UNIVERSITY OF CALCUTTA

Notification No. CSR/ 71 /18

It is notified for information of all concerned that the Syndicate in its meeting held on 13.07.2018 (vide Item No.11) approved the Syllabus of Two-Year (Four-Semester) M.A. / M.Sc. Course of Study in Geography under CBCS in the Post-Graduate Departments of the University and in the affiliated Colleges offering Post-Graduate Courses under this University, as laid down in the accompanying pamphlet.

The above shall be effective from the academic session 2018-2019.

SENATE HOUSE
KOLKATA-700073
The 17th August, 2018

(Debabrata Manna)
Deputy Registrar (Acting)

Postgraduate CBCS Syllabus
of
Geography

TO BE EFFECTIVE FROM THE ACADEMIC SESSION 2018-19

University of Calcutta
August, 2018

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CONTENTS

SYLLABUS STRUCTURE

Semester	Module	Type	Subject	Marks	Credits
I	101	Th	Philosophy of Geography	50	5
	102	Th	Geomorphology & Geotectonics	50	5
	103	Th	Soil & Biogeography	50	5
	104	Th	Economic Geography	50	5
	105A	Pr	Geospatial Analysis (Visual)	40	5
	105B	Pr	Term Paper	10	1
II	206	Th	Climatology	50	5
	207	Th	Hydrology & Oceanography	50	5
	208	Th	Population & Regional Development	50	5
	209	Th	Social & Cultural Geography	50	5
	210	Pr	RS, GIS & GNSS (Digital)	50	5
III	311	Th	Elective Paper – I (Other Discipline)	50	4
	312	Th	Elective Paper – II (Other Discipline)	50	4
	313	Th	Optional Special Paper – I*	50	5
	314	Pr	Statistical Techniques (including computer)	50	5
	315	Pr	Quantitative & Field Techniques	50	5
IV	416	Th	Historical & Political Geography	50	5
	417	Th	Regional Geography of India	50	5
	418	Th	Optional Special Paper – II*	50	5
	419	Pr	Optional Special Paper – III*	50	5
	420A	Pr	Optional Special Paper – IV*: Dissertation	25	4
	420B	Pr	Field / Project Report	25	2
I–IV	101–420B	—	22 Modules	1000	100
III	311/312	Th	Elements of Geography (Elective for Other Disciplines)	50	4

Optional Special Papers: *Any one to be selected for Modules 313, 418, 419 and 420A from the following

A. Advanced Cartography
B. Advanced Geomorphology
C. Advanced Industrial Geography
D. Agricultural Geography
E. Climatology of Tropical Asia
F. Environmental Geography
G. Geography of Culture and Heritage
H. Geography of Health
I. Geography of Tourism
J. Coastal Management
K. Geomorphology of Humid Tropics
L. Population and Welfare Geography
M. Regional Planning
N. Soil Geography and Land use
O. Urban Geography

SEMESTER I

MODULE-101: PHILOSOPHY OF GEOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Development in Modern Geographical Thought

1.1 Place of Geography in the classification of knowledge after Varenius and Kant. Evolution of Geography as a spatial science.

1.2 Positivism in Geography: Explanation and search for scientific routes.

1.3 Critiques of positivism. Crisis of modernity.

1.4 Shift towards critical perspectives.

Unit-2: Emergence of Critical Perspectives

2. 1 Behavioural, radical and humanistic geography.

2.2 Post modernity and the production of space after Lefebvre, Harvey, and Soja.

2.3 The cultural turn. Feminist Geography: Space, place and identity.

2.4 Chronological geographies of gender.

Unit-3: Changing Trends and Dimensions

3.1 Geography of inequality.

3.2 Colonial and post-colonial interpretations in geography.

3.3 Geography in the era of globalisation: Political-economic perspectives in spatial relations.

3.4 Select ideas of environment and human geography: Contesting environment and socialising nature.

Unit-4: Contemporary Pedagogies and Research Frontiers in Geography

4.1 Revival of classical paradigm.

4.2 New social geographies: Clustering and segregation, hybrid geography, mental map and local imaginaries.

4.3 Geography of power and regional identity.

4.4 Spatial dimension of political ecology.

MODULE-102: GEOMORPHOLOGY & GEOTECTONICS (Theoretical – 50 marks / 5 credits)

Unit–I: Concepts in Geomorphology

1.1 Spatial scale, temporal scale and related concepts: Systems, feedback, equilibrium and threshold.

1.2 Morphogenetic regions. Models of slope evolution.

1.3 Measurement and monitoring of landform evolution in fluvial and coastal environments. Significance of process studies and simulation modelling.

1.4 Plate tectonics as a unified theory of global tectonics.

Unit–II: Rivers and River Basins

2.1 River hydraulics: flow and energy. Hydraulic geometry of streams.

2.2 Catchment processes and fluvial processes. Factors regulating entrainment, transportation and deposition of sediments.

2.3 Adjustment of channel forms and patterns to morphodynamic variables.

2.4 Fluvial landforms: Genetic classification, ordering, formation and evolution.

Unit–III: Evolution of Landforms

3.1 Coastal morphodynamic variables and their influence on evolution of coastal forms.

3.2 Classification and evolution of periglacial landforms.

3.3 Impact of Pleistocene on landform evolution.

3.4 Planetary geomorphology with special reference to Moon and Mars.

Unit–IV: Applied Geomorphology

4.1 Application of geomorphology in feasibility assessment of engineering and industrials projects. Geomorphic approach to hazard studies.

4.2 Factors, vulnerability, consequences, and management of earthquakes, tsunamis and landslides.

4.3 Factors, vulnerability, consequences, and management of riverbank erosion, storm surges and floods.

4.4 Principles of integrated coastal management.

MODULE-103: SOIL & BIOGEOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Soil Geography

1.1 Soil as a component of Biosphere; Concept of land and soil; Plant-water-soil relationship.

1.2 Bio-functions of Soil; Soil organic matter, Soil organisms and Micro-organisms and their relation with soil fertility.

1.3 Soil mineralogy and Soil nutrients; Role of physico-chemical properties in soil fertility and productivity.

1.4 Soil degradation and pollution: causes, processes and consequences; Preventive, ameliorative and conservation measures.

Unit-2: Plant Geography

2.1 Plant ecology: habitat factors and plant responses to environment: adaptation, and climax: domestication of plants.

2.2 Phytogeographical regions; Concept of plant species, family and genera; taxonomy.

2.3 Consequences of deforestation and exploitation of targeted species; Forest conservation, Social forestry and Participatory Management of Forest.

2.4 Concept of degeneration and regeneration of plants.

Unit-3: Zoo Geography

3.1 Theory of evolution of species and its critics.

3.2 Dispersal of animals in different geological periods.

3.3 Dispersal and migration of animals; means and barriers; Zoo-geographical regions of the world.

3.4 Principles of animal ecology; Wild life management; Relevance of sanctuaries with special reference to India.

Unit-4: Ecosystem and Ecology

4.1 Principles of physical and human ecology; Ecosystem models.

4.2 Concept of biological desert; Forms and functions of marine ecosystem.

4.3 International Biological Programme, Man and Biosphere Programme.

4.4 Biodiversity conservation with special reference to humid tropics.

MODULE-104: ECONOMIC GEOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Resources and Economics

1.1 Concept of resource, resistance and neutral stuff. Resource-creating factors: nature, man and culture. Resource adequacy and concept of scarcity. Economic systems.

1.2 Ranking of world economies. Resource classification: Ackerman's scheme.

1.3 Limits to growth: Classical, neo-classical and ecological economics.

1.4 Economic theories: Functional, sustainable development, resource and inequality.

Unit-2: Agricultural Economy

2.1 Agricultural regions: Concepts and techniques of delineation.

2.2 Word agricultural systems, Agri-business.

2.3 Green revolution and food security in India.

2.4 Land tenure systems and land reforms in relation to Indian agriculture.

Unit-3: Industrial Economy

3.1 Theories of industrial location as proposed by Palander, Hoover, Smith and Pred.

3.2 Major industrial regions. Spatial distribution of manufacturing industries: Petroleum refining and textile.

3.3 Emerging industries with special reference to food processing and ICT in India.

3.4 Industrial policy of India. Role of liberalisation, privatisation and globalisation.

Unit-4: Trade and Commerce

4.1 Economics of global trade: Balance of payment, role of GATT and WTO.

4.2 Regional blocks in international trade.

4.3 Market network and linkages: Market centres, periodic and daily marketing, retailing and whole-selling, E-commerce.

4.4 Labour markets and mobility with special reference to India.

MODULE-105A: GEOSPATIAL ANALYSIS (Practical – 40 marks / 5 credits)

Unit- I: Analyses of topographical maps

1.1 Comparative utility of topomaps, aerial photos and satellite images as sources of geographical data.

1.2 Preparation of altimetric frequency curves and hypsometric curves of drainage basins.

1.3 Extraction of radii of curvature and sinuosity and braiding indices of channels.

1.4 Determination of settlement hierarchy.

Unit-2: Analyses of satellite images

2.1 Common types of IRS and Landsat sensors and their suitability for analysis of geographical information. Indian referencing scheme of IRS sensors.

2.2 Extraction of physical features from satellite images of various resolution and band combinations.

2.3 Extraction of cultural features from satellite images of various resolution and band combinations.

2.4 Detection of change from multidated maps and/or images (including images captured from web-based earth observation programmes).

Unit-3: Preparation of analytical maps

3.1 Preparation of land capability maps.

3.2 Preparation of landslide risk zonation maps.

3.3 Preparation of flood risk zonation maps.

3.4 Preparation of coastal erosion vulnerability maps.

Unit-4: Laboratory Notebook and Viva Voce

MODULE-105A: TERM PAPER (Practical – 10 marks / 1 credit)

SEMESTER II

MODULE-206: CLIMATOLOGY (Theoretical – 50 marks / 5 credits)

Unit-1: Concepts of Weather and Climate

1.1 The climate system: Micro, Meso and Macro; Linkages of climate with other environmental systems

1.2 Role of heat and moisture in the atmosphere; Adiabatic processes and instabilities

1.3 The wind circulation systems: Primary, Secondary and Tertiary

1.4 Clouds: Formation and classification; Precipitation: Forms and functions

Unit-2: Tropical Climates and Weather Hazards

2.1 Tropical circulations: Hadley and Walker, ENSO phenomena

2.2 Tropical air mass; Convergence and divergence

2.3 The Asian Monsoon: Importance, characteristics, and prediction

2.4 Weather hazards – Heat and cold waves, thunderstorm, tornado and cyclone: Distribution, significance and forecasting

Unit-3: Climate Change

3.1 Scientific evidences of climate change; Reconstruction of past climates

3.2 Theories of climate change; Prognostication of future climates

3.3 The climate cycle; Climate trends in the Holocene period

3.4 Recent trends of global climates: Implications and arguments

Unit-4: Applied Climatology

4.1 Approaches and techniques of weather forecasting with reference to the tropics: short, medium and long range

4.2 Climate and agriculture: Agro-climatology – Water budget and Crop Calendar

4.3 Climate and settlements: Urban climatology – Urban Heat Island and Architecture

4.4 Climate and health: Bio-climatology – Human Comfort and morbidity

MODULE-207: HYDROLOGY & OCEANOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Hydrology - I

1.1 Water in earth: forms, occurrences and properties.

1.2 Significance of the global hydrological cycle with special reference to global storage and transportation of heat.

1.3 Precipitation, evaporation and transpiration in different landuse/landcover conditions. Modern methods of recording these attributes.

1.4 Hydrological data: Source, measurement and analysis.

Unit-2: Hydrology - II

2.1 Water management in tropical farmlands: Techniques and approaches. Artificial rainmaking.

2.2 Water management in tropical cities: Techniques and approaches. Rainwater harvesting.

2.3 Principles of integrated basin management with reference to micro-watershed planning.

2.4 Consequences of river impoundment. Issues related to damming of large rivers.

Unit-3: Oceanography - I

3.1 Classification, characteristics and origin of the major structural and morphological features of the ocean floor with particular reference to plate tectonics.

3.2 Bottom topography of Indian Ocean: characteristics and evolution.

3.3 Waves and tides: Genetic classification and models of formation.

3.4 Ocean circulation: classification and significance.

Unit-4: Oceanography - II

4.1 Water mass: origin, evolution, physical and chemical properties. Air-sea interactions.

4.2 Sea-level change: types, causes and implications.

4.3 Ocean as a resource: Anthropogenic utilisation of the oceans.

4.4 EEZ and CRZ: delimitation, significance and policy issues.

MODULE-208: POPULATION & REGIONAL DEVELOPMENT (Theoretical – 50 marks / 5 credits)

Unit-1: Population Geography

1.1 Changing approaches to Population Geography- - Contemporary trends

1.2 Population- Demographic characteristics- reproduction, health and education- Challenges for developed and developing countries

1.3 Critical review of population growth theories and models – demographic transition and demographic dividend- critic

1.4 Population Quality: Literacy, Occupation and Health; Population Composition

Unit-2: Migration, Mobility and Displacement

2.1 Factors, processes and typology – Contemporary trends in developed and developing countries - Rural and urban dimensions

2.2 Population, social organisation and governance -People as communities and citizens - People's rights in contemporary societies; enclaves and their problems

2.3 Population as social capital- Status of developed and developing countries

2.4 Population and Vulnerability: Displacement – Diaspora and Identity Crisis

Unit-3: Theories of Regional Development

3.1 Concepts: Growth and Development, spatial integration, factors affecting regional development

3.2 Classical and Neoclassical Growth models: Smith, Keynes, Rostow, Marx

3.3 Models of industrialisation-urbanisation: Perroux, North, Myrdal, Hirschman, Friedmann

3.4 Alternative models: Agropolitan, Basic Needs, Export-led, Import Substitution

Unit-4: Global Economic Integration and Regional Development

4.1 Understanding Dependency: Frank, Santos; Neo-Liberal influences

4.2 Convergence-Divergence, scales of economies and their relation with regional development.

4.3 Role of Institutions in Regional Development: framework and actors

4.4 Regional Development: paradigm shifts and regional disparity in India

MODULE-209: SOCIAL & CULTURAL GEOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Society and Space

1.1. The changing nature of social geography – evolution of perspectives

1.2. Social Processes and spatial form: conceptual framework

1.3. Changing Nature of Social Space: modernity-post modernity, crisis of local-global

1.4. Changing social order: fragmentation, segregation and polarisation – post-industrial capital and society (urban space)

Unit-2: Social Justice and Social Geography of India

2.1. Social Justice: concept and theories

2.2. Achieving social justice (welfare, well-being and social security)

2.3. Social change in India – evolving scenario of caste-class divides and rural-urban divides.

2.4. Social Planning: Constitutional provisions, Inclusive growth and its measures; spatial implications

Unit-3: Cultural Geography: Concepts and Approaches

3.1. Evolution of Cultural Geography

3.2. Components and structure of Culture

3.3. Understanding the theoretical intersects in brief: Historical Materialism, Feminism, Post Structuralism, Culture of Science and Ethics.

3.4. Colonialism, neo-colonialism and metropolitan culture: patterns of dominance-dependence

Unit-4: Cultural Identity and Processes

4.1. Cultural Hearths and Realms of the World: contemporary scenario: impacts of technology and mobility

4.2. Processes of Diffusion and Acculturation

4.3. Popular cultures, Folk culture and its revival

4.4. India and its multicultural identity

MODULE-210: RS GIS & GNSS (Practical – 50 marks / 5 credits)

Unit-1: Remote Sensing

1.1 Georeferencing using ortho-images and GNSS data.

1.2 Generation of spectral library of LU/LC features from L3 and TM data.

1.3 Image classification.

1.4 Change detection from multidated maps and images.

Unit-2: Geographical Information System

2.1 Raster to vector conversion.

2.2 Spatial analysis through vector overlay.

2.3 Preparation of annotated thematic maps.

2.4 Preparation of DEM from spot heights, contours and SRTM data.

Unit-3: Global Navigation Satellite System

3.1 Principles of GNSS positioning with special reference to GPS.

3.2 Collection and retrieval of GNSS positions.

3.2 Preparation of maps from GNSS data.

3.3 Length and area measurements from GNSS data.

Unit-4: Laboratory Notebook and Viva Voce

SEMESTER III

MODULE-311: ELECTIVE PAPER – I (Other Discipline, Theoretical – 50 marks / 4 credits)

MODULE-312: ELECTIVE PAPER – II (Other Discipline, Theoretical – 50 marks / 4 credits)

MODULES-313 A–O: SPECIAL PAPER (OPTIONAL–THEORETICAL)

MODULE 313 A (OPTIONAL): ADVANCED CARTOGRAPHY – I (Theoretical – 50 marks / 5 credits)

Unit-1: Emerging Concepts in Cartography and Understanding of Field Astronomy

1.1 Basic concepts in Cartography , Geo-informatics – Cartography relationship

1.2 History and development of Cartography. .

1.3 Field Astronomy – Celestial sphere, co-ordinates of celestial bodies. Equation of time and its application.

1.4 Determination of latitude, longitude and azimuth of celestial bodies.

Unit-2: Geodesy and Spherical Trigonometry

2.1 Geodesy –Shape and size of Earth, Concept of Datum.

2.2 Plane and spherical co-ordinates, UTM and UPS grid systems.

2.3 Spherical Trigonometry –Spherical triangle, Napier's rule, Spherical excess.

2.4 Determination of distance, azimuth and area on the earth's surface.

Unit-3: Ground Survey and Positioning

3.1 Traverse Survey

3.2 Triangulation Survey.

3.3 Tacheometric Survey.

3.4 Reciprocal Levelling.

Unit-4: Remote Sensing and Aerial Photogrammetry

4.1 Principle of remote sensing, electromagnetic radiation, remote sensing platforms, sensors, orbiting satellites. Spectral, spatial, temporal and radiometric resolution, Elements of Image Interpretation

4.2 Digital Image processing- Basic concepts ,Image Rectification-Radiometric and Geometric Corrections, Image Enhancement and Spatial Filtering, Image Classification-Types and Classifiers

4.3 Aerial photographs – Types, Edge Information, Elements of Air photo Interpretation.

4.4 Photogrammetry – Scale, Relief displacement, Calculation of number of photographs for aerial coverage, Parallax and determination of height of photo features.

MODULE 313 B (OPTIONAL): ADVANCED GEOMORPHOLOGY – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Perspectives in Geomorphology

1.1 Evolution of Geomorphological thoughts and ideas: A general review.

1.2 Concepts of spatial scale, temporal scale, equilibrium and threshold. Morphogenetic regions.

1.3 Approaches to Geomorphology: Structural, climatic, applied and systems approach.

1.4 Principles of landform classification: Genetic and hierarchical.

Unit-2: Fluvial Processes and Forms

2.1 Hydrological properties of channels: Regime, velocity, discharge and energy. Factors controlling entrainment, transportation and deposition by running water.

2.2 Morphological properties of channels: profiles, planforms, patterns and classification. Effects of floods in channel modification and characterisation.

2.3 Formation, system of change and classification of fluvial landforms with special reference to terraces, alluvial fans and accretional topography.

2.4 Slope processes in fluvial landscapes: Factors and processes of bank erosion and valley walls.

Unit-3: Coastal Processes and Anthropogenic Impact

3.1 Coastal Morphodynamics: factors, characteristics and relative dominance of wave, tidal and fluvial processes in coasts.

3.2 Processes and effects of bioturbation, bio-tidal accretion, coral formation and storm surge / tsunami in coasts.

3.3 Formation, system of change and classification of coastal landforms with special reference to rhythmic beach topography, coastal dunes and deltas.

3.4 Humans as geomorphic agents: Effects of river control, coastal modification and Landuse change in mountainous regions.

Unit-4: Tropical Geomorphology

4.1 Definition and boundary of humid tropics. Climatic and vegetation characteristics and their control on tropical landforms.

4.2 Factors and processes of deep weathering with special reference to formation of tors, domed inselberges and laterite duricrusts.

4.3 Characteristics of tropical streams with special reference to of large rivers.

4.4 Urban geomorphology of humid tropics: Scope, content and significance in town planning.

MODULE 313 C (OPTIONAL): ADVANCED INDUSTRIAL GEOGRAPHY – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Basic Concepts

1.1 Concepts and significance of Industrial Geography.

1.2 Evolution of Industrial Geography.

1.3 Factors of Industrial Location.

1.4 Evolution of Industrial Growth and Industrial Renaissance.

Unit-2: Theories of Industrial Location

2.1 Critical appreciation of Least Cost Approach by A. Weber.

2.2 Profitability of Sub-optimal Approach by D. Smith and Market Area Analysis by August Losch.

2.3 State Control of Industrial Location – merits and demerits.

2.4 Private Control of Industrial Location – advantages and disadvantages.

Unit-3: Large-Scale Industries

3.1 Automobile industry – Distribution, recent trends, problems and prospects.

3.2 Chemical industry – locational pattern, recent trends, problems and prospects.

3.3 Cotton textile industry – Spatial pattern dispersal, trends, problems and prospects.

3.4 Nuclear power industry – importance, distribution, recent trends.

Unit-4: Policies and Technology

4.1 Urbanisation as a function of industrialisation

4.2 Industrialisation, Environmental Degradation and Management.

4.3 Human Resource and Industrial Development.

4.4 Industrial ties with Science and Technology; Policies in Developing Countries.

MODULE 313 D (OPTIONAL): AGRICULTURAL GEOGRAPHY – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Basic Concepts

1.1 Scope, content and relation with other branches of Geography.

1.2 History of evolution of agriculture.

1.3 Theories of Agricultural location: Von-Thünen's classical theory, theory by Hoover; Sinclair's model of Peri-urban agriculture.

1.4 Agricultural Innovations and their Diffusion.

Unit-2: Factors of Agricultural Development and Agricultural Pattern

2.1 Influence of physical factors on Agriculture: Terrain, Rainfall, Temperature and Soil.

2.2 Influence of Social and Economic factors on Agriculture, Land reforms, Fragmentation and Consolidation of soil.

2.3 Global pattern of Agriculture: Subsistence, Commercial and Mixed.

2.4 Impact of Globalisation on Agriculture.

Unit-3: Concept of Land and Landuse Survey

3.1 Major components of Land and Landuse, Soil, Moisture and Drainage.

3.2 Principles of Landuse, after Graham, Stamp and Lewis.

3.3 Land Classification – Storie's rating index, Azzi's index, Land Capability Classification by USDA.

3.4 Landuse survey – Reconnaissance, Topographical Survey, Remote Sensing, Integrated Survey Technique.

Unit-4: Agro Climatology and Landuse in Selected Regions

4.1 Spatial and temporal variation of climate and their impact on agriculture.

4.2 Agro climatic and Agro-ecological regions of India.

4.3 Landuse pattern in Wetlands and suggestions for optimum use.

4.4 Landuse in Glaciated lands and suggestions for optimum use.

MODULE 313 E (OPTIONAL): CLIMATOLOGY OF TROPICAL ASIA – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Concepts and Contexts

1.1 Definition, delineation and climatic sub-regions of the Tropical Asia

1.2 Controls of weather and climate of the Tropical Asia; Distribution and nature of interaction of land and water surface on climates of the region

1.3 Nature of population and land use in the region with particular reference to its climates

1.4 Significant meteorological organisations, e.g. IMD, IITM, BMD, WMO Members of the Regional Association-II: Asia, IPCC, etc. in the region

Unit- II: Essence of Meteorology

2.1 Radiation and its distribution in the earth-atmospheric system: Basic laws of radiation, scattering, albedo, atmospheric window and greenhouse effect; Spatio-temporal variation of temperature and its significance

2.2 Principal forces and equations of the atmospheric motion: Circulation, vorticity, convergence, divergence and atmospheric turbulence; Transport of heat and moisture

2.3 Adiabatic, non-adiabatic and isentropic processes; Virtual temperature; Barotropic and Baroclinic instabilities; Tephigram

2.4 Precipitation of warm and mixed clouds; Formation of thunderclouds; Cloud dissipation: artificial precipitation, suppression of hail and fog

Unit-3: Tropical Circulations and Dynamics

3.1 General Circulation Model (GCM) with special reference to tropical circulations; Indian Ocean Dipole (IOD) and its relationship with the Monsoon

3.2 Tropical jet streams: Westerly and easterly jet, Somali jet

3.3 Inter Tropical Convergence Zone (ITCZ); Trade wind inversion: Causes and consequences

3.4 Synoptic features associated with the Monsoon: Onset and withdrawal of monsoons, monsoon trough and depression

Unit-4: Monsoon Modelling and Weather Forecasting

4.1 Significance of Monsoon modelling and weather prediction: Physical, social and economic

4.2 Numerical Weather Prediction (NWP) of the Monsoon: Initialisation of the data for use in weather prediction models, technique of selecting parameters, data assimilation techniques, regression methods and sub-grid scale processes

4.3 Principles and application of satellites and remotely sensed data in weather predictions: Insat, Meteosat and Radar

4.4 Now-casting and very short range forecasting; Synoptic weather forecasting; Prediction of normal and extreme weather elements/ events

MODULE 313 F (OPTIONAL): COASTAL MANAGEMENT – I (Theoretical – 50 marks / 5 credits)

Unit-1: Coastal processes and forms

1.1 Coastal Morphodynamics: factors, characteristics and relative dominance of wave, tidal and fluvial processes. Morphodynamic indices and their controls.

1.2 Processes and effects of bio-tidal accretion, coral formation and storm surge / tsunami in coasts.

1.3 Formation, system of change and classification of coastal landforms with special reference to rhythmic beach topography, coastal dunes and deltas.

1.4 Coastal classification schemes of Hayes (1979), Orton and Reading (1991 and 1993) and Darlymple, Zaitlin and Boyd (1992).

Unit-2: Coastal ecology

2.1 Coastal ecosystems: Diversity and uniqueness.

2.2 Coastal vegetation of humid tropics: Classification and significance.

2.3 Coastal animals of humid tropics: Classification and significance.

2.4 Coastal ecosystems of West Bengal: Threats and management.

Unit-3: Anthropogenic impacts on coasts

3.1 Origin, typology and classification of impacts: Direct, indirect, cumulative, ecosystem, socio-economic and natural.

3.2 Coastal reclamation: Types, techniques and effects.

3.3 Coastal pollution: Sources and management.

3.4 Principles of Environmental Impact Assessment and Environmental Management Planning as applicable to coastal regions

Unit-4: Coastal hazards – Factors, risks, vulnerability and management

4.1 Tropical storm.

4.2 Tsunami.

4.3 Saltwater incursion.

4.4 Dune encroachment.

MODULE 313 G (OPTIONAL): ENVIRONMENTAL GEOGRAPHY – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Concept

1.1. Scope, Content and Recent Dimensions of Environmental studies in Geography

1.2. Symbiosis between Man and Environment; Effects of Environment on man: Bio-physical, Perceptional, Behavioural and that related to Resource Availability

1.3. Effects of Man on Environment with changes in Mode of Production

1.4. Physical, Ecological and Human Ecological Issues, Holistic and Reductionist Approaches to Environment

Unit-2: Atmospheric Changes and the Biosphere

2.1. Climatic Factors shaping the Geographical, Zoning and its Periodicity

2.2. Changing Climate of the World

2.3. Climatic Hazards and Management, Social Response to Climatic Hazard

2.4. Biomes and their relationships to Climate and Hydrological Cycle

Unit-3: Energy and the Environment

3.1. Ecosystem Approach in Environmental Studies

3.2. Bio-geo-chemical Cycles and their significance

3.3 Flow, Fixation and Balance of Energy in the Biosphere

3.4. Energy and Biomass Pyramid; Exchanges among Ecosystems and Changes of Ecosystems

Unit-4: Environmental Degradation and Hazards

4.1. Water, Air and Noise problems in urban-industrial Environment; Water and soil pollution in rural landscape

4.2. Impact of Green Revolution; Problems of Solid waste and nuclear fallout

4.3. Human response to Flood, Drought, Landslide, Earthquake and Cyclone

4.4. Disaster Management

MODULE 313 H (OPTIONAL): GEOGRAPHY OF CULTURE & HERITAGE – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Conceptual Background

1.1. Scope and content of cultural geography

1.2. Geography and heritage: Definition, scope, content

1.3. History and development of geography of culture and heritage

1.4. Cultural and heritage geography: Hegemony, rights, practices

Unit-2: Theories of culture and heritage

2.1 Enlightenment

2.2 Colonisation

2.3 Orientalism

2.4 Modernism

Unit-3: Culture, Heritage and Society – I

3.1 Indigenous population: Material culture, ethnography and society

3.2 Religion and society: Religious culture, pilgrimage and sacred geography

3.3 Classical tradition: Sanskrit and vernacular traditions, epics, academic treatises

3.4 Western culture and their impacts: Islamic and colonial

Unit-4: Culture, Heritage and Society – II

4.1 Built heritage: Urban and rural built heritage, religious and secular buildings, conservation of built heritage

4.2 Text and heritage: Traditional and modern

4.3 Images and heritage: Visual methods and techniques – photography, film, painting, maps and other images, lifestyle and material culture

4.4 Oral traditions: Cults, folklore, rituals. Impact of oral traditions on audio – visual and textual media.

MODULE 313 I (OPTIONAL): GEOGRAPHY OF HEALTH – I (Theoretical – 50 marks / 5 credits)

Unit-1: Concepts

1.1 Concept of Health Geography: Nature and content

1.2 Approaches in interpreting geographies of health

1.3 Dualism between health and medical geography

1.4 Applications and the challenges of health geography

Unit-2: Health and Epidemiology

2.1 Principles of Epidemiology: Landscape, Spatial and Geographical Epidemiology; Ecology of human health

2.2 Epidemiological Transition Model: Phases and features

2.3 Sense of place and health, Measures of indicators of health (Fertility, Mortality and Morbidity)

2.4 Epidemiology: Measures and techniques

Unit-3: Disease Ecology

3.1 Disease Ecology, Types of Diseases and their Distribution and Regional Pattern; International Classification of Disease (ICD), Disease cycle

3.2 Causes of diseases and modes of transmission; Factors influencing diseases: Pathological, Environmental, Social and Cultural

3.3 Diseases: Emergence, re-emergence, and persistence (Malaria and Dengue)

3.4 Disease diffusion: Types, network and barrier (Tuberculosis and HIV/AIDS)

Unit-4: Health, Wellbeing and Social Environment

4.1 Concept and factors influencing human health and wellbeing

4.2 Linkage between Health and Society; Environment, Development, Education and Awareness

4.3 Driving forces of health in relation to environmental trends - population dynamics, urbanisation, poverty, malnutrition and inequality

4.4 WHO programmes on health and wellbeing

MODULE 313 J (OPTIONAL): GEOGRAPHY OF TOURISM – I (Theoretical – 50 marks / 5 credits)

Unit-1: Conceptual Framework

1.1 Concept, definition, nature and importance of Tourism.

1.2 Typology of Tourism: Domestic, International, Inter-regional and Intra regional, Mass Tourism.

1.3 Components of Tourism and Approach to the study of Tourism.

1.4 Socio-economic significance of Tourism.

Unit-2: Tourist Resource and Tourist

2.1 Meaning and definition of Tourist resource, their characteristics.

2.2 Typology of Tourist resources – Natural and man-made and their changing nature.

2.3 Classification of Tourist: Tourist, Traveller, Visitor. Different schemes of classification of Tourist.

2.4 Tourism product and Typology and their changing characteristics.

Unit-3: Tourism Infrastructure

3.1 Concept of Tourism infrastructure – travel and accommodation.

3.2 Tourism and Transport: Travel motivation, view of Lundberg, McIntosh and Robinson.

3.3 Travel agency and Tour operators: concept, classification and functions.

3.4 Tourism and Hoteleering: History and classification of hotels and its significance.

Unit-4: Economy, Environment and Organisation of Tourism

4.1 Economic significance of Tourism.

4.2 Environmental impact of Tourism.

4.3 International Organisation in the Tourism Sector.

4.4 Tourism Paradigms: Eco-tourism, Green Tourism, Heritage Tourism, Soft and hard Tourism and adventure tourism etc.

MODULE 313 K (OPTIONAL): GEOMORPHOLOGY OF HUMID TROPICS – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Humid Tropical Environment

1.1 Concepts of spatial scale, temporal scale, equilibrium and threshold. Morphogenetic regions.

1.2 Definition and boundary of humid tropics; their climatic and vegetation characteristics.

1.3 Control of humid tropical climate and vegetation on geomorphic processes and landforms. Distinctiveness of humid tropical geomorphology.

1.4 Factors and processes of deep weathering with special reference to formation of tors, domed inselberges and laterite duricrusts.

Unit-2: Fluvial Processes and Forms

2.1 Hydrological properties of channels: Regime, velocity, discharge and energy. Factors controlling entrainment, transportation and deposition by running water.

2.2 Morphological properties of channels: Profiles, planforms, patterns and classification. Effects of floods in channel modification and characterisation.

2.3 Characteristics of tropical streams with special reference to large rivers.

2.4 Formation, system of change and classification of fluvial landforms with special reference to terraces, alluvial fans and accretional topography.

Unit-3: Coastal Processes and Forms

3.1 Coastal Morphodynamics: Factors, characteristics and relative dominance of wave, tidal and fluvial processes in coasts.

3.2 Processes and effects of bioturbation, bio-tidal accretion, coral formation and storm surge/tsunami in coasts.

3.3 Formation, system of change and classification of coastal landforms with special reference to rhythmic beach topography, coastal dunes and deltas.

3.4 Coastal classification schemes of Hayes (1979), Orton and Reading (1991 and 1993) and Darlymple, Zaitlin and Boyd (1992).

Unit-4: Other Tropical Processes and Landforms

4.1 Factors and processes of Mass wasting with special reference to landslide and subsidence.

4.2 Badland Morphogenesis: Components, factors, processes and evolution.

4.3 Karstic processes and forms in Humid Tropics with special reference to tower and cone karsts.

4.4 Urban geomorphology of humid tropics: Scope, content and significance in town planning.

MODULE 313 L (OPTIONAL): POPULATION & WELFARE GEOGRAPHY – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Population Dynamics

1.1 Factors affecting Population density and distribution.

1.2 Fertility, Mortality and Migration differentials.

1.3 Demographic Mobility-transition, Correlation and dispersion.

1.4 Stationary and Stable population-various Age-sex structures and their implications; Demographic reconstruction.

Unit-2: Theories and Models

2.1 Theories of Population Growth.

2.2 Theories of Migration (individuals and groups).

2.3 Economic, Social and Demographic transitions.

2.4 Research trends on contents, methods and techniques.

Unit-3: Population Size and Economic Development

3.1 Concept of over population, under population and optimum population.

3.2 Population-resource regions of the world.

3.3 Population problems of the Third World: Backwardness, Poverty and Famine with special reference to India, China and Ethiopia.

3.4 Significance of Scientific and Technological Revolution and Urbanisation.

Unit-4: Population Policies with Special Reference to India

4.1 Fertility influencing policies – Pro-natal and Ante-natal.

4.2 Mortality influencing policies.

4.3 Migration influencing policies.

4.4 UNO's World Population Plan of Action.

MODULE 313 M (OPTIONAL): REGIONAL PLANNING – I (Theoretical – 50 marks / 5 credits)

Unit-1: Concept and Theories

1.1 Concept of Region (Hartshorne), its critics and further development; typology and delineation.

1.2 Critical appreciation of Losch and Christaller's theory.

1.3 Economic Base theory, Regional development theories of Growth Centre and Growth Pole.

1.4 Theories of City Structure; Core-periphery relations.

Unit-2: Regional Planning

2.1 Basic principles of Regional Planning – Types of planning.

2.2 Measurement of Regional Development; Economic Development.

2.3 Regional Disparity and Regional Diversity.

2.4 Economy of a region: Levels of development.

Unit-3: Regional Identification

3.1 Process and measurement of Urbanisation; Urbanisation in the Third World.

3.2 Definition of Towns: Physical, social, functional; Human ecology of cities.

3.3 Concept and approaches to Rural Development, Rural Development Institution: Panchayati Raj.

3.4 Problems of Rural Development.

UNIT-4: Urban Structure

4.1 Internal Structure of Cities, Inner problems and Structural elements of CBD; Rural- urban fringe, Suburbs, Rural -urban continuum.

4.2 State Control of Industry.

4.3 Residential Segregation; Factorial ecology; Neighbourhood concept.

4.4 Urban environment, Urban land-use, Urban ecology and Urban management.

MODULE 313 N (OPTIONAL): SOIL GEOGRAPHY & LAND USE – I

(Theoretical – 50 marks / 5 credits)

Unit-1: Soil Formation and Classification

1.1 Soil as a system of Dynamic Equilibrium in Nature; Soil and Land relationship.

1.2 Pedon and Polypedon; Soil Catena – a critical review.

1.3 Theories of soil formation: Podsol, Chernozem and Laterite-their sub-types.

1.4 Classification of soils: Different Schools of Thought and their critical review.

Unit-2: Components and Characteristics of Soil

2.1 Soil properties: Physical and Chemical.

2.2 Soil Clay: Its origin, constitution, properties and types. Methods of identification of Clay Minerals.

2.3 Soil Nutrients: Nutrient fixation in Soil; Principles of Base Exchange.

2.4 Soil Fertility: Controlling factors-Role of water, physio-chemical properties of soil, Macro and Micro Flora and Fauna and Modern Technology in augmenting Soil Fertility.

Unit-3: Survey and Management of Soil

3.1 Techniques of Soil Survey for Agricultural and Non-agricultural uses and Soil mapping.

3.2 Methods of Soil Conservation and Amelioration.

3.3 Soil Pollution and its control.

3.4 Integrated Soil and Water Management.

Unit-4: Soils of India

4.1 Genesis and Classification of soils; Problems and prospect of utilisation of different soils in India.

4.2 Soils in Agro-ecological regions of India: Soil-crop relationship in terms of Fertility, Productivity and Choice of crops.

4.3 Soil Degradation: Factors, process and resultant forms in different parts of India.

4.4 Amelioration and Conservation of major soils of India with special reference to West Bengal.

MODULE 313 O (OPTIONAL): URBAN GEOGRAPHY – I (Theoretical – 50 marks / 5 credits)

Unit-1: Evolution of the Urban Context

1.1. Emergence of Urban Geography as a discipline: changing approaches and methodological foundations.
1.2. Origins of the cities: ancient and medieval (the city in history)
1.3. Capitalism and urban development: Urbanisation and the industrialised world, Political economy of urbanisation.
1.4. Urbanisation in the Third World - Concept of peripheral urbanisation- Salient characteristics-slums and urban poverty, Globalisation and Third World urbanisation.

Unit-2: Urban Space: Transition and Expansion

2.1. Urban morphology: land use and the economics of land use change

2.2. Urban economy and its problems: deindustrialisation, growth of the service economy

2.3. The Process of Suburbanisation, the Peri-urban Interface: critical issues, Sprawl versus Compact City.

2.4. Urban renewal – Gentrification, Revanchism; Strategies for the Global South

Unit-3: Urban Structure and Social Production of the Built Environment

3.1. Models of spatial structures: the pre-industrial (Sjoberg) and industrial city (Marx, Fordist)

3.2. Social Space and polarisation: meaning, differentiation, congregation and segregation

3.3. Neighbourhood changes and residential mobility

3.4. Social Justice and the city

Unit-4: The Urban Environment: Select Issues

4.1. The Physical Environment: pollution and degradation

4.2. The Social Environment: poverty and crime

4.3. Urban Ecology: concept and implications

4.4. Sustainable Urban Planning: policy and practice

MODULE-314: STATISTICAL TECHNIQUES (Practical – 50 marks / 5 credits)

Unit-1: Probability, Sampling and Test of Confidence

1.1 Probability theory and Normal distribution

1.2 Sampling theory and Sampling Error

1.3 Scaling Techniques: Rank Score, Weighted Score, Likert's Opinionnaire

1.4 Statistical Decision theory: Social Affinity Index (SAI), t-test, Type I and Type II errors, One-tailed and two-tailed tests

Unit-2: Correlations and Statistical inferences

2.1 Partial and Multiple correlations

2.2 Factor Analysis (Centroid Method)

2.3 Analysis of Variance (ANOVA)

2.4 Non-parametric tests: Chi-Square Test, Mann-Whitney U Test

Unit-3: Computer Application in Data Processing and Representation

3.1 Data mining from internet sources: Preparation of an inventory

3.2 Tabulation of data and its graphical representation: Population, Land use, Weather (Any one)

3.2 Use of statistical formula: Central tendency, Dispersion, Co-efficient of Variation

3.3 Fitting of trend lines: Bi-variate, Time series

Unit-4: Laboratory Notebook and Viva Voce

MODULE-315: QUANTITATIVE & FIELD TECHNIQUES (Practical – 50 marks / 5 credits)

Unit-1: Quantitative analysis and diagrams

1.1 Gini-coefficient and Lorenz curve

1.2 Nearest Neighbour Analysis and Occupational Ternary diagram.

1.3 Exponential growth curve and population projection

1.4 Index number and Cumulative Index Curve

Unit-2: Quantitative Mapping and Interpretation

2.1 Mean centre of population and its shift; Concentration of population about mean centre

2.2 Location quotient; Z-score

2.3 Residual mapping; Crop combination analysis

2.4 Population potential (Gravity Model); Accessibility Map (Distance/ Centrality Matrix/ MAT)

Unit-3: Field Techniques

3.1 Observation Method: Traffic Composition/Flow, Bio-diversity Register, Crop-composition

3.2 Survey Schedule: Household Survey, Market Survey, Passenger Survey, Tourist Survey

3.3 Field instruments: Portable weather station, Abney Level, Clinometer,

3.4 Land Use Study at Micro-level using Cadastral Map

Unit-4: Laboratory Notebook and Viva Voce

SEMESTER IV

MODULE-416: HISTORICAL & POLITICAL GEOGRAPHY (Theoretical – 50 marks / 5 credits)

Unit-1: Historical Geography: Conceptual Issues

1.1 Nature, scope, content and approaches.

1.2 Development of historical geography as a discipline.

1.3 Major issues in the discourse of historical geography.

1.4 Sources of historical geography and cartographic materials.

Unit-2: Historical Geography of India

2.1 Development of the identity of India: Pilgrimage, population dynamics and sacred space.

2.2 Elements of historical geography and travel literature: Hiuen Tsang, Ibn–E–Batuta, Barnier.

2.3 Historical geography and environment: Resources, agriculture, industry, trade and urbanisation.

2.4 Historical geography and society: Caste, tribe, religion, language, gender and ideologies.

Unit-3: Political Geography: Conceptual Issues

3.1 Evolution of Political Geography: major theoretical influences

3.2 Spatial perspectives: border, frontiers, buffer zones, core and periphery, regional identity

3.3 Transitions in the Political economy: Imperialism decolonisation, post-colonisation, neo-liberalism, and globalisation.

3.4 Neo-Marxist critique – Harvey, Peet, and Smith

Unit-4: Issues in Political Geography and the Indian Polity

4.1 World Wars and strategic relations, geo-political context of Cold War, emergence of Superpowers

4.2 Electoral Geography: overview of models; Political ecology: tragedy of commons

4.3 India: Federalism, SAARC and BRICS

4.4 Interstate and Intra-national Issues: Water disputes

MODULE-417: REGIONAL GEOGRAPHY (Theoretical – 50 marks / 5 Credits)

Unit-1: India – Selected Regional Issues

1.1 Tectonics and environmental problems of the Eastern Himalaya

1.2 Geo-diversity and resource utilisation of the Indian Coasts

1.3 Problems of the Arid and Semi-Arid Regions of India

1.4 Ethno-cultural diversity of the North East India; Impact of Globalisation on the diversity

Unit-2: India – Issues of Regional Disparities

2.1 Infrastructure development in India: Rural-urban dichotomy

2.2 Socio-economic disparities: North-south, east-west

2.3 Employment scenario and labour migration in India

2.4 Gender discrimination and empowerment

Unit-3: Ganga Delta – Physical Aspects

3.1 Tectonic and stratigraphic evolution of the Bengal basin

3.2 Ganga delta: Quaternary evolution and geomorphic classification

3.3 Drainage system of the Indian Ganga delta: characteristics and changes in the last 250 years; Water resources: status and issues.

3.4 Indian Sundarban: Tidal hydrodynamics and impact on land use change; biodiversity conservation in mangrove ecosystem

Unit-4: Ganga Delta – Human Aspects

4.1 Population: Growth, migration, distribution and changing composition

4.2 Agriculture: Crop combination, problems and prospects

4.3 Industrialisation and urbanisation: Infrastructural development, problems and recent trends

4.4 Human development: Progress and disparity

MODULES 418 A–O: SPECIAL PAPER (OPTIONAL–THEORETICAL)

MODULE 418 A (OPTIONAL): ADVANCED CARTOGRAPHY – II (Theoretical – 50 marks / 5 credits)

Unit-1: Mapping Elements and Thematic Mapping

1.1 Maps: Characteristics and Categories.

1.2 Cartographic Generalisation: Elements, Controls and manipulations.

1.3 Symbolisation – Point, Line, Area, Volume symbols.

1.4 Choropleth Mapping- selection of class interval and accuracy assessment.

Unit-2: Understanding of the Following Projections for their Specific Use

2.1 Polar Zenithal Gnomonic Projection.

2.2 International Projection.

2.3 Interrupted Sinusoidal Projection.

2.4 Mercator Projection (Normal and Transverse Case).

Unit-3: Determination of Distance, Azimuth and Scale Variations (Select Projections)

3.1 Polar Zenithal Stereographic Projections and Equatorial Zenithal Gnomonic Projection

3.2 Conical Equal Area Projection with two standard parallels and Conical Orthomorphic Projection with two standard parallels.

3.3 Cylindrical Equal Area Projection with two standard parallels.

3.4 Mollweide's Projection.

Unit-4: Geoinformatics

4.1 G.I.S- Definition, Components , Recent trends

4.2 Data Type- Raster and Vector, Data Structure; Meta Data.

4.3 Data Manipulation and Spatial Analysis.

4.4 Geoinformatics -Concept, Integration of Remote Sensing, GIS and GNSS; Applications of Geoinformatics.

MODULE 418 B (OPTIONAL): ADVANCED GEOMORPHOLOGY – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Applied Geomorphology

1.1 Methods and uses of rainwater harvesting and check dams.

1.2 Geomorphic effects of sea level change in coasts and estuaries.

1.3 Application of Humid Tropical Geomorphology in Terrain Evaluation, Environmental Impact Assessment and Environment Management Planning.

1.4 Principles of Integrated Drainage Basin Management and Integrated Coast Zone Management with reference to Coastal Regulation Zones.

Unit-2: Case Studies of Landforms and Landuse

2.1 Badlands on laterite duricrusts: Garhbeta and Santiniketan, West Bengal.

2.2 Tors and inselberges: Chhotanagpur plateau, Jharkhand.

2.3 Alluvial fans: Sub-Himalayan West Bengal.

2.4 Deltas and estuaries: Lower Ganga delta, West Bengal.

Unit-3: Management of Geomorphic Problems

3.1 Management of mining subsidence with special reference to Raniganj coalbelt and Darjiling hills.

3.2 Management of river discharge with special reference to Damodar Valley Corporation and Farakka Barrage Project.

3.3 Management of urban water supply and disposal with special reference to Kolkata.

3.4 Management of reclaimed coastal areas with special reference to Indian Sundarban.

Unit-4: Management of Geomorphic Hazards

4.1 Management of landslides with special reference to northern West Bengal.

4.2 Management of floods with special reference to northern alluvial fans and Padma-Bhagirathi interfluve of West Bengal.

4.3 Management of riverbank erosion with special reference to Ganga and Bhagirathi in West Bengal.

4.4 Management of coastal erosion with special reference to West Bengal coast.

MODULE 418 B (OPTIONAL): ADVANCED INDUSTRIAL GEOGRAPHY – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Phases of Indian Industrialisation

1.1 Classification of Indian Industries.

1.2 Industrial growth in Pre independence era – Regional characteristics.

1.3 Industrial growth in Post-independence era – Regional characteristics.

1.4 Levels of Industrial Development.

Unit-2: Profile of Selected Indian Industries

2.1 Cotton Textile Industry: Spatial pattern, dispersal, problems and prospects.

2.2 Iron and Steel Industry: Distribution, development, trends, problems, govt. policies, prospects.

2.3 IT-electronic Industry: Significance, spatial pattern, trends, problems and prospects.

2.4 Petroleum Refining Industry: Distribution, development, problems and prospects.

Unit-3: Spatial Strategy for Industrial Development in India

3.1 Identification of Industrial Backwardness.

3.2 Regional Imbalance and Dispersal of industries.

3.3 Policy measures to remove regional disparities.

3.4 Role of Small-scale industrial sector in Indian economy.

Unit-4: Problems and Policies in Indian Industries

4.1 Sickness in Indian industries: Spatial pattern, trends and preventive measures.

4.2 Labour problems in Indian industries: Trends and nature of industrial disputes, Trade union movement, Social security measures.

4.3 Industrial policy for Indian industries.

4.4 Impact of Privatisation, Liberalisation and Globalisation on industry with special reference to Indian cases. Phases in the development of International Trade in India and its impact on Industrialisation in India.

MODULE 418 D (OPTIONAL): AGRICULTURAL GEOGRAPHY – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Factors of Agricultural Development in India

1.1 Impact of physical factors: Type of land, climate and soil.

1.2 Impact of socio-economic factors: Irrigation, Fertilisers, Pesticides, Size of holding, Marketing and Credit societies.

1.3 Impact of Five Year Plans: Changes in outlook over time.

1.4 Impact of Land Reforms with special reference to West Bengal.

Unit-2: Farming Systems in India

2.1 Shifting Agriculture: Its characteristics, merits and demerits.

2.2 Subsistence Farming: Its characteristics, merits and demerits.

2.3 Plantation Farming: Its characteristics, merits and demerits.

2.4 Intensive Subsistence Farming: Its characteristics, merits and demerits.

Unit-3: Agricultural Innovations in India

3.1 H. V. V. seeds as an innovation, Process of Hybridisation.

3.2 Irrigation and Agro- chemicals and their impacts on Land and Water pollution.

3.3 Mechanisation in Agriculture: Its impact on Economic Development.

3.4 Agricultural Credits.

Unit-4: Agricultural Pattern in India

4.1 Cropping pattern.

4.2 Agricultural Regions.

4.3 Impact of Green and White Revolution on agricultural pattern.

4.4 Recent trend in agricultural pattern.

MODULE 418 E (OPTIONAL): CLIMATOLOGY OF TROPICAL ASIA – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Applied Climatology and Climate Change

1.1 Trends and application of climatology in various branches of Geography and related disciplines

1.2 Theories of climate change; Review of IPCC Assessment Reports on Climate Change with particular reference to the Tropical Asia

1.3 Paleo-climatology: Content and techniques, and importance in South Asia

1.4 Global warming and its consequences on the Tropical Asia: Physical, economic, social and political

Unit-2: Weather Hazards and Water Resources

2.1 Origin and nature of: Droughts and floods, dust storms and tornadoes

2.2 Western disturbances: Origin, characteristics and importance

2.3 Mitigation of weather hazards: Behavioural, technological and institutional setup

2.4 Climatic controls on water resource systems of the Tropical Asia: Precipitation, evaporation, storages and flow of water

Unit- III: Agro-climatology and Food Security

3.1 Concept of agro-climatic regionalisation; Cropping pattern in the different agro-climatic regions of the Tropical Asia

3.2 Climatic factors of crop growth in the tropics: Radiation, temperature, moisture and wind

3.3 Micro-climatology of selected field crops: Rice, wheat, potato, mustard and tea

3.4 Selection of crops under prolonged dry/ wet spells of the Monsoon; Climate change and food security/ sovereignty in the Tropical countries of Asia

Unit- IV: Anthropo-climatology and Climate Policies in the Tropical Countries of Asia

4.1 Climate and human civilisation; Role of weather on human comfort and morbidity; Acclimation

4.2 Climate and housing; Methods and impacts of artificial weather making

4.3 Human influence on city climates: Urban heat island and continentality effect; Climatic aspects of urban planning

4.4. Climate issues at national and international level: Policies, debates and agreements; Alternative fuels and sustainable green energy development

MODULE 418 F (OPTIONAL): COASTAL MANAGEMENT – II (Theoretical – 50 marks / 5 credits)

Unit-1: Coastal Engineering

1.1 Modelling in coastal engineering

1.1 Erosion prevention structures: classification and evaluation

1.3 Beach nourishment and augmentation

1.4 Dredging: types and utility

Unit-2: Socio-economic aspects in coastal management

2.2 Coastal communities: Types, opportunity and vulnerability

2.2 Coastal development: stakeholders, issues and management

2.3 Environmental impacts of coastal communities

2.4 Socio-economic responses to climate and sea level change in coasts

Unit-3: Integrated Coast Zone Management

3.2 Coast zone components: identification and establishment of relationships

3.2 Environmental assessment and auditing; problem analysis and conflict resolution

3.3 Coastal management and planning techniques: Administrative, social and technical

3.4 Integrated coastal management plan: Types, implementation, monitoring and evaluation.

Unit-4: Case studies on coastal issues and management

4.2 Coastal erosion in Medinipur and Sundarban coasts

4.2 Reclamation of Sundarban

4.3 Sedimentation of the Hugli estuary

4.4 Coastal tourism at Digha, Bakkhali and Mandarmani

MODULE 418 G (OPTIONAL): ENVIRONMENTAL GEOGRAPHY – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Anthropogenic Aspects

1.1 Environment and Development: Utilisation and Conservation of Renewable Resources, Recycling of Materials, Afforestation, Biodiversity and Biotechnology

1.2 Population Growth, Economic Development and Environmental Conservation with Special Reference to Third World Countries

1.3 Basic Principles of Spaceship Earth---Ecosystem Balance

1.4 Agricultural and Industrial Planning and Environment

Unit-2: Social hazards and Human Impacts

2.1 Social Hazards: Poverty and Famine, Crime and Human Trafficking

2.2 Man-animal Conflict in Forest-society Interface of Sundarbans

2.3 Human Impact of River Valley Planning

2.4 Urban Environmental Management: Local Self-governance and Community Action; Significance of Slum Development and Ecotourism

Unit-3: Environmental Management

3.1 Global Resource Scarcity and Use of Oceans as International Commons.

3.2 Sustainable Development: Concepts and Models

3.3 Environmental Impact Assessment: Concepts and Indian Case Studies; Recommendations of Rio+20 Conference; Environmental Audit

3.4 Environmental Management: Case Studies of East Calcutta Wetland and Chilika; Environmental Management Plan

Unit-4: Environmental Policy and Management in India

4.1 Environmental Perception, Ethics, Laws and Policies

4.2 Environmental Movements in India*: Bisnoi, Chipko*, Silent valley and Narmada

4.3 Participatory Management of forests in India with special reference to West Bengal

4.4 Legal Intervention, Government Policy, Institutional set-up and Role of NGOs in Environmental Management in India, Bhopal Gas Tragedy and Ganga Action Plan

MODULE 418 H (OPTIONAL): GEOGRAPHY OF CULTURE & HERITAGE – II

(Theoretical – 50 marks / 5 credits)

Unit 1: Material culture and Lifestyle

1.1. Tribal society: Repositories of tribal knowledge, dialects, folk traditions, art and culture

1.2. Minorities: Cultural expressions – built heritage and lifestyle

1.3. Colonial culture and society: Built heritage, education systems, visual images

1.4. Religious cults: socio – religious lifestyle and culture, built heritage and folk culture

Unit 2: Text, Heritage and Society in India

2.1. Classical textual heritage: Religious, literary, academic

2.2. Religious texts: Sanskritic, vernacular, Islamic, colonial

2.3. Colonial texts: Census, popular culture and media, academic writings, travel literature

2.4. Post – colonial texts and heritage: Political/ social issues, popular media

Unit 3: Visual heritage in India

3.1. Maps: Mental maps, cadastral maps, digitisation of spatial realities

3.2. Paintings: Material culture, lifestyle and society

3.3. Films: Visual culture and society

3.4. Photographs: Visual language and photographs, visual literacy. Historical development, theories and methods

Unit 4: Oral tradition and Heritage in India

4.1. Music and texts: Imageries in musical traditions – classical, folk and modern music

4.2. Myths and legends: construction of society and worldview (mainstream and parallel culture)

4.3. Pilgrimage: space, culture and sacred heritage in India

4.4. Lifestyle studies: Material culture and ethnography

MODULE 418 I (OPTIONAL): GEOGRAPHY OF HEALTH – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Healthcare

1.1 Healthcare system: Concept and functions; Levels and types of healthcare access and provision

1.2 Indicators of health and healthcare; Changing geography of healthcare; Complementary and Alternative Medicine (CAM)

1.3 Ecology of urban and rural health and healthcare

1.4 Health care delivery system in India

Unit-2: Environment and Health Vulnerability

2.1 Exposure and Health: Air pollution; Water; Housing; Workplace

2.2 Health and disease pattern in environmental context of India

2.3 Climate change and human health

2.4 Therapeutic landscapes; Health and medical tourism

Unit-3: Public Health and Health Inequalities

3.1 Health Inequalities: Global patterns and regional contrasts; Neighbourhood and health

3.2 Health inequalities in India; Rural-urban, caste, religion and states

3.3 Inequalities in the utilisation of health services

3.4 Programs of public health in India

Unit-4: Health Hazards, Health Risks and Health Programme

4.1 Globalisation and perception of health hazards, Occupational Hazards and Health Risks

4.2 Politics of health; Risk assessment and preventions

4.3 Migration, disruption and health, impact of migration on the spread of disease

4.4 Health policy and planning; Global infectious disease programmes

MODULE 418 J (OPTIONAL): GEOGRAPHY OF TOURISM – II (Theoretical – 50 marks / 5 credits)

Unit-1: Tourism in India

1.1 History of Tourism Industry in the World and in India.

1.2 Trends in Tourist Flow: National and International.

1.3 Tourism Industry and Indian Economy: Employment and Foreign Exchange earnings.

1.4 Tourism Promotion Agencies in India: Functions and characteristics.

Unit-2: Tourist Resource of India

2.1 Tourist Resource of India – characteristics and classification.

2.2 Changing nature of Tourist Resource in India (both natural and man-made).

2.3 Ethnic and Heritage Tourism in India – Characteristics and importance.

2.4 Performing Arts and Promotional Tourism in India.

Unit-3: Tourism, Environment and International Relations

3.1 Environmental impact of Tourism – a study of Mountain and Beach Tourist Resource.

3.2 Socio-cultural Impact of Tourism – Cultural change and Tourism development.

3.3 Eco-tourism concepts, issues and prospects – significance of Eco-tourism.

3.4 Tourism and International relations – integration, co-operation and cultural exchange.

Unit-4: Policy, Planning, Management and Prospects of Tourism

4.1 Structure of Tourism organisation and Tourism policy of India.

4.2 Tourism planning – concepts and goals and Tourism planning in India.

4.3 Tourism Management: Issues and themes and Human Resource Development in Tourism Industry.

4.4 Tourism career – opportunities and courses – offered by different institutes in India.

MODULE 418 K (OPTIONAL): GEOMORPHOLOGY OF HUMID TROPICS – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Applied Humid Tropical Geomorphology

1.1 Methods and uses of rainwater harvesting and check dams.

1.2 Geomorphic effects of sea level change in coasts and estuaries of humid tropics.

1.3 Application of Humid Tropical Geomorphology in Terrain Evaluation, Environmental Impact Assessment and Environment Management Planning.

1.4 Principles of Integrated Drainage Basin Management and Integrated Coast Zone Management with reference to Coastal Regulation Zones.

Unit-2: Case Studies of Landforms and Landuse

2.1 Badlands on laterite duricrusts: Garhbeta and Santiniketan, West Bengal.

2.2 Tors and inselberges: Chhotanagpur plateau, Jharkhand.

2.3 Alluvial fans: Sub-Himalayan West Bengal.

2.4 Deltas and estuaries: Lower Ganga delta, West Bengal.

Unit-3: Management of Geomorphic Problems

3.1 Management of mining subsidence with special reference to Raniganj coalbelt.

3.2 Management of river discharge with special reference to Damodar Valley Corporation and Farakka Barrage Project.

3.3 Management of urban water disposal with special reference to East Kolkata Wetlands.

3.4 Management of reclaimed coastal areas with special reference to Indian Sundarban.

Unit-4: Management of Geomorphic Hazards

4.1 Management of landslides with special reference to northern West Bengal.

4.2 Management of floods with special reference to deltaic West Bengal.

4.3 Management of riverbank erosion with special reference to Ganga and Bhagirathi in West Bengal.

4.4 Management of coastal erosion with special reference to West Bengal coast.

MODULE 418 L (OPTIONAL): POPULATION & WELFARE GEOGRAPHY – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Economic Development and Inequality

1.1 Factors responsible for different levels of Development.

1.2 Comparative study of the Population characteristics, Economic development and Inequality in the Developed and Developing countries.

1.1 Impact of Migration in the areas of Source and Destination.

1.2 Open door policy and Inequality-International and Intra-national.

Unit-2: Social Inequality

2.1 Status and opportunity of the People below the Poverty Line.

2.2 Deprivation of the Backward and Minority Communities.

2.3 Gender issues.

2.4 Insecurity of the Child labour, Unemployed youth and Superannuated persons.

Unit-3: Economic and Human Development

3.1 Basic indicators of Economic Development.

3.2 Basic indicators of Human Development.

3.3 Indicators of Gender-related Development and Gender Empowerment Measure.

3.4 Poverty line and Measures of Poverty Alleviation.

Unit-4: Social Well-being

4.1 Economic basis and indicators of Social well-being.

4.2 Indicators of Quality of life.

4.3 Intra-urban Inequality in India.

4.4 Indicators of Social well-being relevant to India: Housing, Health and Nutrition, Literacy and Education, Social Security.

MODULE 418 M (OPTIONAL): REGIONAL PLANNING – II (Theoretical – 50 marks / 5 credits)

Unit-1: Planning Region

1.1 Concept of planning region, economic planning.

1.2 Planning Regions of India; purpose and methods of delineation of Planning Region.

1.3 State as a Planning unit; Criteria for dividing a State into Economic Region; West Bengal as a case study.

1.4 Micro Level Planning at District Level: West Bengal and Tamil Nadu.

Unit-2: Urban Development

2.1 Metropolitan concept, Metropolis, Metropolitan area, Metropolitan region, Mega-city and Primate city. Need, Importance and Concept of Urban Planning.

2.2 Urban Planning in India: Kolkata, Mumbai and Delhi; City region: Problem of planning.

2.3 Planned Town: concept; New Towns of India.

2.4 National Policies on Urbanisation, Urban Renewal vs. Urban Redevelopment; 74th Constitutional Amendment.

Unit-3: Rural Development

3.1 Tribal Area Development.

3.2 Rural Development Strategies, case studies from India.

3.3 Backward Region: Identification and Development.

3.4 Rural Development in India: Programmes and Policies.

Unit-4: Regional Development

4.1 Economic Base, Resource Potentials.

4.2 Role of Agriculture in Regional Development.

4.3 Role of Industries in Regional Development.

4.4 Transport, Trade and Commerce and Regional development.

MODULE 418 N (OPTIONAL): SOIL GEOGRAPHY & LAND USE – II

(Theoretical – 50 marks / 5 credits)

Unit-1: Concepts

1.1 Concept and attributes of land.

1.2 Landscape ecology.

1.3 Land use categories.

1.4 Factors influencing land use.

Unit-2: Theories and Policies Concerning Land Use

2.1 Objectives and principles of land use: Stamp, Lewis and Graham.

2.2 Theories of decision making and choice of land use.

2.3 Land use and Government policy concerning: Forestry, wetland, agriculture, mining, urbanisation, industrialisation and river valley planning.

2.4 Environmental impact of changes in land use.

Unit-3: Land Use Survey and Planning

3.1 Objectives, principles, types and methods of land use survey - Macro and Micro level.

3.2 Basic principles of Land use Planning.

3.3 Planning techniques: Land classification by Stone and different organisations-USDA and FAO.

3.4 Planning systems and issues - Rural, Peri-urban and Urban: Von Thünen, Sinclair and Bergers' model.

Unit-4: Land Reclamation and Subsequent Use: Case Studies

4.1 Wastelands of western West Bengal.

4.2 River islands and *chars* of West Bengal

4.3 Indian Sundarban

4.4 East Kolkata Wetlands, including Salt lake

MODULE 418 O (OPTIONAL): URBAN GEOGRAPHY – II (Theoretical – 50 marks / 5 credits)

Unit-1: Urban Planning

1.1 Genesis of modern urban planning: The Seers

1.2 Post War planning, Master Plans and Development Plans

1.3 Inclusive Planning and Participatory Planning: Conceptual framework

1.4 Urban Planning in India: a critical overview

Unit-2: Institutions and Governance

2.5 Evolution of the Neo-liberal city and the changing nature of urban governance;

2.6 Stakeholders in urban governance: elected, bureaucratic, citizens' groups and others

2.7 Role of Institutions in Urban governance

2.8 Citizenship and Right to the City

Unit-3: Planning and Governance in India

3.1. Legislations, 74th Amendment and beyond

3.2. Planning for Small and Medium Towns; New Towns

3.3. Metropolitan Planning Issues: Mumbai, Delhi.

3.4. Critical Overviews of planning trends: JNNURM, Slum-Free Cities, Smart Cities

Unit-4: Planning and Governance: the City of Kolkata

4.1. History of Planning

4.2. Planning Problems and Issues: Land use and Space-use, Slums, Transport.

4.3. Expansion and New Townships

4.4. The urban ecosystem: Urban geo-hydrology, Floods, Wetlands

MODULES 419 A–O: SPECIAL PAPER (OPTIONAL–PRACTICAL)

MODULE 419 A (OPTIONAL): ADVANCED CARTOGRAPHY – III (Practical – 50 marks / 5 credits)

Unit-1: Location of Points and Determination of Area

1.1 Use of GPS for planimetric and altimetric locations of points.

1.2 Theodolite Survey for vertical distance.

1.3 Tacheometric survey for determining difference in height.

1.4 Preparation of Map using Total Station.

Unit-2: Construction of the Graticules of Selected Projections

2.1 Polar Zenithal Gnomonic Projection and Equatorial Zenithal Gnomonic Projection

2.2 Conical Equal Area and Conical Orthomorphic Projections with two standard parallels.

2.3 Modified International and Interrupted Sinusoidal Projections.

2.4 Mercator and Mollweide's Projections.

Unit-3: Choropleth, GIS and Digital Mapping

3.1 Capturing data, Scanning, GPS.

3.2 Digital Image processing.

3.3 Creation of maps by GIS.

3.4 Choropleth mapping.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 B (OPTIONAL): ADVANCED GEOMORPHOLOGY – III

(Practical – 50 marks / 5 credits)

Unit-1: Quantification and Interpretation of Fluvial Processes

1.1 Computation of channel pattern indices from river planform.

1.2 Determination of discharge by using field equipment (Total station, GNSS, echosounder, and current meter). Calculation of velocity and discharge using Manning equation.

1.3 Calculation of hydraulic geometry equations from field data.

1.4 Analysis and interpretation of hydrographs, rating curves, and flow duration curves.

Unit-2: Quantification and Interpretation of Coastal Processes

2.1 Preparation of wave refraction diagram.

2.2 Identification and measurement of sedimentary and biogenic forms.

2.3 Determination of breaker types by empirical equations.

2.4 Coastal erosion: Quantification of eroded area and vulnerability zonation.

Unit-3: Sediment Analysis and Image Interpretation

3.1 Measurement of suspended sediment concentration.

3.2 Analyses of pebbles and sediments: Shape indices, textural analysis by sieving.

3.2 Floods and landslides: Risk zoning from maps and images.

3.3 Extraction of geomorphic features from Satellite FCCs in overlays.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 C (OPTIONAL): ADVANCED INDUSTRIAL GEOGRAPHY – III

(Practical – 50 marks / 5 credits)

Unit-1: Industrial Growth

1.1 Distributions of Particular industry, co-efficient of geographical association.

1.2 Analysis of Time series data.

1.3 Growth of selected industries in India.

1.4 Standard distance.

Unit-2: Industrial Concentration

2.1 Computation of Location Quotient.

2.2 Co-efficient of Localisation for estimating the incidence of Localisation.

2.3 Study of industrial disparity by Lorenz Curve.

2.4 Functional analysis by Ternary diagram.

Unit-3: Industrial Relations

3.1 Computation of Index number of industrial production.

3.2 Correlation of different variables relating to industrial development in India or in any part of the country.

3.3 Study of industrial structure.

3.4 Analysis of industrial pollution (air/water/noise).

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 D (OPTIONAL): AGRICULTURAL GEOGRAPHY – III

(Practical – 50 marks / 5 credits)

Unit-1: Determination of Chemical Properties by Instruments

1.1 Soil pH.

1.2 Phosphorus, potassium, nitrogen.

1.3 Organic Carbon.

1.4 Soil salinity.

Unit-2: Preparation of Maps and Charts Based on Agricultural Data

2.1 Cropping pattern.

2.2 Crop-combination by combinatorial analysis.

2.3 Cropping-intensity and Crop-diversification.

2.4 Crop-productivity.

Unit-3: Data Analysis and Mapping

3.1 Regression analysis with agricultural data.

3.2 Scatter diagram showing relationship between Physical parameters and Agricultural data.

3.3 Determination of Agro-efficiency.

3.4 Preparation of Agro-meteorological map.

Unit-4: Laboratory Notebook and Viva Voce.

MODULE 419 E (OPTIONAL): CLIMATOLOGY OF TROPICAL ASIA – III

(Practical – 50 marks / 5 credits)

Unit-1: Generation/ Collection of Climatic Data and their Statistical Analysis

1.1 Principles and use of vital weather instruments: Thermometer, barometer, anemometer, hygrometer, evaporimeter / lysimeter, rain gauge, etc.; Digital Weather Station: Components and functions

1.2 Preparation of an inventory of sources of climatic data, and its collection from secondary source(s)

1.3 Visit to a weather station and preparation of a report

1.4 Statistical analysis of temperature and rainfall data: Central tendency, dispersion, probability and recurrence

Unit-2: Cartographic Representation of Climatic Data and their Interpretation

2.1 Chronological charts of weather elements with trend lines: Moving average, Semi-average, and Least Square methods

2.2 Compound (Octagonal) wind rose diagram; Isoanomalous curve; Relative temperature graph

2.3 Climatic comfort diagram, Hythergraph, Climograph (G. Taylor)

2.4 Monthly rainfall dispersion diagram (Quartile method), Climatic water budget, and Ergograph

Unit-3: Preparation and Interpretation of Weather/ Climatic Maps; Use of Satellite Images

3.1 Comparative analyses of Daily Weather Reports of India: Monsoon, Pre-monsoon and Post-monsoon

3.2 Identification and interpretation of weather features on weather images of India: Clouds, fog, Atmospheric/ weather disturbances, Monsoon trough, cyclones, anti-cyclones, etc.

3.3 Estimation/ downscaling of weather data using web-based freely available standardised software and model

3.4 Preparation and interpretation of (preferably Indian) climatic hazard maps: Drought, flood, heat/ cold waves, storms, *storm* surge, sea level rise (*any two*)

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 F (OPTIONAL): COASTAL MANAGEMENT – III (Practical – 50 marks / 5 credits)

Unit-1: Quantification of coastal processes

2.2 Preparation of wave refraction diagram.

2.2 Determination of breaker types by empirical equations.

2.3 Determination of discharge of tidal streams by using field equipment (total station / dumpy level, echosounder and current meter)

2.4 Longshore drift estimation using tracers.

Unit-2: Quantification of coastal landforms and environment

2.2 Coastal mapping and profiling using survey equipment (total station / theodolite)

2.2 Floral species survey using grid method.

2.3 Sample designing for conducting perception survey of coastal issues.

2.4 Questionnaire preparation for primary survey.

Unit-3: Sediment analysis and image interpretation

3.2 Measurement of suspended sediment concentration.

3.2 Analyses of pebbles and sediments: Shape indices, textural analysis by sieving.

3.2 Extraction of geomorphic and cultural features from satellite images.

3.3 Coastal erosion and inundation: Rate estimation and risk zoning from maps and images.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 G (OPTIONAL): ENVIRONMENTAL GEOGRAPHY – III

(Practical – 50 marks / 5 credits)

Unit-1: Laboratory Techniques to Detect Environmental Pollution

1.1 Acidity and Alkalinity of Soil and Water
1.2 Nitrate and Phosphate content in Water
1.3 BOD and Total hardness in Water
1.4 Dust fall and Measurements of Air-pollutants, Noise pollution

Unit-2: Environmental Survey and Mapping Techniques

2.1 Sampling Procedures
2.2 Preparation of Questionnaire for Perception Survey on Environmental Problems (Natural and Social Hazards)
2.3 Environmental Mapping Techniques, Population—Development—Environment interrelationship
2.4 Preparation and Interpretation of Environmental Maps in Micro-level

Unit-3: Field Techniques

3.1 Identification and study of an Environmental Problem in field
3.2 Regression Analysis, Correlation and (bi-variate) Time Series Analysis of Environmental data, Concentration by Lorenz Curve
3.3 Cartographic presentation of Primary/Secondary data and collation of Environmental Maps
3.4 Preparation of the Environmental Management Plan

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 H (OPTIONAL): GEOGRAPHY OF CULTURE & HERITAGE – III

(Practical – 50 marks / 5 credits)

Unit-1: Understanding culture and heritage

1.1 Reading texts: Content analysis of print and audio-visual media

1.2 Reading images: Compositional interpretation, discourse analysis, photo elicitation, photo documentation, etc.

1.3 Visualisation of space: Social/cultural construction of landscapes and built environment

1.4 Ethnography and visual media (digital / non-digital)

Unit-2: Methodological approaches

2.1 Data sourcing from archival and other sources. Creation and interpretation of images in space and society

2.2 Investigating space and place: Sampling techniques, interviews, questionnaires. Report writing with graphics and text

2.3 Participant and non- participant observation, Participatory Rural Appraisal (PRA), ethnographic writing, researching rituals, festivals. Against methods.

2.4 Writing field notes and photo- documentation techniques

Unit-3: Project (on any one)

Natural and built environments / Cultural texts and images / Ethnographic research

Unit-4: Laboratory notebook and viva-voce

MODULE 419 I (OPTIONAL): GEOGRAPHY OF HEALTH – III

(Practical – 50 marks / 5 credits)

Unit-1: Health Monitoring

1.1 Cartography of health and diseases

1.2 Measuring the frequency of outcomes in epidemiology

1.3 Healthcare Indicators. Seasonality of death and birth

1.4 Space-Time analysis of communicable and non-communicable diseases

Unit-2: Mapping of Health and HealthCare

2.1 Mapping spatial patterns in health parameters

2.2 Sources of data and data quality. Modelling health data in spatial setting,

2.3 Techniques of probability mapping of disease. Bayesian Inference

2.4 Mapping of Health Services and access to care, Therapeutic landscapes

Unit-3: Health Statistics and Geographic Information System

3.1 Spatial statistics in health

3.2 Correlation between suffering and related variables

3.3 Modelling disease diffusion and spatial variation in disease risk

3.4 GIS application in health services and challenges

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 J (OPTIONAL): GEOGRAPHY OF TOURISM –III (Practical – 50 marks / 5 credits)

Unit-1: Tourist Flow and Infrastructure

1.1 Tourist flow analysis.

1.2 Growth and Projection of Tourist.

1.3 Classification of Tourist resource of India.

1.4 Infrastructure of Tourism.

Unit-2: Tourism and Development

2.1 Levels of Tourism Development.

2.2 Levels of Economic Development.

2.3 Correlation between tourist flow and indicators of development.

2.4 Relation between Economic Development and Tourism Development by weighted score.

Unit-3: Tourism, Environment and Planning

3.1 Isochronic map showing tourist resource and travel time.

3.2 Tourism and development of Tertiary sector.

3.3 Tourism complex planning.

3.4 Environmental Impact Assessment of Tourism Development.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 K (OPTIONAL): GEOMORPHOLOGY OF HUMID TROPICS – III

(Practical – 50 marks / 5 credits)

Unit-1: Quantification and Interpretation of Fluvial Processes

1.1 Computation of channel pattern indices from river planform.

1.2 Determination of discharge by using field equipment (Total station, GNSS, echosounder, and current meter). Calculation of velocity and discharge using Manning equation.

1.3 Calculation of hydraulic geometry equations from field data.

1.4 Analysis and interpretation of hydrographs, rating curves and flow duration curves.

Unit-2: Quantification and Interpretation of Coastal Processes

2.1 Preparation of wave refraction diagram.

2.2 Identification and measurement of sedimentary and biogenic forms.

2.3 Determination of breaker types by empirical equations.

2.4 Coastal erosion: quantification of eroded area and vulnerability zonation.

Unit-3: Sediment Analysis and Image Interpretation

3.1 Measurement of suspended sediment concentration.

3.2 Analyses of pebbles and sediments: shape indices, textural analysis by sieving.

3.2 Floods and landslides: risk zoning from maps and images.

3.3 Extraction of geomorphic features from Satellite FCCs in overlays.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 L (OPTIONAL): POPULATION & WELFARE GEOGRAPHY – III

(Practical – 50 marks / 5 credits)

Unit-1: Measures of Temporal and Spatial Changes

1.1 Population growth rate: Absolute and compound.

1.2 Population projection.

1.3 Migration analysis.

1.4 Spatial variation of temporal trends and Population quality.

Unit-2: Measures of Development

2.1 Literacy and Educational level: Grass Enrolment Ratio and Dropout.

2.2 Morbidity and Medical facilities, Infant and child mortality rate, maternal mortality rate, Life expectancy at birth.

2.3 Sex ratio and Work participation rate.

2.4 GNP, GDP, and SDP per capita.

Unit-3: Measures of Poverty and Survey Techniques

3.1 Head Count Index and Gini's co-efficient.

3.2 Poverty gap and Severity of poverty.

3.3 Enumeration techniques.

3.4 Preparation of Questionnaires.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 M (OPTIONAL): REGIONAL PLANNING – III (Practical – 50 marks / 5 credits)

Unit-1: Regional Concentration and Disparities

1.1 Sphere of influence by Gravity Model.

1.2 Measurement of Inequality by Lorenz Curve.

1.3 Concentration by Location Quotient.

1.4 Regional Disparity by Sopher's Index.

Unit-2: Transport and Regional Development

2.1 Infrastructure and Regional development.

2.2 Accessibility by Detour Index.

2.3 Measurement of Transport Accessibility by Shortest Path Matrix.

2.4 Regional Growth by analysis of Time series data.

Unit-3: Regional Growth

3.1 Rank-size distribution of population.

3.2 Rural-urban growth and differentials.

3.3 Correlation and Spatial correspondence.

3.4 Weighted Score and Combination analysis.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 N (OPTIONAL): SOIL GEOGRAPHY & LAND USE – III

(Theoretical – 50 marks / 5 credits)

Unit-1: Laboratory Analysis of Physical Properties of Soil

1.1 Hygroscopic moisture.

1.2 Soil colour.

1.3 Soil texture by Mechanical analysis.

1.4 Pore space, Moisture holding capacity, Volume expansion, Apparent density and Specific gravity by Keen Box experiment.

Unit-2: Laboratory Analysis of Chemical Properties of Soil

2.1 Soil pH.

2.2 Calcium content and organic matter content.

2.3 Base exchange capacity.

2.4 Salinity.

Unit-3: Data Analysis and Mapping

3.1 Regression and correlation of different properties of soil.

3.2 Preparation of Soil Maps based on spatial variation of the properties.

3.3 Preparation and Interpretation of land use map: Macro scale.

3.4 Preparation and Interpretation of land use map: Micro scale.

Unit-4: Laboratory Notebook and Viva Voce

MODULE 419 O (OPTIONAL): URBAN GEOGRAPHY – III (Theoretical – 50 marks / 5 credits)

Unit-1: Analysis of Spatial Urban Phenomena

1.1. Correlation between associated variables and Residual Mapping

1.2. Inequality mapping – Gini, Theil and CV, Index of dissimilarity

1.3. Quality of Life Index for Urban Residential Areas

1.4. Delineation of urban sphere of influence

Unit-2: Mapping the Built Environment (using RS-GIS techniques)

3.1. Mapping of Urban Land Cover and Land Use

3.2. Detection of changes in the Urban Environment: NDVI, Temperature Zonation.

3.3. Urban Expansion Mapping

3.4. Attribute Data Interfaces – mapping of services (using the Ward as an unit)

Unit-3: Qualitative methods in Urban Research

4.1. Urban ethnography – interview, FGDs, participant observations

4.2. Understanding "Everyday Urban Life" – perceived spaces (observer and citizens)

4.3. Visual geography – using visual data and imageries

4.4. Content Analysis: Policy /Planning Reports and Documents

[Note: Exercises for 4.1, 4.2 and 4.3 can evolve from heritage/ festivals/ trades and commerce/ neighbourhoods/ environmental issues/ public space of any city]

Unit-4: Practical Notebook and Viva Voce

MODULE-420A: SPECIAL PAPER–IV: DISSERTATION (Practical–25 marks / 4 credits)

MODULE-420B: FIELD / PROJECT REPORT (Practical–25 marks / 2 credits)

To be evaluated on the basis of group discussion and grand viva

ELECTIVE COURSE FOR OTHER DISCIPLINES

MODULE 311/312: ELEMENTS OF GEOGRAPHY (Theoretical – 50 marks / 4 Credits)

Unit-1: Cartography

1.1 Concept of maps, scales, and projection
1.2 Concept of remote sensing

Unit-2: Climatology

2.1 Indian Summer Monsoon: Variabilities and adaptation
2.2 Climate change and its consequences

Unit-3: Geomorphology

3.1 Fluvial processes and landforms
3.1 Glacial processes and landforms

Unit-4: Population and Settlement Geography

4.1 Population dynamics
4.2 Rural–urban linkages, liveable cites

Unit-5: Social and Cultural Geography

5.1 Concepts of social processes, social well-being
5.2 Cultural segregation, cultural turn

Unit-6: Regional Planning

6.1 Concept and types of regions
6.2 Bases of regional classification of India

Unit-7: Geography of Hazards

7.1 Hazards: Concept and classification
7.2 Case study from West Bengal: Landslide / flood / coastal erosion (any one)

Unit-8: Philosophy of Geography

8.1 Approaches to geographical studies
8.2 Dichotomies and dualism in geography