

**Department of Geography**

**Faculty of Natural Sciences**

**Jamia Millia Islamia**

**New Delhi – 110025**

**(A Central University by an Act of Parliament)**

**M.A/ M.Sc. Geography**

**Syllabus (w.e.f. 2019 – 2020)**

## Course Structure M.A./ M.Sc. Geography

Paper No/Code	Title		Credit	Type
<b>Semester – I</b>				
Paper – I (GGM – 101)	Geomorphology		4	CC
Paper -II (GGM – 102)	Climatology and Oceanography		4	CC
Paper – III (GGM – 103)	Human Geography		4	CC
Paper – IV (GGM – 104)	Geography of India		4	CC
Practical – I (GGM – 105)	Cartographic Methods		2	
Practical – II (GGM-106)	Quantitative Methods in Cartography		2	
Paper – V (GGM-107)	Disaster Management		4	
<b>Semester – II</b>				
Paper – VI (GGM-201)	Geographical Thought		4	CC
Paper – VII (GGM-202)	Biogeography		4	CC
Paper – VIII (GGM-203)	Geoinformatics and Applications		4	CC
Practical – III (GGM-204)	GIS and Applications		2	
Practical – IV (GGM-205)	Land Surveying and GPS		2	
Paper – IX (GGM-206)	World regional Geography		4	CB
Paper – X (GGM-207)	Research Methodology		4	CC
<b>SEMESTER-III- Select any one Group</b>				
	Physical Geography	Human Geography		
Paper – XI (GGM-301)	Fluvial Geomorphology	Urban Geography		CC
Paper – XII (GGM-302)	Coastal Geomorphology	Population & Settlement Geography		CC
Paper – XIII (GGM-303)	Tropical Geomorphology	Regional Development		
Paper – XIV (GGM-304)	Field Visit			
Paper – XV (GGM-305)	Data Analysis SPSS			AECC
Paper – XVI (GGM-306)	Environmental management			CBCS
Semester –IV				
Paper – XVIII (GGM-401)	Watershed management	Political Geography		
Paper – XIX (GGM-402)	Sustainable Development			CBCS
Paper – XX (GGM-403)	Optional			
Paper – XXI (GGM-404)	DIP Training			
<b>Practical – V (GGM-405)</b>	Project		4	

**SEMESTER – I**  
**Geomorphology**  
**Paper - I (GGM - 101)**  
**Credits: 4 (CC)**

**UNIT - I:**

Fundamental concepts in Geomorphology: Concept of time and space; Concept of dynamic equilibrium; Concept of morphogenetic regions; Models in Geomorphology, Approaches and methods of geomorphologic investigations.

**UNIT - II:**

Geomorphic processes. Dynamics of fluvial, glacial, Aeolian, marine and karst processes and resulting landforms, complexities in geomorphologic processes.

**UNIT – III:**

Drainage basin and morphometric analysis; Denudation chronology; Soil erosion and its measurement; Slope form, processes and evolution; Measurement of surface runoff; Interruption in the evolution of landforms: Tectonic, climatic and base level changes.

**UNIT - IV:**

Applied geomorphology: Principles and purpose; Geomorphology and soils; Geomorphology and land and water Resource Management Urban geomorphology, Geomorphology and watershed management; Geomorphic hazards and mitigation.

**Books Recommend:**

1. Dayal, P. 2015. Text-Book of Geomorphology, Shukla Book Depot, Patna.
2. Dury, G.H. (Ed.) 1966. Essays in Geomorphology. Heinmann Educational Books Ltd., London.
3. Fairbridge, R.W. (Ed.) 1968. Encyclopedia of Geomorphology. Rein-hold Book Corp., New York.
4. Gabler R.E, Peterson. J.F., Trapasso, L.M., Dorothy, S. 2009. Physical Geography, Brooks/Cole, Cengage Learning, Belmont, USA.
5. Garner, H.F. 1974. The Origin of Landscape: A Synthesis of Geomorphology. Oxford Univ. Press, New York.
6. Gautam, A. 2015. Geomorphology. Sharda Pustak Bhawan. Allahabad.
7. Goudie, A. (Ed.) 2003. Encyclopedia of Geomorphology, Routledge, London.
8. Goudie, A. (Ed.) 2005. Geomorphological Techniques (2<sup>nd</sup> Edition), Routledge, London.
9. Harvey, 2012. A. Introducing Geomorphology: A Guide to Landforms and Processes.
10. Hugget, R.J. 2011. Fundamentals of Geomorphology. Routledge Pub.
11. Jhon, R. Hails. 1977. Applied Geomorphology, Elsevier.
12. Kale, V. and Gupta, A., 2004. Elements of Geomorphology. Oxford University press, Calcutta.

13. Kenneth J. Gregory, Andrew S Goudie, 2011. The SAGE Handbook of Geomorphology, SAGE Publications Ltd., London.
14. Mateo Gutierrez, 2012. Geomorphology, CRC Press, Boca Raton (FL), USA.
15. Paul R. Bierman, David R. Montgomery, 2014. Key Concepts in Geomorphology, W. H. Freeman and Company Publishers, New York.
16. Savindra, S. 2017. Geomorphology. Pravalika Publications, Allahabad.
17. Strahaler, A.H. 2013. Introducing Physical Geography. Wiley Pub.
18. Thornbury, W.D., 1991. Principles of Geomorphology, Wiley Eastern Ltd., New Delhi.
19. Way, D. 1978. Terrain Analysis: A Guide to Site Selection using Aerial Photo Interpretation. Dowden, Hutchinson & Ross, Stroudsburg.
20. Worcester, P.C. 1969. Text Book of Geomorphology. East West Press, New Delhi.

**SEMESTER - I**  
**Climatology and Oceanography**  
**Paper - II (GGM - 102)**  
**Credits: 4 (CC)**

UNIT - 1

Atmospheric thermodynamics; Adiabatic Process; Entropy and law of dynamics, Hydrostatic equilibrium, budget and energy balance; Classification of climate.

UNIT – 2

Genesis of Indian Monsoon and the causes of its variability, Classification, sources, origin and modifications of air masses, Micro climates and human comfort zone, Urban Microclimate with special reference to tropical cities, Global Climate Change: Climatic records; Evidences of past climatic changes; Climate models; Forecast of local weather

UNIT - 3

Currents and Thermohaline Circulation, Instability and Ocean Heat Budget Upper Ocean Structure and Processes ; Evolution of Ocean Floor Morphostructure - Actualistic Model Vorticity, Deep Ocean Circulation and Ocean Waves ; Tides - generating forces, types, theories and effects; Marine biodiversity and coral reefs.

UNIT - 4:

Marine resources: Development and conservation; Ocean routes and trade development; Marine pollution management; Global warming and transgression of seas; Coastal area management; Remote sensing in oceanographic studies; Laws of the sea.

**Books Recommended:**

1. Barry, R.G. and Chorley R.J. 2009. Atmosphere Weather and climate (9<sup>th</sup> edition), Routledge.
2. Barret, E.C. 1974. Climatology from Satellites. Methuen, London.
3. Critchfield, J.H. 1983. General Climatology (4<sup>th</sup> edition). Phi Learning Pub.
4. Davis, R.J.A. 1986. Oceanography-An Introduction of the Marine Environment. Win
5. C. Brown, Iowa.
6. Griffiths, J.F. 1976. Applied climatology. Oxford press, New York.
7. Hobbs, J.E. 1996. Applied Climatology. Oxford University Press.
8. Huntington, E. and S.S. Visher. 1922. Climatic Changes. Yale University Press.
9. Hussain, T. and Tahir, M. 2012. Climatology. Jawahar, New Delhi.
10. Hussain, T. and Tahir, M. 2012. Oceanography. Jawahar, New Delhi.
11. Kings, C.A.M. 1969. An Introduction to Oceanography. McGraw, New York.
12. Lamb, H.H. 1991. Climate : Present, Past and Future. Vol.1&2. Routledge.
13. Trewartha, G.T. and Horn, L.A., 1980 (5th edition). Introduction to Climate, International Studies.
14. Trujillo, A.P., Thurnman, H.V. 2016. Essentials of Oceanography, Prentice Hall.

15. Trujillo, A.P., Thurnman, H.V. 2010. (10th Edition). Introductory Oceanography. Prentice Hall.
16. Weyl, P.K. 1970. Oceanography-An Introduction of the Marine Environment, John Wiley and Sons, London.
17. Russell, D. T. and Allen P., 1997, Applied Climatology: Principles and Practice, Routledge, London.
18. Rohli, R. V., Vega, A. J., 2018. Climatology, Jones & Bartlett Learning, Burlington, MA, USA.
19. Dennis L. Hartmann, 2016. Global Physical Climatology, Elsevier Science, Amsterdam, Netherlands.
20. Edward Aguado, James E. Burt, 2015, Understanding Weather and Climate, Pearson,
21. C. Donald Ahrens, Perry Samson, 2011. Extreme Weather and Climate, Brooks/Cole, Cengage Learning, Belmont, CA, USA.

**SEMESTER – I**  
**Human Geography**  
**Paper - III (GGM - 103)**  
**Credits: 4 (CC)**

**UNIT-I: Development and Concepts**

Development of Human Geography as a discipline; Contemporary Relevance of geography as discipline; Approaches to Human Geography, Cultural or Social Determinism; Post-Modern Human Geography.

**UNIT-II: Population and Development**

Human races: classification and distribution, Population growth, Global Demographic transition; Recent international migration: causes and consequences; Population policies, Human development: measurement and global disparity;

**UNIT-III: Cultural Landscape Politics**

Cultural Geographies: Religion and languages; Issues of nationalism and identity; major cultural realms; Trends and Patterns of World Urbanization; Multiculturalism, Global border and water disputes.

**UNIT-IV: Resources and Economy**

Population-Resource Relationship; Rostow's Economic Growth Model; Global agricultural production and food security; World energy resources: production and consumption; Global economic development and international relations.

**Books Recommend:**

1. Rubenstein, James M. 2011. The cultural landscape : an introduction to human geography (10<sup>th</sup> Edition), Prentice Hall, Upper Saddle River, NJ, USA.
2. PETER DANIELS, MICHAEL BRADSHAW, DENIS SHA, JAMES SIDAWAY, TIM HALL, 2012. An introduction to human geography, Pearson (5<sup>th</sup> Edition), Harlow, UK.
3. Paul L. Knox, Sallie A. Marston, 2015. Human Geography: Places and Regions in Global Context, Global Edition, Pearson International,
4. Soja E, 1989 Postmodern Geographies, Verso, London.
5. Postmodern Human Geography: A Preliminary Assessment (Postmoderne Geographie des Menschen. Eine vorläufige Bilanz) Author(s): Michael Dear Source: Erdkunde, Bd. 48, H. 1 (Mar., 1994), pp. 2-13 Published by: Erdkunde.

**SEMESTER - I**  
**Geography of India**  
**Paper - II (GGM - 104)**  
**Credits: 4 (CC)**

**UNIT-I Physical Characteristics**

Indian federalism, India unity in diversity Physiography; Drainage Systems; Climate Characteristics; Natural Vegetation; Soils.

**UNIT-II Population**

Human Development Index and its components, Growth and Distribution of Population; Education Policy 2000, Population Characteristics and Composition (literacy, sex ratio, age, occupational structure etc.); Ageing Population, Unemployment and problems of demographic dividend.

**UNIT-III Resources and Planning**

Agro-climatic regions, Agricultural growth and Development: The Political Economy of Green Revolution in India; Food Security; Globalization and Indian Agriculture; Policies and Programmes; Industrial Development: Industrial Development in India, Industrial Policy, Special Economic Zones; Energy Crisis

**UNIT-IV Trade and Economy**

Regional Disparities in Economic Development; India's Foreign Trade; WTO and India's Trade Policy; Globalization and Free Market Economy; Indian Diaspora and Economic Development. Multi-level planning, Community participation & governance and planning contemporary issues and Economic Reforms – Multinationals and liberalization

**Suggested Readings:**

1. Deshpande C.D. 1992. Indian-A Regional Interpretation. Northern Book Centre, New Delhi.
2. Govt. of India: India-Reference Annual, 2018 Pub. Div., New Delhi.
3. Govt. of India: National Atlas of India. NATMO Publication, Calcutta.
4. Govt. of India: The Gazetteer of India. Vol. I & III Publication Division.
5. Mitra, A. 1967. Levels of Regional Development of India. Census of India, Vol. I, Part I-A (i) and (ii), New Delhi.
6. Shafi, M. 2000. Geography of South Asia. McMillan & Co., Calcutta.
7. Singh, R.L. 1971 (ed). India A Regional Geography. National Geographical Society, Varanasi. Spate, O.H.K. and Learmonth A.T.A. 1967. India and Pakistan – Land, People and Economy Methuen & Co., London.
8. Hussain M (2017): Geography of India, 7<sup>th</sup> Edition, McGraw Hill Education; New Delhi.
9. Singh G (2010): A Geography of India, Atma Ram and Sons; ninth edition (2010).

10. Ministry of Finance, (GOI) Economic survey of India (various Issues), Oxford University Press, New Delhi.
11. Census of India (Various Issues): Office of the Registrar General and Census Commissioner India.

**SEMESTER -I**  
**Cartographic Methods**  
**Practical –I- GGM-105**  
**Credits: 2 (CC)**

**UNIT - I: FUNDAMENTALS OF CARTOGRAPHY**

Maps and their significance; Classification of maps; Theory of communication; Elements of maps: Generalization, Symbolization and Classification; Techniques of mapping: dot, choropleth, isopleths and diagrammatic; Principles of map designing.

**UNIT - II: RELIEF MAPPING**

Relative relief: GH Smith and Robinsons methods; Morphometric Analysis: Drainage Density, Stream order, Elongation ratio, Circularity ratio, Bifurcation ratio.

**UNIT - III: MAPPING OF SOCIO-ECONOMIC DATA**

Population Density; Rural – Urban population; Patterns of irrigation, Location of Industries; Cartograms.

**UNIT - IV: APPLIED CARTOGRAPHY**

Any one of following: 1. Topographic mapping 2. Tourist mapping 3. Service and utility mapping Note: Students will have to prepare a set of ten maps on selected theme.

**Books Recommended:**

1. Dickinson. G.C. 1968. Statistical Mapping and Presentation of Statistics. Arnold, London.
2. Lawrence. G.R.P. 1971. Cartographic Methods. Methuen, London.
3. Monkhouse. F.J and Wilkinson. H.R. 1972. Maps and Diagrams. Methuen, London.
4. Misra. R.P.1969. Fundamentals of Cartography. Prasaranga. University of Mysore, Mysore.
5. Raisz. E. 1962. Principles of Cartography. McGraw Hill, New York. 6. Robinson. A.H. 1978. Elements of Cartography. John Wiley, New Yor

**SEMESTER - I**  
**Quantitative Methods in Cartography**  
**Practical - II (GGM-106)**  
**Credits: 2 (CC)**

**UNIT - I: MEASURES OF GEOGRAPHICAL PATTERNS**

Nearest Neighbour Analysis; Gini's Co-efficient; Lorenz curves; Location quotient; Rank size rule.

**UNIT - II: NETWORK ANALYSIS**

Indices of transport network efficiency; Compositing the indices of transport network efficiency; Indices of nodal accessibility; Local degree – Road Local degree - Rail. Weighed road capacity and tortousrity ratio; Compositing the indices of nodal accessibility.

**UNIT - III: METHODS OF PREDICTIONS AND LEVELS OF MEASUREMENT**

Levels of measurement; Methods of sampling; Simple linear regression analysis; Plotting of regression line; Plotting of absolute and relative residuals; Explanation of residuals plotted on the maps.

**UNIT - IV: MEASURES OF DISPARITIES AND POTENTIAL MODELS**

Gravity and potential models; Delimitation of hinterlands; Combinational analysis of Weaver, S.M. Rafiulla's method, Measures of Disparities: Kendall's ranking method.

**Books Recommended:**

1. Berry, B.J.L. and Marble, D.R. (ed.). 1968. Spatial Analysis: A Reader in Statistical Geography. Prentice Hall, New York.
2. Cole, J.P. and Kind, C.A.M. 1968. Quantitative Geography. John Wiley Pub., New York.
3. Ibrahim, R. 1984. Market Centers and Regional Development. B.R. Publisher, New Delhi.
4. Mahmood, A. 1986. Statistical Methods in Geographic Studies. Rajesh Publishers, New Delhi.
5. Smith, D.M. 1975. Patterns in Human Geography. Penguin Books, England.
6. Maurice, Yeats. 1974. An Introduction to Quantitative Analysis in Human Geography. McGraw Hill, New York.
7. Peter Hagget, Andrew. D. Cliff and Allen Frey. 1977. Locational Methods. Vol. 1 and 11. Edward Arnold, London.

## **SEMESTER - I**

### **Disaster Management**

**Paper - VII (GGM - 107)**

**Credits: 4 (CC)**

#### **UNIT-I: Concept of Disaster**

Hazard and Disaster - Concepts and Classifications; Hazard Analysis; Disaster risk analysis

Vulnerability Analysis; Risk Assessment,

#### **UNIT-II: Natural Disasters**

Earthquakes - causes, characteristics, effects and damage potential, associated hazards, response; Potential Earthquake Sites in India; Case Study of the 2001 Gujarat Earthquake

Tsunamis - mechanism, potential areas, damaging effects, associated hazards, preparedness; Case Study of the 2004 Indian Ocean Tsunami; Landslides - factors, associated hazards, damage potential, Landslide Susceptibility Assessment; Case Study of Landslides in the Garhwal Himalays; Floods - causes and types, geomorphology of floods, associated hazards, damage potential, mitigation measures; Cyclones: characteristics, associated hazards, damage potential , impact assessment; Case Study of Foni 2019 and Hudhud 2014; Droughts : types, mitigation measures,

#### **UNIT-III: Manmade Disasters**

Classification of Manmade Disasters; Manmade Disasters: War and Conflict; Terrorism; Industrial Disasters; Hazardous Waste and Radiation.

#### **UNIT-IV: Management**

Approaches to disaster management; Disaster management cycle: Crisis management: quick response and relief, recovery, development; Risk management: risk identification and risk assessment, risk reduction - preparedness, prevention and mitigation, risk transfer; Act and policy: IDNDR, UNISDR, DMA-2005. Early Warning System, India Disaster Resource Network

#### **Suggested Readings:**

1. G. F. White (Ed). 1974. Natural Hazards – Local, National, Global. Oxford University Press.
2. V.T. Chow. 1964. Handbook of Applied Hydrology. McGraw-Hill.
3. A. N. Strahler and A. H. Strahler. 1973. Environmental Geoscience - Interaction Between Natural Systems and Man. Santa Barbara, California: Hamilton Publishing.
4. P. Reining. 1978. Handbook of Desertification Indicators. Washington D.C.: American Association for the Advancement of Science.
5. K. S. Valdiya. 1987. Environmental Geology. Tata McGraw-Hill.

6. Coppola DP (2011): *Introduction to International Disaster Management*. Elsevier.
7. Alexander, D. (1993): *Natural Disasters*, ULC Press Ltd, London
8. Collins, L.R. and Scheind, T.D. (2000): *Disaster Management and Preparedness*, Taylor and Francis
9. Edwards, B. (2005): *Natural Hazards*, Cambridge University Press, UK
10. NDMA (2009): *National Policy on Disaster Management*, NDMA, New Delhi
11. Sharma, R.K. & Sharma, G. (eds.) (2005): *Natural Disaster*, APH Publishing Corporation, New Delhi
12. Smith, K. (2011): *Natural Hazards*, Routledge, London

**SEMESTER - II**  
**Geographical Thought**  
**Paper -VI (GGM - 201)**  
**Credits: 4 (CC)**

**UNIT-I: Development and Evolution of Geography as Discipline**

Place of geography in the classification of knowledge, Changing nature and scope of geography; Fundamentals concepts of geography; Approaches to Geography; Dualism and dichotomy in Geography; Anomalous character and contemporary relevance of geography

**UNIT-II: Development in ancient and Medieval times**

Contribution of Greek, Roman and Arab and Indian Geographers; Broadening horizons: Impact of voyages and discoveries; Renaissance and its impact on Geographical Thought; Foundation of Scientific Geography: contributions of Varenus and Kant.

**UNIT - III: Foundation of Modern Geography**

Founders of modern Geography: Contribution of Humboldt and Ritter; Darwin's impact on Geography during the latter half of the nineteenth century; School of thoughts in Geography- German, French, British, American, India and Russia, Schaefer-Hartshorne debate, Exceptionalism

**UNIT - IV: Modern concepts in Geographical Thought**

Empiricism, Positivism, and Quantitative revolution, Humanistic geography; Behavioralism in Geography; Radical geography; Applied Geography; Modernism and Post modernism in Geography; Modern concepts: Pragmatism, Functionalism, Idealism, Phenomenology and realism

**Books Recommended:**

1. Dickinson. 1969. The Maker's of Modern Geography. Routledge and Kegan Paul, London.
2. Hartshorne. R. 1939. The Nature of Geography. Association of American Geographers, Lancaster, Pennsylvania.
3. Hartshorne. R. 1959. Perspective on the Nature of Geography. Rand McNally and Company, Chicago.
4. Harvey, D. 1991. The Condition of Post Modernity: An Enquiry into the Origins of Cultural Change. Wiley-Blackwell, Oxford.
5. Husain, M. 2002. Evolution of Geographic Thought (also in hindi). Rawat Publications, Jaipur.
6. Singh, J. 1988. Bhaugolik Chenta ka karam vikas. Gyanodaya. Gorakhpur.
7. Peet, R. 1998. Modern Geographical Thought. Blackwell, Oxford.
8. Adhikari, S. 2015. Fundamentals of Geographical Thought. Orient Blackswan. Hyderabad, India

11. Dikshit, R.D. Geographical Thought. 1997. PHI Learning Pvt. Ltd., New Delhi.
12. Martin G.J. 2005. All Possible Worlds. OUP, USA.
13. Cresswell, T. 2012. Geographical Thought: A Critical Introduction. Wiley Pub.
14. Lalita Rana. 2008. Geographical Thought: A Systematic Record Of Evolution. Concept Publishing Company.
16. Arild Holt-Jensen. 2009. (2nd edition). Geography: History and Concepts. Sage Pub.

**SEMESTER – II**  
**Biogeography**  
**Paper - VII (GGM - 202)**  
**Credits: 4 (CC)**

**UNIT-I: DEVELOPMENT AND FUNDAMENTALS OF BIOGEOGRAPHY**

Introduction and history of biogeography; Evolution and plate tectonics; The ecological niche and ecosystem; Biogeographical processes: speciation, diversification and dispersal; Distributions of species; The theory of Island Biogeography; Marine biogeography Succession and Ecological adaptation, Climax concept and ecosystem balance and spatial Dimension in Biogeography

**UNIT-II: PLANT GEOGRAPHY**

Plant geography: development and scope; Evolution of plants, Classification of plants: taxonomic, ecological and climatic. Raunkiaer's and Grime's classification; Distribution of plants: climatic and edaphic factors, Major biomes (forests, grasslands, deserts and marine); Human impact on plants.

**UNIT-III: ZOOGEOGRAPHY**

Zoogeography: scope and development; Evolution of animals; Taxonomic classification of animals; Zoo-geographical regions of the world; Dispersal of mammals, birds, reptiles, fishes; Human impact on animals and their habitats

**UNIT-IV: CONSERVATION BIOGEOGRAPHY**

Conservation Biogeography: scope and significance; Mega-extinctions and Climate Change; Ecological hotspots; Global biodiversity: distribution and extinction; Conservation of species, ecosystem and biosphere; Global efforts for the conservation of species, Agro forestry and Reforestry international and National efforts for conserving Biological Resources, Biosphere Reserves, Tropical Forest Action Plan

**Books Recommend:**

1. Cox, C. B., R. Ladle, and P. D. Moore. 2016. *Biogeography: An Ecological and Evolutionary Approach*. John Wiley & Sons.
2. Darlington, P. J. 1957. *Zoogeography: the Geographical Distribution of Animals*, John Wiley and Sons, New York
3. Darwin, C. 1859. *The Origin of Species*. P. F. Collier & Son
4. Flannery, T. 2015. *The Eternal Frontier: An Ecological History of North America and Its Peoples*. Grove/Atlantic, Inc.
5. Gavin, D. G. 2012. *Biogeography* in J. P. Stoltman, editor. *21st Century Geography: A Reference Handbook*. SAGE Publications, Thousand Oaks, CA.
6. Hugget, R. J. 2005. *Fundamentals of Biogeography*, 2<sup>nd</sup> Edition, Routledge, London.

7. Jackson, S. T. 2004. Quaternary biogeography: Linking biotic responses to environmental variability across timescales in M. V. Lomolino and L. R. Heaney, editors. *Frontiers of Biogeography: New Directions in the Geography of Nature*. Sinauer, Sunderland, MA.
8. Lomolino, M. V., B. R. Riddle, J. H. Brown, and R. J. Whittaker. 2010. *Biogeography*. Fourth Edition. Sinauer Associates, Sunderland, MA.
9. MacDonald, G. M. 2003. *Biogeography: Space, Time and Life*. Wiley, New York.
10. Mathur, H. S. 2003. *Essentials of Biogeography*, Pointer Publishers, Jaipur
11. McCarthy, D. 2011. *Here Be Dragons: How the study of animal and plant distributions revolutionized our views of life and Earth*. OUP Oxford.
12. Molles, M. C. 1999. *Ecology: Concepts and Applications*. WCB/McGraw-Hill.
13. Pears, N. 1977. *Basic Biogeography*, Longman Group, London
14. Perry, D. A., R. Oren, and S. C. Hart. 2013. *Forest Ecosystems*. JHU Press.
15. Pielou, E. C. 1974. *Population and Community Ecology: Principles and Methods*. Gordon and Breach.
16. Robinson, H. 1972. *Biogeography*, MacDonald and Evans, London
17. Seddon, B. A. 1971. *Introduction to Biogeography*, Gerald Duckworth and Co., London
18. Tivy, J. 1993. *Biogeography: A Study of Plants in the Ecosphere*, Longman, London

**SEMESTER - II**  
**Geoinformatics & Application**  
**Paper -VIII (GGM - 203)**  
**Credits: 4 (CC)**

**UNIT I**

Fundamentals of Remote sensing; - Physics of Remote Sensing; Electro Magnetic Spectrum (EMS); EMR and its interaction with atmosphere and earth surface features.; Sensors types: active and passive: Digital Image Processing-Digital data formats; Image Restoration: geometric radiometric corrections and filtering. Image Enhancement: Band combinations; Image Classifications: supervised and unsupervised. GIS; Data Models; spatial data analysis; GPS; Fundamentals of GPS; Understanding of Maps; Scale; Projection

**UNIT II**

Factors influencing soil reflectance properties, Spectral signatures, soil moisture assessment, Soil Erosion Assessment Models, Soil conservation. Spectral properties of crops, crop canopy, crop acreage estimation, vegetation indices, crop condition assessment, Yield Modelling.

**UNIT III**

Concept of Urbanization and Environment, Challenges and recent trends, Land use land cover mapping and classification system, Urban Sprawl, slums and squatter settlements, Suitability analysis for urban development.

**UNIT IV**

Mapping and monitoring of catchment and command areas, Watershed: delineation, morphometric analysis, watershed development planning, wetland mapping, and mapping of drought prone areas. Application of Geoinformatics in Hazards, risks and vulnerability analysis related to global warming, floods and droughts, and weather variations, ecosystems changes, and snow/glaciers melting, energy studies, health and diseases studies.

**Suggested Readings:**

1. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey
2. Lillesand Thomas M. & Kiefer Ralph: Remote Sensing Image Interpretation John Wiley and Sons, New York
3. A. K. Singh (2007). Geoinformatics Applications in Agriculture.
4. Gonzalez Rafael C and Woods Richard E.: Digital Image Processing Addison Wesley, New York
5. Applications of remote sensing in agriculture (1990) edited by M.D. Steven, J.A. Clark, Publisher – Butterworth, London.

6. Ustin, S. (2001). Manual of Remote Sensing, Volume 4, Remote Sensing for Natural Resource Management and Environmental Monitoring, 3rd Edition, Willey Publishing

**SEMESTER - II**  
**GIS & Application**  
**Practical - III (GGM - 204)**  
**Credits: 2 (CC)**

**UNIT I: Concepts of GIS**

Components of GIS; Coordinate Systems: Geographical Coordinate Systems, Projected Coordinate System; Data import and export.

**UNIT II: Data Models**

Types of data: spatial and non-spatial; Data formats: Raster and Vector data; Attribute and spatial data query.

**UNIT III: Spatial Analysis**

Spatial analysis: overlay and proximity; Digital elevation model (DEM); Slope and Aspect; Spatial interpolation: kriging and IDW

**UNIT IV: Applications**

Land use/ land cover; change detection; habitat suitability; flood inundation; watershed delineation.

**Suggested Readings:**

1. Ian Heywood. An Introduction to Geographical Information Systems
2. Aronoff, S. Geographic Information Systems: A Management Perspective
3. Elangovan, K. GIS - Fundamentals, Applications and Implementations
4. Chang, Kang-Tsung Introduction to Geographical Information Systems
5. Bhatta, B. Remote Sensing and GIS
6. Maguire, David J. Geographical Information Systems.
7. Sharma, H.S Mathematical Modeling in Geographical Information System Global Positioning System and Digital Cartography

**SEMESTER - II**  
**Land Surveying and GPS**  
**Practical - IV (GGM - 205)**  
**Credits: 4 (CC)**

**UNIT I**

Surveying: Definition, Principles, Methods, Classification; Plane Table survey, Geodetic Surveys. Basic Principles of Total Station, Historical Development, Classifications, applications of total station and comparison with conventional surveying. Overview of Global Positioning System

**UNIT II**

Land surveying using Plate Table Historical perspective and development, GPS: Receivers, Satellite Constellations, Different segments: space, control and user segments, Antennas, satellite configuration, GPS signal structure, Orbit determination and representation, Anti Spoofing and Selective Availability, Task of control segment - GPS receivers and Errors.

**UNIT III**

DGPS: differential corrections, accuracy in DGPS; GNSS: different GNSS, GNSS Augmentation; RNSS - IRNSS, WAAS, EGNOS, MSAS, QZSS, SNAS, SDCM and WAGE; advantages and disadvantages. Total Station: Methods of Measuring Distance Geopositioning- Basic Concepts, NAVSTAR, GLONASS, Indian Regional Navigational Satellite System (IRNSS), Collection of Ground Control Points (GCP), Way Points, and transformation of GNSS/GPS data into GIS; Ground Truth Verification of GIS data; Precision, Factors Affecting GPS Accuracy, Vertical and Horizontal Accuracy, Mobile Mapping basic concepts and Applications, GPS Application in Surveying and Mapping.

**Suggested Readings:**

1. Hussain, S.K. and Nagaraj, M.S. 1992 :Text Book of Surveying, S. Chand & Co. Ltd.,
2. New Delhi:Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th edition, 1996
3. Satheesh Gopi, rasathishkumar, N.madhu, “ Advanced Surveying , Total Station GPS and Remote Sensing “ Pearson education , 2007 isbn: 978-81317 00679

4. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.
5. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
6. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
7. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998

**SEMESTER - II**  
**World Regional Geography**  
**Paper - IX (GGM - 206)**  
**Credits: 4 (CC)**

**Unit – 1 Eurasia**

Physiography; Drainage; Issues and Challenges: Water availability and Disputes; Human Development and Food Security; Foreign Intervention and Terrorism; Population Issues: Population Structure and Composition

**Unit – 2: Americas**

Physiography: Drainage; Issues and Challenges: Resource Development; International Trade; Antisocial Activities; Terrorism; Population Issues: Ethnicities and Cultural Conflicts;

**Unit – 3: Africa**

Physiography: Drainage; Population Issues: Population Structure and Distribution; Issues and Challenges: Food Insecurity and Malnutrition; Diseases (AIDS); Antisocial Activities: Racism; Unemployment and Youth; Land Grabbing.

**Unit – 4: Oceania**

Physiography: Drainage; Population Structure and Composition; Level of Economic Development; Impact of Climate Change.

**Suggested Readings:**

1. Majid Husain., 2004., World Geography., Rawat Publications., Jaipur., India.
2. Qazi S.A., NavaidShabirQazi., 2007., Geography of the World., APH Publishing Corporation., New Delhi., India.
3. Prajapathi R.V., 2008., Encyclopedia of World Geography., Cybertech Publications., New Delhi., India.
4. Josepg H. Hobbs. (2009) World Regional Geography. Brooks/Cole Cengage Learning. Canada.
5. Lydia Mihelic Pulsipher & Alex Pulsipher (2018): World Regional Geography. W H Freeman & Co; 7 edition.
6. Johnson D et. Al (2011): World Regional Geography. Prentice Hall India Learning Private Limited; 10 edition.
7. Edward Heawood (2018): Geography of Africa. Forgotten Books.
8. De Blij HJ (2013): Geography Relas Regions and Concepts, John Wiley and Sons. 16<sup>th</sup> Edition.

**SEMESTER - II**  
**Research Methodology**  
**Paper – X (GGM - 207)**  
**Credits: 4 (CC)**

UNIT-I

Introduction and Approaches to Research, Stages of Research and Research Accuracy  
Considerations in selecting Research Problems: Availability of Data, Ethical Issues,  
plagiarism

UNIT-II

Problem Identification and Hypothesis building and testing method ; Issues in Research -  
The perspective behind the research, The role of theory, Abstract writing and Title selection,  
Referencing, Pre-structured versus unfolding, qualitative versus quantitative ; Adaptation of  
Proper methodology: Research Design - Strategy, Framework, Sample design

UNIT – III

Hypothesis, meaning, characteristic importance and formulation, testing of Hypothesis –  
parametric (Standard) and non-parametric, Review of literature, Bibliography and case study

UNIT – IV

Application of Remote Sensing and GIS in Research, Arrangements and Analysis of Data  
and map, Quantitative and qualitative interpretations, Writing a Research Proposal Guidelines  
for doing a Survey Writing of Research report/ paper and dissertation, Framing of Pilot and  
Research project;, Questionnaire preparation - Land use (Rural and Urban), Traffic and  
Market, Socio-economic aspects: Sources of information, Integrating different data sets,

**SEMESTER - III**  
**Fluvial Geomorphology**  
**Paper – XI (GGM - 301)**  
**Credits: 4 (CC)**

**Unit I: Concepts**

Concept of grade: graded profile, dynamic equilibrium, Denudation and Morpho chronology, Cyclic and non-Cyclic Concepts of Erosion, Time scale in Fluvial process, Drainage basin as geomorphic unit; Evolution of Drainage System; Properties of Drainage Basins, Fluvial Cycle.

**Unit II: Processes**

Drainage Basin morphology: drainage networks, runoff processes; Morphometric analysis of Drainage basin, Mechanics of fluvial erosion: overland flow, through flow and groundwater flow. Hydraulic geometry: at a station, downstream; stream energy, Sediment transport: suspended and bed load. Models of sediment transport

**Unit III: Channel Morphology and Landforms**

Channel pattern, channel types, concept of grade; Fluvial erosion and deposition; Landforms of fluvial Processes: Valleys: Process of evolution and types, Waterfalls, Rapids, Alluvial fans, River terraces, meanders, Ox bow lake, flood plains, Delta, Types of deltas.

**Unit IV: Major Issues**

River channel management, Soil erosion and its management, Fluvial Hazards: major types, causes, consequences, viability and management, Future of fluvial systems with climate change.

**Recommended Books**

1. Hart, M. G. (1986): Geomorphology, Pure and Applied, George Allen and Unwin, London.
2. Chouly, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London
3. Hails, J. R. (1977): Applied Geomorphology, Elsevier, Amsterdam.
4. Leopold, L. B., Wolman, M. G. and Miller, J. P. (1964): Fluvial Processes in Geomorphology, W. H. Freeman, San Francisco.
5. Schumm, S. A. (1977): Fluvial Systems, Wiley, New York
6. Kale, V. S. and Gupta, A. (2010): Introduction to Geomorphology, Universities Press, Hyderabad.
7. Fryirs, K. A. and Brierley, G. J. (2013): Geomorphologic Analysis of River Systems, Wiley-Blackwell, Chichester
8. Downs P. W. and Gregory K. J. (2004): River Channel Management, Arnold, London

9. Charlton, R. (2008): Fundamentals of Fluvial Geomorphology, Routledge, Oxon
10. Robert, A. (2003): River Processes- An Introduction to Fluvial Dynamics, Arnold, London

**SEMESTER - III**  
**Coastal Geomorphology**  
**Paper - XII (GGM - 302)**  
**Credits: 4 (CC)**

**Unit I: Introduction**

Definition and Classification of Coast; Evolution of Coast; Coastline; Coastal Zones: Shoreline and Hinterland. ; Models of coastal geomorphology

**Unit II: Coastal System**

Coastal rocks and sediments; Coastal systems and energy: waves, tides and currents, swells, breakers and surfs, storm surges and Tsunami; Sea-level changes, shoreline change.

**Unit III: Landforms**

Coastal processes and landforms: Processes of Weathering, Erosion and Transportation in Coastal Areas; Erosional and Depositional Landforms; Coastal wetlands: mangrove swamps and salt marshes; Beaches and spits, coastal dunes

**Unit IV: Applied**

Coastal Environment and Vulnerability; Human Impact on Coastal Environment; Coastal Hazards: Coastal Erosion, Coastal Sand Dune Encroachment and Saltwater Intrusion.; Climate change and coastal hazards; Application of remote sensing and GIS in coastal zone management

Mechanism of Sea level Changes- Transgression, Regression, Relative and Eustatic

**Books Recommended:**

1. Hart, M. G. (1986): Geomorphology, Pure and Applied, George Allen and Unwin, London
2. Chouly, R. J., Schumm, S. A. and Sugden, D. E. (1984): Geomorphology, Methuen, London
3. Hails, J. R. (1977): Applied Geomorphology, Elsevier, Amsterdam
4. Bird, E. C. (2000): Coastal Geomorphology: An Introduction, John Wiley and Sons.
5. Bloom, A. L. (2002): Geomorphology: A Systematic Analysis of Late Cenozoic, Landforms, Prentice-Hall of India, New Delhi
6. Goudie, A. S. (Eds.) (2004): Encyclopedia of Geomorphology, Routledge, London.

7. Ivan, V. (2006): Global Coastal Change, Blackwell publishing, Oxford.
8. King, C. A. M. (1972): Beaches and Coasts, Edward Arnold, London.
9. Pethick, J. (1984): An Introduction to Coastal Geomorphology, Arnold-Heinemann, London.

**SEMESTER - III**  
**Tropical Geomorphology**  
**Paper - XIII (GGM - 303)**  
**Credits: 4 (CC)**

**Unit I: Introduction**

Climatic Geomorphology and morphogenetic regions; Geological Framework of the Tropical Lands; Tropical Climate, Temperature, Winds, Tropical disturbances and water balance.

**Unit II: Processes**

Erosion and Land Cover in the Tropics; Tropical Hydrology; Process Geomorphology in the Tropics: Weathering, Slopes; Tropical Highlands, Hill slopes, pediments and gullies, Duricrusts and types.

**Unit III: Landforms**

Rivers in tropics: discharge, sediment load and landforms; Landforms in Arid tropical regions; Aeolian geomorphology in tropics; Distribution and Tropical coasts and Deltas; Karst landforms in tropics.

**Unit IV: Major Issues**

Quaternary climate changes and landforms in tropics, Anthropogenic alteration of geomorphic processes in Tropics, Anthropogenic Alteration of Geomorphic Processes in the Tropics; Urban Geomorphology in the Tropics; Future with Climate Change.

**Books Recommended:**

1. Garner, H.F. 1974. The Origin of Landscape: A Synthesis of Geomorphology. Oxford Univ. Press, New York.
2. Jhon, R. Hails. 1977. Applied Geomorphology, Elsevier.
3. Strahler, A.H., 2013(6th edition). Introducing Physical Geography. Wiley Publications.
4. Thornbury, W.D., 1991. Principles of Geomorphology, Wiley Eastern Ltd., New Delhi.
5. Worcester, P.C. 1969. Text Book of Geomorphology. East West Press, New Delhi.
6. Faniran, A. and Jeje, L. K. (1983): Humid Tropical Geomorphology, Longman, London
7. Thomas, M. F. (1994): Geomorphology in the Tropics: A study of Weathering and Denudation in Low Latitudes, John Wiley and Sons.
8. Gupta, A. (2011): Tropical Geomorphology, Cambridge University Press, London
9. Budel, J. (1982): Climatic Geomorphology, Princeton University Press, Princeton

10. Goudie, A. (1985): Duricrusts in Tropical and Sub Tropical Landscapes, Alien Unwin, Australia.

**SEMESTER - III**  
**Regional Development**  
**Paper – XIII (GGM-303)**  
**Credits: 4 (CC)**

**UNIT - I: BASIC CONCEPTS**

Region: Concepts and types; Formal and functional; Delineation of region. Development and Planning: Concepts, need and scope; Types of planning.

**UNIT - II: FRAME WORK OF DEVELOPMENT AND PLANNING**

Regional development: concepts, levels, and indicators; Regional Planning: concepts and scope; Levels of planning: local, regional, national and multi-level; Master Plans; Environmental issues in regional planning; Planning for sustainable development.

**UNIT - III: THEORIES AND MODELS**

Theories and models of the regional development: Hirschman's model; Growth centers and Growth pole theory of Perroux, Rostow's model; Gunnar Myrdal model.

**UNIT - IV: PLANNING AND REGION**

Five Year Plans; Command Area Development, planning for backward areas, Integrated Watershed Management Programme; Hill and Tribal Area Development; Decentralized Planning and Panchayati Raj; Regional Economic Imbalances and inequalities in India; SEZs in regional development.

**BOOKS RECOMMENDED:**

1. Mishra. R. P. (1992). Regional planning: concepts, techniques, policies and case studies.
2. Bhat. L. S. (1972) Regional planning in India.
3. Chaudhary. J.R. (2001) Introduction to Development and Regional Planning: With Special
4. Reference to India.
5. Mishra. J. Sinha. C. (1985) Planning and regional development in India.
6. Prasad B.K. (2005) India's development agenda: issues, challenges and policies.

7. Nath V. Aggarwal S.K. (2009) (Edited), Regional Development and Planning in India selected
8. Essays Concept Publishing Company.
9. Compton Paul A. Pecsí Marton. (1976). Regional Development and planning, Akademiai
10. Kiado Publishers.
11. Chand. M. Puri V.K. (1983) Regional planning in India.
12. Aziz. A. Krishna. S. Regional development: problems and policy measures.
13. Mishra. S. Pal. C. (2000) Decentralized planning and Panchayati Raj institutions.
14. Thakur. B. (2005) Urban and regional development in India.

**SEMESTER - III**  
**Environmental Management**  
**Paper - XVII (GGM - 306)**  
**Credits: 4 (CC)**

**Unit - I: Conceptual Framework**

Environmental Management: Concept and Techniques; Environment as life- support system; Human impact on land, climate, natural vegetation and non-renewable natural resources; Environmentalism.

**Unit - II: Environmental Issues**

Environmental issues: Analysis and Prediction; Environmental Degradation; Climate Change; Loss of Habitat and Biodiversity; Air Pollution; Land and Water Pollution; Human Health and Diseases.

**Unit - III: Planning and Strategies**

Methods of Environmental Planning: Survey, evaluation, preservation and conservation of resources; Environmental impact Assessment; Cost benefit Analysis, Environmental Inventorisation and Audit, Integrated management, and community participation in management.

**Unit - IV: Environmental Management**

Management of air and water resources; Management of soil and forest resources; Management of biodiversity; Management of habitats; population management; Management of disaster, and adaptation to climate change.

**Suggested Readings:**

1. Adams, W.M.1995: Green development: Environmental sustainability in the Third World, London: Rout ledge.
2. Alexander, D. 1993: Natural Disasters, New Delhi: Research Press.
3. Allaby, M. 1996: Basics of Environmental science, London: Routledge.
4. Baarshes, W.H. 1996: Eco-fiction: Understanding the Environmental Debate, London: Routledge.
5. Brayant, E.A.1991: Natural Hazards, Cambridge: Cambridge University press.

6. Canter, L. W. 1996: Environmental Impact Assessment, 2nd edition, New York: McGraw Hill.
7. Chapman, D. 1994: Natural Hazards, Melbourne: Oxford University Press.
8. Chapman J.L. and Reiss, M.J. 1993: Ecology: Principles and applications, Cambridge: Cambridge University Press.
9. Colls, J. 1997: Air Pollution: An Introduction, London: Chapman and Hall.

**SEMESTER - IV**  
**Watershed Management**  
**Paper - XVIII (GGM-401)**  
**Credits: 4 (CB)**

**Unit - I: Introduction and Basic Concepts**

Watershed: Concept and Components; Watershed Management; Stages and Practices; Delineation and Codification of watershed; Benchmark Survey for Watershed Management; Watershed Modelling.

**Unit - II: Morphometric Analysis**

Watershed hydrology and surface runoff; Conventional methods: Smith, Wentworth and Robinson; Linear parameters of watershed; Aerial parameters of watershed; Relief parameters of watershed; Land use/ land cover Analysis.

**Unit - III: Management of Natural Resources**

Watershed prioritization: Soil Erosion Modelling: USLE, RUSLE; Sediment Yield Index; Soil information system; ground water recharge; Wetland Management; Forest Management.

**Unit - IV: Integrated Watershed Management**

Integrated watershed management: Concept and Relevance; Participation of local community and stakeholders; Role of IWM in local and regional planning.

**Suggested Books:**

1. K. N. Brooks, P. F. Folliott & J. A. Magner: Hydrology and the Management of Watersheds, Fourth Edition. John Wiley & Sons, Inc., Publication.
2. J. V. S. Murty: Watershed Management, Second Edition. New Age International (P) Limited.
3. I.W. Heathcote: Integrated Watershed Management: Principles and Practices, Second Edition. John Wiley & Sons, Inc., Publication.

4. T. O. Randhir: Watershed Management: Issues and Approaches, Latest Edition. IWA Publication
5. R. S. Kurothe, G. Kumar & A. K. Vishwakarma: Watershed Management: An Encyclopedia, Latest Edition. Biotech Books
6. S. Menon & P. A. Pillai: Watershed Management: Concepts and Experiences, Latest Edition. SBS Publishers
7. R. John: Watershed Management, Latest Edition. Alfa Publications.
8. L. Rattan: Integrated Watershed Management in The Global Ecosystem, Latest Edition. CRC PRESS
9. R. Patel: Watershed Management Planning Using Remote Sensing and GIS, Latest Edition. LAP
10. Lambert Academic Publishing
11. IWMP: Department of Land Resources, Ministry of Rural Development, Government of India, NewDelhi. ([http://dolr.nic.in/iwmp\\_main.htm](http://dolr.nic.in/iwmp_main.htm))

#### **SEMESTER - IV**

### **Political Geography Paper - XVIII (GGM-401) Credits: 4 (CB)**

#### **UNIT - I: Development and Approaches**

Political Geography: Nature, Scope and Significance; Recent Development in Political Geography; Approaches to Study of Political Geography: Whittlesey's Law-Landscape Approach, Hartshorne's Functional Approach, Jone's Unified Field Theory: Idea-area Chain, Political Systems Model, Wallerstein's World-Systems Approach

#### **UNIT - II: Concepts and Theories**

Concepts of Power, Aggression, Conflicts and Cooperation; Geopolitics and Geostrategy; Heartland Theory of Mackinder, Rimland Theory of Spyman & Sea Power Theory by Mahan

#### **UNIT - III: State and Governance**

State, Nation, Nation-state and Nation-building; Physical, Human, and Economic Elements; Frontiers and Boundaries; Colonialism, Neo-colonialism; Neoliberalism; The Political Geography of the Sea

#### **UNIT - IV: Geopolitical Issues**

Geopolitical Significance of Indian Ocean; Political Geography South Asia, Environment and Politics, Politics of Resources; Globalization and World Systems; Emergence of Multipolar World.

### **Books Recommended:**

1. Alexander, L.M. (1963). World Political Patterns. Ran McNally, Chicago.
2. Colin Flint and, Peter J. Taylor, 2018. Political Geography: World-Economy, Nation-State and Locality, 7th Edition, Routledge, London.
3. Cox, K. R. 2002. Political Geography: Territory, State, and Society, Blackwell Publishers, Oxford, UK
4. Cox, K. R., Low, M., Robinson, J. 2008. The SAGE Handbook of Political Geography, Sage Publications, London
5. D Blij, H. J. and Glassner, M. (1968) Systematic Political Geography, John Wiley, New York.
6. Deshpandey, C.D. (1992) India –a Regional Interpretation, Northern Book Centre, New Delhi.
7. Dikshit R.D. (1996) Political Geography; A Contemporary Perspective, Tata McGraw Hill, New Delhi.
8. East, W. G., Prescott J. R. V. 1975. Our Fragmented World: An Introduction to Political Geography, The Macmillan Press Ltd., London.
9. Fisher, C. A. (1968), Essays in Political Geography, Methuen, London.
10. Gallaher, C., Carl T. Dahlman, Mary Gilmartin and Alison Mountz, With Peter Shirlow, 2009. Key Concepts in Political Geography, Sage, Los Angeles
11. Husain, Majid (1994); Political Geography; Anmol, New Delhi. 13) Adhikari, S (2010); Political Geography; Rawat, New Delhi
12. John Agnew, Virginie Mamadouh, Anna J. Secor, and Joanne Sharp, (Eds), 2015. The Wiley
13. Blackwell Companion to Political Geography, Wiley Blackwell, West Sussex, UK
14. Martin Jones, Rhys Jones, Michael Woods (2004) An Introduction to Political Geography: Space, Place and Politics, Routledge
15. Panikkar, K.M. (1959) Geographical Factors in Indian History; II Volumes – Asia Publishing House, Bombay.
16. Pounds, N.J.G. (1972), Political Geography Tata McGraw Hill, New York.
17. Richard Muir, 1997. Political Geography: A New Introduction, Macmillan Press Ltd, London
18. Short, J.R. (1982), An Introduction to Political Geography, Routledge, London.
19. Taylor, P. (1985) Political Geography, Longman, London. 30
20. William B. Wood, George J. Demko (1999) Reordering the World: Geopolitical Perspectives on the Twenty-First Century: Westview Press.

**SEMESTER - IV**  
**Sustainable Development**  
**Paper – XIX (GGM - 402)**  
**Credits: 4 (CC)**

**UNIT – I**

Sustainable Development: Concepts and Applicability; Indices and Factors of Sustainable Development, Environmental Sustainability; Economic Sustainability; Intra-generational Equity.

**UNIT – II**

Resource Issues and Sustainable Development; Approaches to Study the Sustainable Development, Natural Resources Utilization, Pattern of Industrialization and Harness Technology.

**UNIT – III**

Sustainability of Water Resources, Sustainable Management of Forests, Ecosystem Management; Coastal Environments, Sustainable agriculture and food security; Environmental education for sustainable development,

**UNIT – IV**

Environmental Sustainability and Environmental Ethics; Role of technology in Sustainable Development; Resource Conservation and Development; Awareness and Education; Government Policies and Programmes; Population Control.

**Suggested Reading:**

1. Blewett, J. (ed.) (2008): Understanding Sustainable Development, Routledge
2. Brundtland Commission (1987): Our Common Future, Oxford University Press
3. Chambers, N., Craig, S. and Wackernagel M. (2004): Sharing Nature's Interest, Earthscan Publications Ltd., London
4. Dalal-Clayton, B. and Bass, S. (2002): Sustainable Development Strategies: A Resource Book, Routledge
5. Dressner, S. (2002): The Principles of Sustainability, Earthscan Publications Ltd., London

6. Elliott, L. (2004): Global Politics of the Environment, Palgrave MacMillan, New York
7. Hulse, J.H. (2007): Sustainable Development at Risk: Ignoring the Past, Foundation Books
8. Knight, B., Chigudu, H. and Tandon R. (2002): Reviving Democracy: Citizens at the Heart of Governance, Earthscan Publications
9. Mollinga, P., Dixit, A. and Athukorala K. (ed) (2006): Integrated Water Resources Management, Sage, New Delhi
10. Rogers P. (2007): An Introduction to Sustainable Development, Earthscan Publications
11. Sachs, J. (2015): The Age of Sustainable Development, Columbia University Press

**SEMESTER - IV**  
**DIP Training**  
**Practical -V (GGM - 405)**  
**Credits: 4 (CC)**

**UNIT I**

Overview of DIP and its advantage and disadvantages, key stages of DIA, Resolutions: radiometric, spectral and temporal; Digital images and its types;

**UNIT II**

Digital images; Layer stacking, Subsetting and Band Compositions; Image enhancement techniques: Histogram equalization; Image filtering

**UNIT III**

Image classification: Unsupervised classification; Training sets and supervised classification using Maximum likelihood methods;

**UNIT IV**

Accuracy assessment: User, Producer, Overall accuracies; K-Statistics.

**Suggested Readings:**

1. Gonzalez Rafael C and Woods Richard E.: Digital Image Processing Addison Wesley, New York
2. Pratt William K.: Digital Image Processing, John Wiley and Sons, New York
3. Jain Anil K. Fundamentals of Digital Image Processing, Prentice Hall, New Jersey:
4. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey.
5. Richards John A& Xiuping Xia, 2006. Remote Sensing Digital Image Analysis: An Introduction. Birkhäuser.

