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 andApplied 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 andApplied: 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	**10**	**04**	**14**

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 T	Credits P	Total Credits
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

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.

GEO 604: Geography of Migration
(Credits-4)

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. (l977). 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, Θw, ΘE, 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. Liendsor, 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. Kisalaya 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 exposer.

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 delimitation 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, Metheun 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., & Alanso, 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: 2nd degree and 3rd 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.

Semester-IV

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, Useof Total Station in Topographical Survey	5
2	Introduction to GPS and Differential GPS (DGPS): Principle and Function, Duel and Single Frequency DGPS, RTK and Static Surveysin 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 handlining 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.