis along with computer skills.
2. To enable the students to take up career in the field of human geography and handle the large-scale statistical data using appropriate methods and software's in human geography.
3. To gain an understanding of data analysis software's like MS Excel, SPSS and Stat Craft to produce accurate and appropriate results.
4. To promote scientific and technological applications in teaching and research.

Topic No.	Topics	Number of Practicals
Note: Any one section as per specialization		
Section A: Advances in Physical Geography		
1	DEM based Geotechnical analysis and its applications	4
2	Introduction and application of dating techniques	3
3	Data Analysis using MS Excel and other software	4
4	Climate Classification Drought Indices: Meteorological and Remote Sensing-based	4
		15
Section B: Advances in Human Geography		
1	Introduction: Importance, introduction of various tools for data analysis	1
2	Significance of Statistical Methods in Geography; Sources of Data, Scales of Measurement (Nominal, Ordinal, Interval, Ratio), Tabulation and Descriptive Statistics, Measurement of Central Tendencies, Measures of Dispersion, Sampling	3

3	Data Analysis using MS Excel (Cross tabulation, Pivot table, dashboard, tabula)	3
4	Data Analysis using SPSS or Stat Craft	6
5	Data Collection through ODK Collect, Analysis and Report Writing	2
		15

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes (Section A):

By the end of the course, the student will:

1. be familiarized with application of DEM in different geotechnical analysis methods.
2. acquire important knowledge of the application of dating techniques.
3. demonstrate proficiency in using MS Excel for data manipulation, analysis, and visualization in the context of physical geography datasets.
4. analyze climate classification systems in relation to observed climate data sets from different regions of the world.
5. interpret various drought indices to assess drought severity, duration, and spatial extent in different geographic contexts.

Course Outcomes (Section B):

By the end of the course, the student will:

1. gain the knowledge about basics data analysis along with computer skills.
2. student will be sophisticated with handling the large-scale statistical data using appropriate methods and software's.
3. students will able to perform advance data analysis techniques using various software.
4. to acquaint the students with the importance and utility of advances in teaching and research.

Suggested Readings (Section A):

1. Goudie, A. (1990). *Geomorphological Techniques*. (2nd Edn.) Routledge, London.
2. Li, Z., Zhu, C., & Gold, C. (2004). *Digital terrain modeling: principles and methodology*. CRC press.
3. Walker, M. (2013). *Quaternary dating methods*. John Wiley & Sons.
4. Foreman, J. W. (2013). *Data smart: Using data science to transform information into insight*. John Wiley & Sons.
5. Wardlow, B. D., Anderson, M. C., & Verdin, J. P. (Eds.). (2012). *Remote sensing of drought: Innovative monitoring approaches*. CRC Press.

Suggested Readings:

1. Blalock, Hubert M. (1960): *Social Statistics*, McGraw-Hill Book Company, New York.
2. Chakravorti, S.R. and Giri, N. (1997): *Basic Statistics*, South Asian Publishers, New Delhi.

3. Clarke, G.M. and Cooke, D., (1994): A Basic Course in Statistics, Arnold, London.
4. Dixon, W.J and Massey, F.J. (1983) Introduction to Statistical Analysis, 4th ed., New York, MC Graw Hill, 380-381, 534.
5. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1985): Fundamentals of Statistics Vol. I, The World Press Private Ltd. Calcutta.
6. Prakasam, C.P., G. Rama Rao, and R.B. Upadhyay (1987): Basic Mathematics in Population Studies, Gemini Publishers, Mumbai.
7. Siegel J.J. and D.A. Swanson (Ed.), 2004. The Methods and Materials of Demography. Second Edition. Elsevier Academic Press.
8. SPSS 14.0 Brief Guide – SPSS Inc.
9. SPSS regression models 11.0 - SPSS Inc.
10. SPSS advanced models 11.0 - SPSS Inc.

GEO 676: Applied Geography: Field Study (Credits-2)

Course Objectives:

1. To learn field skills and acquire knowledge of real-world conditions.
2. To understand issues related to geography and local and regional environment.
3. To learn field management and develop field strategies.
4. To acquaint students with applications in geographical knowledge.

Topic No.	Topics	Number of Practicals
1	Understand landforms and landscapes before and during the field. Generate topographic data in the field through a profile survey.	2
2	Understand sediment properties and collection of sediment samples in different environments.	2
3	Assessment of climatic variations of different regions	2
4	Field Observations and measurements to study microclimates using various weather instruments	2
5	Assessment of Economic activities and its spatiality	2
6	Socio-economic survey	2
7	Understand current issues of population and settlement using questionnaires and application of Kobo tool	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain field knowledge and be able to appreciate the physical environment.
2. assess climate variations across different regions, analyzing factors such as temperature and precipitation.
3. learn to conduct socio-economic surveys, including the use of questionnaires and digital platforms

Suggested Readings:

1. Goudie, A. (1990). *Geomorphological Techniques*. (2nd Edn.) Routledge, London.
2. Pacione, M. (1999). *Applied Geography: Principles and Practice*. London: Routledge.

3. Phillips, R., & Johns, J. (2012). *Fieldwork for human geography*. Sage Publications.
4. Robinson, G.M. (1998). *Methods and Techniques in Human Geography*. Michigan: John Wiley.

GEO 681: Advance Surveying: Theory (Credits-2)

Course Objectives:

1. To impart adequate knowledge so as to enable the students to take up career in the field of surveying by understanding concepts, development and trends.
2. To use information, function, differentiate instrument and techniques, and their usage in surveying.

Topic No.	Topics	Number of Lectures
1	Introduction to Total Station: Principle and Function, REM, RDM, Use of Total Station in Topographical Survey	5
2	Introduction to GPS and Differential GPS (DGPS): Principle and Function, Dual and Single Frequency DGPS, RTK and Static Surveys in DGPS, Use of DGPS in Topographical Survey	8
3	Comparison of the Total Station with DGPS in Topographical Surveying	6
4	Introduction to UAS (Unmanned Aerial System), UAV (Unmanned Aerial Vehicle), Drone Survey	5
5	Introduction to Laser Scanning Survey	3
6	New Trends in Surveying	3

Course Outcomes:

By the end of the course, the student will:

1. get acquainted with the importance of various key concept along with development and new trends of surveying techniques in geography.
2. able to discover and understand information, function, differentiate instrument and their usage.
3. apprehend with application of advance surveying techniques.

Suggested Readings:

1. Jeff, H. (1995). Differential GPS Explained, Trimble Navigation
2. Lawrence, L., & Alex, L. (2008). GPS Made Easy: Using Global Positioning Systems in the Outdoors. Calgary: Rocky Mountain Books.
3. Mohinder, S. G., Lawrence, R. W., & Angus, P. A. (2001). Global Positioning Systems, Inertial Navigation and Integration, New York: John Wiley and Sons Inc.
4. Satheesh, G., Sathikumar, R., & Madhu, N. (2007). Advanced Surveying: Total Station, GIS and Remote Sensing, Delhi: Pearson Education.

GEO 682: Advance Surveying: Practicals (Credits-2)

Course Objectives:

1. To impart adequate skills so as to enable the students to take up career in the field of surveying by understanding various advance surveying instruments used.
2. To developed the skills of collecting, processing data conducted through survey techniques.
3. To developed the ability to application of surveying techniques in various fields.

Topic No.	Topics	Number of Lectures
1	Total Station Survey: Area Selection, Setting Up of the Instrument atthe Base Station, Survey with and without Reflector	4
2	Total Station Data Processing: Download the Point Data, Import the File into GIS, Creation of Shapefile and Generation of Digital ElevationModel	3
3	DGPS Survey: Area Selection, Setting Up of the Instrument at the Base Station, Survey using Rover and Storing the Data	3
4	DGPS Data Processing: Download Point Data, Import File intoGIS, Creation of Shape file and Generation of Digital Elevation Model	2
5	UAV /Drone Survey: Creation of Mission Plan, Drone Survey, Data Processing	3

Note: a) For 2 credits 2 hours practical twice a week.

b) The concerned teacher may add some points related to the subject.

Course Outcomes:

By the end of the course, the student will:

1. gain the knowledge about handling of advance survey instruments along with usage.
2. sophisticate with handling the advance survey instruments with data collection methods.
3. able to perform advance data analysis techniques using various software collected through advance survey.
4. acquaint the students with the applications, importance and utility of advance survey in teaching and research.

Suggested Readings:

1. Jeff, H. (1995). Differential GPS Explained, Trimble Navigation
2. Lawrence, L., & Alex, L. (2008). GPS Made Easy: Using Global Positioning Systems in the Outdoors. Calgary: Rocky Mountain Books.
3. Mohinder, S. G., Lawrence, R. W., & Angus, P. A. (2001). Global Positioning Systems, Inertial Navigation and Integration, New York: John Wiley and Sons Inc.
4. Satheesh, G., Sathikumar, R., & Madhu, N. (2007). Advanced Surveying: Total Station, GIS and Remote Sensing, Delhi: Pearson Education.

GEO 683: Social Geography (Credits-2)

Course Objectives:

1. To develop a comprehensive understanding of social geography and analyze the spatial distribution and social structures of diverse groups in India.
2. To understand the role of power and identity through the dynamics of race, ethnicity, gender and sexuality.
3. To explore social problems through a geographical perspective.
4. To examine the social basis of regional inequalities to understand their causes.

Topic No.	Topics	Number of Lectures
1	Social Geography: Definition, Nature, Scope, Significance and Concepts	3
2	Tribe: Definition, Nomenclature, Distribution, Developmental Impact and Linguistic Variations	4
3	Religion and Caste in India: Origin, Types and Distribution	5
4	Linguistic Diversity of India and Contemporary Issues	3
5	Power, Identity and Social Geography: Race and Ethnicity; Geography of Gender and Sexuality	4
6	Social Geography and Social Problems: Housing, Space and Society; Crime, Space and Inequality; Geography of Poverty	6
7	Social Basis of Regional Inequalities and Disparities	5

Course Outcomes:

By the end of the course, the student will:

1. demonstrate a thorough understanding of the key concepts and scope of social geography
2. critically analyze the distribution, developmental challenges, and societal roles of tribal communities, religions, castes, and linguistic groups in India
3. apply geographical perspectives to explore and address social issues related to housing, poverty, inequality, crime and regional disparities

Suggested Readings:

1. Ahmad, A. (1993). Social Structure and Regional Development, Rawat Publications, Jaipur
2. Ahmad, A. (2012). Social Geography of India, Concept Publishing Company, New Delhi
3. Panelli, R. (2004). Social Geographies: From Difference to Action, Sage Publications, London

GEO 684: Cultural Geography (Credits-2)

Course Objectives:

1. To develop a comprehensive understanding of social geography and analyze the spatial distribution and social structures of diverse groups in India.
2. To understand the role of power and identity through the dynamics of race, ethnicity, gender and sexuality.
3. To explore social problems through a geographical perspective.
4. To examine the social basis of regional inequalities to understand their causes.

Topic No.	Topics	Number of Lectures
1	Cultural Geography: Definition, Nature, Scope and Significance	5
2	Themes in Cultural Geography: Cultural Region, Cultural Diffusion, Cultural Ecology, Cultural Integration and Cultural Landscape	6
3	Cultural Regions of the World Cultural Change: Cultural Adaptation, Cultural Assimilation, Integration	4
4	Cultural groups with reference to India: ethnicity, religion and language	5
5	Cultural Politics	5
6	Globalization of Culture	5

Course Outcomes:

By the end of the course, the student will:

4. demonstrate a thorough understanding of the key concepts and scope of social geography
5. critically analyze the distribution, developmental challenges, and societal roles of tribal communities, religions, castes, and linguistic groups in India
6. apply geographical perspectives to explore and address social issues related to housing, poverty, inequality, crime and regional disparities

Suggested Readings:

4. Ahmad, A. (1993). Social Structure and Regional Development, Rawat Publications, Jaipur
5. Ahmad, A. (2012). Social Geography of India, Concept Publishing Company, New Delhi
6. Panelli, R. (2004). Social Geographies: From Difference to Action, Sage Publications, London

GEO 691: Research Project: Dissertation (Credits-6)

Course Objectives:

1. To familiarize students with the basics and principles of field research and data collection methods.
2. To learn diverse research methodologies proficiently.
3. To analyze and synthesize scholarly literature effectively.
4. To develop skills in data analysis using cartographic and / or computer-based tools.
5. To enhance report writing capabilities, following academic standards and formats.
6. To prepare students for more extensive scientific research projects and execute them independently.

Guidelines:

1. Each student will perform research project separately.
2. The project working hours should be 30 hours for each credit.
3. The student should select a topic relevant to his / her field of study that addresses a specific problem or question within the discipline.
4. The student should be regular and include timely updates on data collection, preliminary findings, and any challenges faced to his / her supervisor.
5. Project report / Thesis / Dissertation report must be written systematically and presented in bound form: The project will consist of name page, certificate, content, summary of project followed by introduction, literature survey, data and methodology, results and discussion, conclusions,
6. The Project Report should be duly signed by the supervisor and the Head of the Department and submitted to the concerned department.
7. The student should adhere to ethical principles and standards in all aspects of their research.
8. Students will present their preliminary findings to an internal examiner midway through the semester. Feedback and insights provided by the examiner should be considered for further analysis and incorporated into the final report.
9. For the external assessment, the student should submit a final report, followed by a viva-voce.

Course Outcomes:

By the end of the course, the student will:

1. be able to identify and articulate a research topic that is relevant to their field of study.
2. be able to achieve their research objective through different methodological approaches
3. be familiar with the utilization of cartographic and computer tools to organize and / or present data.
4. be able to evaluate research findings and methodologies critically.

5. be skilled in organizing their research findings in a structured and comprehensive report that meet academic standards.
6. develop necessary skills to conduct research effectively and contribute meaningfully to their field of study.