

## SEMESTER -I

### Paper -1.1.1

#### ADVANCED GEOMORPHOLOGY

##### Unit I Recent developments in Geomorphology-conceptual & contextual:

1. Nature & Scope of Geomorphology
2. Fundamental concepts in geomorphology
3. Concepts of Uniformitarianism and Threshold in Geomorphology
4. Multicyclic landforms

##### Unit II

1. Forces of crustal instability: Isostasy, Plate tectonics, seismicity and vulcanicity
2. Concepts of gradation: Types and classification of weathering, mass wasting, Cycle of erosion Davis and Penck
3. Erosional and depositional landforms produced by running water, glacier, wind, Waves, Underground water.

##### Unit III Applied Geomorphology:

1. Natural Hazards due to geomorphic activities: Earthquake, Volcanic eruption, Landslides, Rock slides, Rock fall, fluvial hazard,
2. Role of Geomorphology in Hazard management.
3. Morphometric Analysis: Its geographical significance, Fluvial Morphometry : Linear Aspects, Areal Aspects, Relief Morphometry: Hypsometric analysis, Altimetric analysis, Slope Analysis, Profile Analysis

##### References :

1. Chorley, R. J. *Spatial Analysis in Geomorphology, Methuen, London.*
2. Dury, G. H., *The Face of the Earth, Penguin,*
3. Fairbridge, R. W., *Encyclopedia of Geomorphology, Reinhiltds, New York*
4. Gamen, H.F. *The Origin of Landscapes-A Synthesis in Geomorphology, Oxfun, 1974*
5. Pity A.F., *Introduction to Geomorphology, Methuen, London, 1971*
6. Skiman, B.J. and Porter, S.C. *The Dynamic Earth, John Willey, New York, 1995*
7. Spark, B.W. *Geomorphology - Longman, London, 1950*
8. Sharma, H.S., *Perspective in Geomorphology- Concept, New Delhi, 1980.*
9. Singh, Savinder *Geomorphology, Prayag Publication, Allahabad, 1998.*
10. Thornbury, W. *Principles of Geomorphology, John Willey, New York, 1960.*

### Paper -1.1.2

#### ADVANCED CLIMATOLOGY AND HYDROLOGY

##### Unit I : Recent developments in Climatology:

Factors affecting Insolation, Heat Budget of the earth, Green house effects (Global Warming), Forces contributing to motions of air, General circulation of the

atmosphere, Jet streams and Southern oscillation relevance of influence in World pattern of precipitation, Concepts of air mass, cyclones & fronts.

**Unit II:**

Mechanism of monsoon: Variability, Forecasting; Classification of Climate: Koppen and Thornthwaite, Climate Change & its implications; Synoptic Climatology: Collection, Generation and Interpretation of climatic information.

**Unit III**

Hydrology: Hydrological cycle and determinant factors, Water balance, Floods and drought: Disaster magnitude, frequency and management, Hydrological effects of changes in climate, ground water depression, water quality parameters

**References:**

1. Barry and Chorley- Atmosphere weather and climate, Routledge, London, 1988
2. Critchfield, J.H.- General climatology, Prentice Hall, India, New Delhi, 1993
3. Das P.K., Monsoon, N.B.T., New Delhi, 1987
4. Lal, D.S.- Climatology, Chaitanya Publication, Allahabad, 1986
5. Menon, P.A., Our Weather, N.B.T., New Delhi, 1989
6. Trewartha, An introduction to world climate
7. King C.A.M., Oceanography for geographers
8. Sharma, R.C. and M. Vatal, The Ocean, Rajesh, New Delhi, 1985
9. Jones Global Hydrology: Processes.
10. Lal, D.S. Climatology and Oceanography, Sharda Pustak Bhawan, Allahabad

**Paper -1.1.3**

**REGIONAL GEOGRAPHY OF INDIA WITH SPECIAL REFERENCE TO ODISHA**

**UNIT-I: PHYSICAL ASPECTS:**

Physiographic and Relief

Drainage: the river system and their evolution

Climate: Mechanism of Indian monsoon, Climatic regions

Major soil types and Natural Vegetation

**UNIT-II: ECONOMIC ASPECTS**

Indian Agriculture: Problems and Prospects

Irrigation: Sources of Irrigation, Multipurpose river valley projects

Land use pattern, Agricultural efficiency and productivity

Cropping pattern – Crop combination and Diversification

Factors of Location of Industries, Mineral based industries: Iron and steel, Aluminum, Agro

based industries (Sugar, Textiles)

### **UNIT-III: SOCIAL AND CULTURAL ASPECTS**

Demographic Characteristics: Population composition, Growth, Distribution, Literacy and Sex ratio

Urbanization –Determinants, Trend, Spatial pattern, Salient features, Major issues in urbanization

Poverty and Regional Disparities: Regional and Rural Development Planning during five year plans –Decentralized Planning.

#### **Suggested Readings**

1. Deshpande, C D: India – A Regional Interpretation, Northern Book Depot, New Delhi, 1992.
2. Singh, Gopal : Geography of India, Atma Ram and Sons, 2006.
3. Shafi, M : Geography of South Asia, McMillan and Company, Calcutta, 2000.
4. Singh, R L (ed) : India : A Regional Geography, National Geographical Society, India, Varanasi, 1971.
5. Spate, D H K and ATA Learmonth : Indian and Pakistan – Land, People and Economy, Methnen and Company, London, 1967.

### **Paper -1.1.4**

### **QUANTITATIVE METHODS IN GEOGRAPHY –I**

#### **UNIT-I: Sources of Data and its Method of Collection**

Significances of statistics in geographical Analysis; Sources and Types of Data; Secondary Data- Census, National Sample Survey (NSS), Central Statistical Organisation (CSO);

Data matrix;

Primary Data: Basic concepts of sampling, Types of Sampling, sampling distributions and standard error.

Theoretical Probability Distribution: Binomial, Poisson and Normal Distributions.

#### **UNIT-II: Measures of Concentration, Dispersion and Inequality**

Measures of Central Tendency-Mean, Median and Mode.

Measures of Dispersion-Mean Deviation, Standard Deviation and Quartile deviation.

Measures of Relative Variability-Co-efficient of Variation

Measures of Inequality: Gini coefficient and Lorenz Curve

#### **UNIT-III: Measures of Association**

Correlation: Scatter Diagram and Concept of empirical Analysis, Karl Pearson's Product Moment Correlation coefficient, Spearman's Rank Correlation, Test of significance of coefficient of correlation.

Regression Analysis: Univariate and multivariate Regression Analysis; Regression coefficient and coefficient of determination,

#### **Reading List**

1. Bhagwathi, V. and Pillai, R.S.N. (2003). *Practical Statistics*. New Delhi: Sultan Chand and

Company.

2. Ebdon, D. (1977). *Statistics in Geography: A Practical Approach*. Massachusetts: Blackwell Publishers Inc.
3. Gregory, S. (1973). *Statistical Methods and the Geographer*, London: Longman.
4. Gupta, S.P. (1998). *Advanced Practical Statistics*, New Delhi: Sultan Chand and Company.
5. Hammond P. and McCullagh P. S., 1978: *Quantitative Techniques in Geography: An Introduction*, Oxford University Press.
6. Ishtiaq, A. (2002). *Statistical Geography: Methods and Applications*, Jaipur : Rawat Publications.
7. Mahmood, A. (1986). *Statistical Methods in Geographical Studies*, New Delhi: Rajesh Publications.
8. King L. S., (1969) *Statistical Analysis in Geography*, Prentice-Hall.

**Paper -1.1.5(Practical)**  
**Cartographic Methods in Physical Geography**

**UNIT –I**

1. Morphometric Analysis
2. Sinusity Index
3. Drainage Density & texture analysis, Stream ordering and Bifurcation ratio
4. Hypsographic Curve
5. Aridity indices

**UNIT –II**

1. Use of statistical techniques like central tendency, measures of dispersion to analyze climatic data related to temperature and rainfall.
2. Representation of climatic features through Climograph, Hythergraph, Ergograph, Isolines to represent various climatic elements.

**UNIT –III**

Interpretation of relief from a toposheet through profile drawing, Slope Analysis and Block diagram (One perspective and two perspective)

**References:**

- Singh, G. (2004). *Map Work and Practical Geography*, Delhi: Vikas Publication House.
- Monkhouse, F.J. & Wilkinson, H.R. (1972). *Maps and Diagrams*, London: Mothuen and Co. Ltd.
- Singh, R.L. & Dutt, P.K. (1968). *Elements of Practical Geography*, Allahabad: Learners Friends.
- Singh, L.R. & Singh, R. (1973). *Map Work and Practical Gleography*, Allahabad: Central Book Depot.
- Alvi, Z. (1995). *Statistical Geography-Methods & Application*, Jaipur: Rawat Publications.
- Misra, R.P. & Ramesh, A. (1986). *Fundamentals of Cartography*, New Delhi: McMillan.
- Singh, R.L. & Singh Rana, P.B. (1992). *Elements of practical Geography*, New Delhi: Kalyani Publisher.
- Robinson, Arthur, H.J., Morrison, P., Muehrke, A., Kimmerling & Guptill, S. (eds.) (1995). *Elements of Cartography*, New York: Wiley.

**SEMESTER-II**  
**Paper -1.2.6**  
**HUMAN ECOLOGY**

**Unit I**

General systems; ecological concepts; geography and human ecology. Ecosystems Concept and Components. Ecosystem, -form & function: trophic level, ecological pyramids, ecological niche, energy and nutrients in the ecosystems, Biogeochemical cycles, food chains & food webs.

**Unit II**

Man-environment relationship & ecological changes with reference to soils, forests and energy resources, urbanization, industrialization & globalization; case studies of ecological changes with reference to Sardar Sarovar Project & National Parks.

**Unit III**

Environmental Legislation and issues: The Stockholm Conference, Environmental Legislation in India: wild life act, forest act, water pollution act & various earth summits (Updated versions).

**References:**

1. Chandana, R.C. : Environmental Awareness, Kalyani Publisher, New Delhi, 1997.
2. Hagget, P. : Geography-A Modern Synthesis, Harper& Row Publication, New York, 1975.
3. Singh, Savindra: Environment Geography, Prayag Publication, Allahabad, 1991.
4. Miller,G.T. :Living in the Environment
5. Odum,E.P. :Fundamentals of Environmental Science, Prentice Hall, NewYork, 1996.
6. Eyne, S.R. and Jones,G.R.J.(eds): Geography of Human Ecology, Edward Arnold, London,
7. Ackerman, E.A., Geography as a Fundamental Research Discipline, University of Chicago Research Papers, 1958.
8. Agarwal, A. and sen, S.:The Citizens Fifth Report. Centre for Science and Environment New Delhi 1999.
9. Bertalanffy, L. General Systems Theory, George Bragiller New York, 1958.
10. Bodkin, E.: Environmental Studeis, Charles E.Merril Pub Co., Columbu, Ohio, 1982.
11. Chandna, R.C.: Environmental awarness, Kalyani Publishers, New Delhi, 1998.
12. Chorley, R.J., Geomorphology and General Systems Theory, U.S.G.S. Professional Paper, 500B, 1962.
13. Eyre, S.R. and Jones, G.R.J. (eds.), Geography as Human Ecology, Edward Arnold, London, 1966.
14. Kormondy, E.J.: Concepts of Ecology, Prentice Hall, 1989.
15. Manners, I.R. and Mikesell, M.W. (eds.), Perspectives on Environment, Commission on College Geography, Publ. No.13, Washington, D.C., 1974.
16. Nobel and Wright: Environmental Science, Prentice Hall, New York 1996.
17. Odum, E.P.: Fundamentals of Ecology, W.B. Saunders, Philadelphia, 1971.
18. Russwurm, L.H. and Sommerville, E.(eds.): Man's Natural Environment- A systems Approach, Duxbury, Massachusetts, 1985.

19. Sharma, H.S.: Ranthambhore Sanctuary-Dilemma of Ecodevelopment, Concept, New Delhi, 2000.
20. Simmons, I.G.: Ecology of Natural Resources, Edward Arnold, London, 1981.
21. Singh, S.: Environmental Geography, Payag Publications, Allahabad, 1991.
22. Smith, R.L: Man and his Environment: An Ecosystem Approach, Harper & Row, London, 1992.
23. U.N.E.P.: Global Environmental Outlook, U.N. Pub, New York, 1998.
24. World Resources Institute: World Resources, (Latest Report) Washington D.C.
25. World Watch Institute: State of the World, Latest Report) Washington, D.C.

### **Paper -1.2.7**

### **Population and Settlement Geography**

#### **Population and Settlement Geography**

##### **Unit-I**

Development of Population Geography as a specialized field of Geography, Nature and Scope of Population Geography, Population Geography and Demography, Sources of population data,

Population Dynamics: fertility and mortality – measures and methods of their Estimation, regional patterns of mortality and fertility in the world.

##### **Unit-II**

The Demographic Transition Theory and its Applicability in the Contemporary World; Migration- Migration Patterns and theories; Population Dynamics in India with special focus on Orissa; Malthus' theory of population and its Critiques, population and environment, population and economic development, Population Policies with special reference to India.

##### **Unit-III**

Settlement: Site, Situation, Types, Size; Spacing and internal morphology of rural and urban settlements; Ecological processes of urban growth, urban fringe, settlement systems; Primate city, the Rank size rule, Settlement hierarchy, Christaller's Central Place theory, August Losch's theory of market centers

#### **References**

1. Alexander, J.W. Economic Geography, Prentice Hall, Engelwood Cliff, 1988.
2. Chandna, R.C. Geography of Population; concept, Determinants and Patterns. Kalyani Publishers, New York 2000.
3. Clarke, John I., Population Geography, Pergamon Press, Oxford 1973.
4. Gosal, G.S. Population Geography, 1984.
5. Crook, Nigel Principles of Population and Development. Pergmon Press, New York, 1997.
6. Davis, Kinsley. (1949) *Human Society*, Macmillan. Co, New York.
7. Garnier, B.J. Geography of Population Longman, London 1970.
8. Guilmo, C.Z and Alian Vagnet. (2000) *Essays on Population and Space in India*, Institut de Pondichery, Pondicherry.

9. Hassan, Mohammad Izhar (2005): Population Geography, Rawat Publications, Jaipur, New Delhi.
10. Mandal, R.B – Introduction to Rural Settlements, 1970
11. Mamdani, Mahmood. (1972) *The Myth of Population Control: Family, Caste and Class in an Indian Village*, Monthly Review Press, New York.
12. Parret, H.R., (1997) *Population Geography*, Oxford and Boyd, Oxford.
13. Preston, Samuel. et al. (2001) *Demography*, Blackwell publishers Inc,
14. Ramachandralu, G and M.Prasada Rao. (2004) *Census 2001 and Human Development in India*, Serials Publication, New Delhi.
15. Rao, Mohan. (2004) *From Population Control to Reproductive Health- the Malthusian Arithmetic*.
16. Srinivasan K. and M.Vlassoff. Population Development Nexus in India: Challenges for the New Millennium. Tata McGraw -Hill, New Delhi 2001.
17. Srinivasan, K. Basic Demographic Techniques and Applications Sage Publications, New Delhi 1998.
18. Sundaram K.V. and Sudesh Nangia, (ed.) Population Geography, Heritage, Publications, Delhi 1986.
19. Woods R. Population Analysis in Geography. Longman, London 1979.
20. Zelinsky Wilbur, A Prologue to Population Geography, Prentice Hall, 1966.
21. Singh, R.L Rural Settlement in Moonsoon Asia, 1972
22. Singh, R.Y Geography of Settlements, 1994
23. Hudson, J.H Geography of Settlement, 1976
24. Doxiadis, C.A. Ekistics – An introduction to science of human settlements, 1968
25. Trewartha, G.T. Geography of Population. New York, 1969.

**Paper -1.2.8**  
**Economic Geography**

**UNIT-I**

- i. Content, scope and recent trends in economic Geography
- ii. Factors of Location of Economic activities: Physical and socio-cultural.
- iii. Concept of Economic Development and sectors of economy

**Unit-II**

- i. Location of Primary Activities – Agricultural Location theory of Von Thunen
- ii. Location of Secondary Activities –Industrial Location, Contribution of Weber and Hoover.
- iii. Location of Tertiary activities – Location of Market/service centres, Contribution of Walter Christaller and August Losch.

**Unit-III**

- i. Agricultural and Industrial Regions of the World,
- ii. Globalization, WTO and Developing Countries.
- iii. International Trade and Major Trading Blocs: EU, SAARC, NAFTA, ASEAN

**References:**

Gautam,A.,(2010) *Advanced Economic Geography*, Sharada Publication,Allhabad  
 Siddhatha,K.,(2011) *Economic Geography :Theories,Patterns& Models*,Kislaya Publishers,  
 New Delhi  
 Roy,P.,(2001) *Economic Geography*  
 Coe, N., Kelly, P., and Yeung, H. (2007) *Economic Geography: A Contemporary Introduction*, London:  
 John Wiley & Sons  
 Leyshon, A., Lee, R., McDowell, L and Sunley, P. (eds) (2011) *The Sage Handbook of Economic  
 Geography*, London: Sage

Polenske, K. (ed) (2007) *The Economic Geography of Innovation*, Cambridge University Press:  
 Cambridge

### 1.2.9

## **SOCIAL GEOGRAPHY**

### **UNIT-I: Introduction:**

Nature and development of social geography, philosophical bases of social geography: Empiricism, Positivism, Radicalism, Humanism, Feminism. Social geography in the realm of social sciences.

### **UNIT-II: Space and Society:**

Understanding society and its structure and process; Geographical bases of social formation; contribution of social geography to social theory; power relations and space.

### **UNIT-III: Socio Issues in India:**

Concept of Social differentiation, Evolution of socio-cultural regions of India; role of caste, ethnicity, religion and languages system; social transformation in India and Unity in Diversity in India.

### **Reading List :**

Ahemd, Aijazuddin (1999) **Social Geography**, Rawat: New Delhi.  
 De Blij. B.d. **Human Geography**. John Wiley and Son, New York.  
 Dreze Jean, Amartya Sen(1996) **Economic Development and Social Opportunity**,  
 Oxford University press, New Delhi.  
 Dubey, S.C(1991) **Indian Society**, National Book Trust, New Delhi, 1991.  
 Gregory, D. and UJ. Larry. (eds.) **Social relations and Spatial Structures**, McMillan,  
 1985  
 Haq, Mahbubul: **Reflection on Human Development**. Oxford University Press.New  
 Delhi  
 Planning Commission, **Government of India**: Report on Development of Tribal  
 areas.1981  
 Rao, M.S.A.: **Urban Sociology in India**. Orient Longman, 1970 .  
 Schwartzberg Joseph: **An Historical Atlas of South Asia**. University of Chicago  
 Press. Chicago, 1978 .  
 Sen, Amartya and Dreze Jean, **Indian Development Selected Regional Perspectives**.  
 Oxford University Press,1996 .



**1.2.10**  
**CARTOGRAPHIC TECHNIQUES IN HUMAN GEOGRAPHY**  
**( Practical )**

**Unit I:** Dot Method, Proportionate Circle and Proportionate Sphere, Lorenz Curve, Rank-Size Rule.

**Unit II:** Isochrones, Nearest Neighbour Analysis, Network Analysis: Alpha Index, Detour Index and Beta Index, Isotims and Iso dapanes

**Unit III:** Socio-Economic Survey

**References :**

1. F.J. Monkhouse and H.R. Wilkinson (1972) Maps and Diagrams, Mothuen and Co. Ltd., London
2. L.R. Singh and Raghuvander Singh (1973), Map Work and Practical Geography, Central Book Depot, Allahabad.
3. R.I. Singh and P.K. Dutt (1968), Elements of Practical Geography, Students Friends, Allahabad.
4. Singh Gopal (2004) 4<sup>th</sup> edition, Map Work and Practical Geography, Viksa Publication House.

**SEMESTER-III**

**2.3.11**  
**HISTORY OF GEOGRAPHICAL THOUGHT**

**Unit I: Concepts in geography**

Geography as social sciences and natural sciences, dualisms in geography: systematic and regional geography, physical and human geography, general & particular. Myth and reality about dualism, concept of region, delimitation of region, geography as the study of areal differentiation and spatial organization,

**Unit II**

General character of geographic knowledge during the ancient & medieval period: foundations of modern Geography: Contribution of French, British, and German & American Indian schools of geography.

**Unit III: Conceptual and methodological development**

Conceptual and methodological development of geography in 20<sup>th</sup> century, changing paradigms: Man & Environment, Determinism & Possibilism, Quantitative Revolution, impact of positivism, humanism, radicalism & behaviourism in geography.

**References:**

1. Dixit, R.D. (1997): *Geographical Thought: A Contextual History of Ideas*, Prentice Hall of India: New Delhi.
2. Dickinson, Robert E. (1978): *The Makers of Modern Geography*, Routledge & Kegan Paul, London & Henley.
3. Johnston, R J : *The Future of Geography*,
- 3 Adhikari, S *Fundamental of Geographical Thought*
- 4 Hartshorne, R. *Perspective on the Nature of Geography*.
- 5 Hussain, M : *Evolution of Geographical Thought*, Rawat Publications, Jaipur.

- 6 James & Jones - *American Geography – Inventory and Prospects*  
 7 Harvey, David, *Explanations in Geography*

Paper 2.3.12

**GEOGRAPHY OF DEVELOPMENT**

**Unit-1.** Development: Concept and Indicators, Physical Quality of Life Index (PQLI) and Human Development Index (HDI), Goals of Development-Economic Growth, Distributive Justice, Ecological Sustainability; Geographical Aspects of Development, Relevance of Geographical Studies of Development.

**Unit-2.** Global patterns of Development- Developed and Developing Countries, the global North-South Divide, Core-Periphery Countries, First, Second and Third World; Theories of Development- Walter Rostow's Stages of economic growth, Dependency theory, and World System Theory; Income differentials at global level, patterns of agricultural and industrial development, regional disparities in fertility, literacy, and infant mortality at the global level, Globalisation and uneven development

**Unit-3.** Spatial structure of development in India: Regional Imbalances in Development-agricultural and industrial development, interstate differentials in income, fertility, literacy, infant mortality, and health facilities; Development Contrasts: Case Study of Kerala and Odisha; Backward Areas planning in India with special reference to tribal and hill areas; Development planning in India: the five year plans, The new economic policy and its impact on regional structure of development in India.

**Selected Readings**

1. Chand. M and Puri, M (2009) *Regional Planning in India*, Allied Publishers Private Limited, Mumbai
2. Coale, J.P (1981) *The Development Gap: A Spatial Analysis of World Poverty and Inequality*, John Wiley and Sons, Chisester.
3. Courtenay, P.P (ed.) (1985) *Geographical Studies of Development*, Longman, London.
4. Desai, V and Potter. R (2001) *The Companion to Development Studies*, Hodder Arnold
5. Forbes, D.K. (1984) *Geography of Development: A Critical Survey*, Croom Helm, London
6. Gore. C. (1984) *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London
7. Kant. S, Singh. N, Singh, J and Mukerji, A.B (2004), *Reinventing Regional Development*, Rawat, Jaipur
8. Mishra R.P. Prakasha Rao. V.L.S. and Sundaram K.V (1974) *Regional Development Planning in India: A New Strategy*, Vikas, New Delhi.
9. Mishra. R.P and Honjo. M (1981) *Changing Perception of Development Problems*, Maruzen Asia, Singapore
10. Mishra. R.P. (1984) *Development Issues of Our Time*, Concept, New Delhi
11. Morris, A(1998) *Geography and Development*, Routledge
12. Morris D. Morris (1979) *Measuring the Condition of World Poor*, New York: Pergamon Press
13. Pathak, C. R. (2003): *Spatial Structure and Processes of Development in India*. Regional Science Association. Kolkata. 21
14. GOI (2002), *National Human Development Report [India], 2001*, Planning Commission
15. Preston.P.M. (2002) *Development Theory: An Introduction*, Blackwell, Oxford, UK

16. Rubenstein, J.M. (1981) *Introduction to Human Geography*, MacMillan, London.
  17. Smith, D.M. (1994) *Geography and Social Justice*, Basil Blackwell, Oxford
  18. Sundaram, K.V. (1983) *Geography of Underdevelopment: Spatial Dimensions of Underdevelopment*, Concept, New Delhi
  19. UNDP (1990) *Human Development Report, 1990*,
  20. UNDP (2010) *Human Development Report, 2010*,
  21. UNICEF (1998) *The Progress of Nations*, Unicef, New York
- Willy Brandt (1980) *North-South: A Program for Survival*, the MIT Press, Cambridge

### 2.3.13 URBAN GEOGRAPHY

#### Unit –I

**UNIT-I** Definition, nature and scope of urban geography; different approaches and recent trends in urban geography; Origin and evolution of urban places in Ancient, Medieval, Modern and Post-Modern periods- factors, stages, evolution and characteristics.

#### Unit-II

Aspects of urban places: Location, site and situation, Size and Spacing of Cities: The Rank Size Rule, The Law of the Primate City, Urban Hierarchies, Central Place Theory; August Loch's theory of Market Centers, Internal morphology of urban settlement; Ecological processes of urban growth; Urban fringe; City- Region; Theories of city structure-concentric zone theory, sector theory, multiple nuclei theory, New examples from Global urban south

#### Unit-III

Urbanization: Definition, The City in History; Measures of urbanization, factors affecting urbanization, Historical development of Urbanization in the world: Regional aspects of world urbanization; Patterns and trends of urbanization in India, Policies on Urbanization, Urban change/landscape in post-liberalized period.

#### Suggested Readings:

1. Bala, Raj (1986), *Urbanisation in India*, Rawat Publishers, Jaipur.
2. Bansal, S.C. (2008), *Urban Geography* (Hindi Edition), Meenakshi Prakashan, Meerut.
3. Bansal, S.C. (2010), *Urban Geography*, Meenakshi Prakashan, Meerut.
4. Cadwallader, Martin (1986), *Urban Geography*, Prentic Hall, New Jersey.
5. Carter, Harold (1995), *The Study of Urban Geography* (4th Edition), Arnold, London.
6. Dickinson, R.E. (1964), *City and Region*, Routledge, London.
7. Kundu, A (1992), *Urban Development and Urban Research in India*, Khanna Publication, New Delhi.
8. Mayer H.M. and Kohn, C.F. (eds.) (1958), *Readings in Urban Geography*, University of Chicago Press, Chicago.
9. Pacione, Michael (2001), *Urban Geography-A Global Perspective*, Routedge, London,
10. Ramachandran, R. (1989), *Urbanisation and Urban Systems in India*, Oxford, New Delhi.
11. Rao, B.P. and Sharma, N. (2000-01), *Urban Geography* (Hindi Edition), Vasundhra Prakashan, Gorkhpur.

12. Singh, K. and Steinberg, F. (eds.) (1987), *Urban India in Crisis*, New Age International, New Delhi.
13. Smailes, A.E. (1953), *The Geography of Towns*. Hutchinson, London.
14. Hall, Tim (2000), *Urban Geography*, Routledge:london

### **Paper 2.3.14**

#### **NATURAL RESOURCE MANAGEMENT**

##### **UnitI : Introduction**

Concept, models and approaches to natural resource management, problems of resource utilization, population pressure, Problem & Prospects of various resources: soil, water, minerals and forests.

##### **UnitII: Conservation and management**

Conservation and management of resources, Resource conservation and management methods, resource scarcity hypothesis, resource appraisal; use of GIS. and remote sensing in resource appraisal..

##### **UnitIII: Resource development**

Sustainable resource management concept, methods, dimensions and sustainable system, integrated resource development and its application.

##### **References:**

1. Adams, W.M. *Green, Development, Environment and Sustainability in the Third World*. Routeledge and Hall, New York, 1990.
2. Holechak, J.L. *Natural Resources: Eulogy, Economics and Policy*. Prentice Hall, New Jersy 2000
- 3 Mc Laren, D.J. &Skinnet, B.J. *Resources and Conservaion, Cambridge University Press New York, 1991*
3. Simon,I.G. *Earth, Air ,Water Resources and Environment in Late 20 th century*.Edward Arnold,New York 1991

### **Paper 2.3.15**

#### **Geographic Information System and Remote Sensing**

##### **UNIT-1**

Geographical Information System (GIS): Definitions and Applications; Components of GIS- Computer Hardware and GIS Software.

Remote Sensing: Definitions, Historical development and Applications; Satellite (Landsat and IRS), Sensors (Active and Passive) and platforms (Airborne and Spaceborne); Aerial Photography and Remote Sensing.

Global Positioning System (GPS): Principles and Uses.

##### **UNIT-2**

Geographic Objects: point, line and area; Analog and digital maps;

Nature of geographic data: Spatial and Attribute Data, Concept of vector and raster based models;

GIS data creation and Analysis: Georeferencing and Projection, Digitization and manipulation of GIS data bases; Spatial Data Visualisation

### **UNIT-3**

Principles of Remote Sensing: Electromagnetic Energy; Interaction mechanism with atmosphere and earth surfaces; Spectral signatures of earth surface features.

Concept of resolution: Spatial, Spectral and Radiometric; Visual interpretation of satellite images; Stereoscopic vision

Digital Image Classification: Supervised and unsupervised classification

### **Selected Readings**

Burrough P. A. and McDonnell R. A., 2000: *Principles of Geographical Information Systems– Spatial Information Systems and Geostatistics*, Oxford University Press.

Chang K.-T., 2009: *Introduction to Geographic Information Systems*, McGraw-Hill.

Jensen J. R., 2004: *Introductory Digital Image Processing: A Remote Sensing Perspective*, Prentice Hall.

Joseph, G. 2005: *Fundamentals of Remote Sensing*, United Press India.

Kumar, K. : Remote Sensing. NCERT

Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: *Remote Sensing and Image Interpretation*, Wiley.

## **SEMESTER-IV REGIONAL DEVELOPMENT AND PLANNING (SPECIAL PAPER)**

### **PAPER-2.4.16**

### **REGIONAL PLANNING**

#### **Unit I**

**Conceptual and Theoretical Framework:** Regional concept in Geography and its application to planning; types of regions and methods of regional delineation; Concept of Development, Indicators of Development, Regional Development; Planning Process: Types of Planning , Regional Planning and its rationale, principles and objectives; Approaches of Regional Planning; National vs Regional Planning.

## Unit II

**Regional Growth Theories:** Economic Base Theory; Input and Output Model; Regional Multiplier; Friedman's Core-Periphery Theory; Polarization and Trickle-down Theory of Hirschman; Spread and Back Wash Theory of Myrdal; Growth Pole Theory of Perroux. Planning Region: Need for Planning Region; Characteristics of Planning Regions; City-Region Concept(Globalization and Regional structure)

## Unit III

**Regional planning in India:** Regional Imbalances/Disparities; Causes and Consequences; Measurements of Regional Disparities; Planning Policies for Regional Development; National Capital Region; Hilly Region; Tribal Region; Multi Level Planning

### Recommended Readings:

1. Bhatt, L.S. (1972) **Regional Planning in India**, Statistical Publishing Society, Calcutta.
2. Bhatt, L.S. et. al. (eds) (1982) **Regional Inequalities in India**, Society for the study Regional Disparities, New Delhi.
3. Blunder. J. et. al. (1973) **Regional Analysis and Development**, Harper & Row, London.
4. Chand, M and V.K. Puri (1985) **Regional Planning in India**, Allied Pub. Pvt. Ltd. New Delhi.
5. Coates, B.R. and R.J. Johnston (1977) **Geography and Inequality**, Oxford University Press, Oxford.
6. Friedmann, J and William Alonso (1967) **Regional Development and Planning: a Reader**, MIT Press, Cambridge Massachusettes.
7. Kuklinski, A.R. (ed) (1972) **Growth Poles and Growth Centres in Regional Planning** , Monton, The Hague.
8. Misra R.P. et. al. (eds.) (1974) **Regional Development Planning in India**, Vikas, New Delhi.
9. Raza, Moonis (1988) **Regional Development**, Heritage, New Delhi.
10. Sundram, K. V. (1977) **Urban and Regional Planning in India**, Vikas Publishig House Pvt Ltd, New Delhi

### 2.4.17

## URBAN PLANNING

**Unit-I: Conceptual and Theoretical Framework:** Origin of Cities, Growth of Cities, system of cities, Stages of Urban Development , Introduction: Criteria of Urban areas and nature of Urbanisation, Evolution of Planning, Objects of Urban Planning, Economic justification for Urban Planning, Principles of Urban Planning, Necessity of Urban Planning,

**Unit-II: The Pioneers of Urban Planning:** E. Howard; C. Perry; Patrick Geddes; Le Corbusier  
Edwin Lutyeris ideas; Process of planning: Delhi Master Plan; Bhubaneswar

**Unit-III Contemporary Urban Issues in India:**

Metro and mega cities- Problem & issues, Urban land use and zoning; Housing; Blight; Urban  
Renewal; JNNURM; Slum and its Redevelopment Policies & Programmes with reference to  
India, Heritage conservation, Participation/ Governance

**Suggested Readings:**

- Bala, Raj (1986), *Urbanisation in India*, Rawat Publishers, Jaipur.  
Bansal, S.C. (2008), *Urban Geography* (Hindi Edition), Meenakshi Prakashan, Meerut.  
Bansal, S.C. (2010), *Urban Geography*, Meenakshi Prakashan, Meerut.  
Cadwallader, Martin (1986), *Urban Geography*, Prentice Hall, New Jersey.  
Carter, Harold (1995), *The Study of Urban Geography* (4th Edition), Arnold, London.  
Dickinson, R.E. (1964), *City and Region*, Routledge, London.  
Kundu, A (1992), *Urban Development and Urban Research in India*, Khanna Publication,  
New Delhi.  
Mayer H.M. and Kohn, C.F. (eds.) (1958), *Readings in Urban Geography*, University of  
Chicago Press, Chicago.  
Pacione, Michael (2001), *Urban Geography-A Global Perspective*, Routledge, London,  
Ramachandran, R. (1989), *Urbanisation and Urban Systems in India*, Oxford, New Delhi.  
Rao, B.P. and Sharma, N. (2000-01), *Urban Geography* (Hindi Edition), Vasundhara  
Prakashan, Gorkhpur.  
Singh, K. and Steinberg, F. (eds.) (1987), *Urban India in Crisis*, New Age International,  
New Delhi.  
Smailes, A.E. (1953), *The Geography of Towns*. Hutchinson, London.

**2.4.18**

**URBANIZATION AND MIGRATION**

**Unit-I Conceptual Framework on Urbanization**

Origin & historical development of cities; Process of Urbanization & base of urban development;  
Urban Economic base: Basic & Non-basic functions and Classification of cities; Urbanization in  
India: Pre & Post, Post-Independence period; Measures of urban concentration, Problems and  
policies of Urbanization; Role of Urban Local Bodies (ULB) in Urbanization

**Unit-II Conceptual Framework on Migration**

Definition of Migration; Mobility and migration: General terms and Concepts; Internal and  
International Migration Causes of Migration and Consequences of Migration; Theories of  
migration (Ravenstein's Laws of Migration, Gravity model; Lee's Theory; Todaro, Stouffer's  
Theory of Mobility, Zelensky; Lewis) ; Measurement of Migration

**UNIT-III Urbanisation, Migration And Development:**

Industrialization, Migration and Urbanization inter-relationship, Poverty and Migration, Access to Basic Amenities and Urban security, The Millennium Development Goals and the Role of Cities

1. Kundu, A. Urban Development and Urban Research in India. Khama Publishers, New Delhi.
2. Ministry of Housing and Urban Poverty Alleviation, GoI, (2009): India Urban Poverty Report-Oxford University Press, New Delhi
3. Carter, Herald (1995): The Study of Urban Geography, Arnold, Fourth Edition, London.
4. Mandal R.B. Urban Geography
5. Zelinsky Wilbur, A Prologue to Population Geography, Prentice Hall, 1966.
6. Hassan, Mohammd Izhar (2005): Population Geography, Rawat Publications, Jaipur, New Delhi.
7. Chandna, R.C. Geography of Population; concept, Determinants and Patterns. Kalyani Publishers, New York 2000
8. Socio Economic made Simple, Rupa Publications

## **Special Paper(Population Geography)**

### **Paper 2.4.16**

#### **Demographic Techniques**

##### **Unit-1: Demographic data and Concepts**

1. Sources of Demographic Data for geographical analysis-Census, vital statistics, Sample Registration System (SRS), National Sample Survey (NSS), and National Family Health Survey (NFHS) and UN Publications. The quality of information from different sources. Rates and Ratios
2. Age-Sex structure: Median Age, Population Pyramid, and Age Dependency Ratio, Sex Ratio. Measurement of quality of age data. Smoothing of age data.
3. Population patterns: Basic Demographic Equation, Measures of population growth. Factors associated in variations in population growth. Measures of Distribution and Density of population

##### **Unit-2: Components of Population Change**

1. Measures and Methods of estimation of fertility: Period Measures-Child-Woman Ratio, Crude Birth Rate, General Fertility Rate, Age-specific fertility rate, Total Fertility Rate, Specific Fertility Rate, Gross Reproduction Rate, Net Reproduction Rate, Coale's Index. Cohort Measures –Parity Progression Ratio, Birth Intervals, Lexis Diagram
2. Basic Measures and methods of estimation of mortality- Crude Death rate, Age-specific death rate, cause-specific death rates, the Maternal Mortality Ratio. Construction of life table
3. Measures of Urbanisation and Migration

##### **Unit-3: Population projections and Demographic Models**

1. Population Projections- Uses of Projection, Methods of population projection,
2. Demographic Models-Stationary and Stable Populations, Calculation of Stable Age Distribution
3. Model Life Tables-UN Model Life Tables and Coal-Demeney Life Tables



### **Selected Readings**

1. Srinivasan, K. (1998) '**Basic Demographic Techniques and Applications**', Sage Publications, New Delhi.
2. Preston, Samuel. Patrick Heuveline and Michel Guillot (2000) '**Demography: Measuring and Modeling Population Processes: Measuring and Modelling Population Processes**', Blackwell Publications.
3. Palmore, James A., and Robert W. Gardner. 1994. *Measuring mortality, fertility, and natural increase: A self-teaching guide to elementary measures*. Honolulu: East-West Center
4. Rowland, Donald T. (2003) **Demographic Methods and Concepts**, Oxford University Press, USA
5. Swanson, David A. and Jacob S. Siegel(2003) *The Methods and Materials of Demography*, Emerald Group Publishing

## **SEMESTER-IV**

### **Paper 2.4.17**

#### **GEOGRAPHY OF HEALTH AND HEALTH CARE**

**Perspectives on Health:** Definitions, Linking Environment, Development and Health; Geographical factors affecting Human Health and Diseases- Physical (relief, climate, soils and vegetation); Social factors (population density, illiteracy, and social customs); Economic factors (poverty, occupation, food and nutrition, and standard of living; Environmental factors (urbanization and congestion, water, air and noise pollution, Climate Change and solid waste). Nature, Scope and Significance of Geography of Health; Development of this area of Specialisation.

**Mortality and Morbidity:** Mortality as a component of demographic change, Concepts of mortality and morbidity-their measurements, Classification of diseases: genetic, communicable and non-communicable; occupational and deficiency diseases. WHO classification of diseases; Epidemiological Transition, Health transition, routes to low mortality; McKeon's thesis of Modern rise in world population; Levels and trends of mortality in developed and developing countries and causes of mortality decline in these. Trends and Patterns of Childhood Mortality in India with a special focus on Odisha.

**Health Care Planning and Policies:** Activities of International( WHO, UNICEF, and Red cross), National (Government and Non-Government) organisation in health services; Health Care Systems in India; Primary Health Care, nutrition, preventive and curative health care, Health Care Programmes - Family welfare, Immunization, National Disease Eradication, Health for All, and National Rural Health Mission(NRHM); Availability, Accessibility and Utilisation of Health Care Services; Inequalities in Health Care Services in India with special reference to Odisha.

### **Suggested Readings**

1. Cliff, A. and Haggett, P. : Atlas of Disease Distribution. Basil Blackwell, Oxford, 1989.
2. Digby, A. and Stewart, L. (eds.) : Gender, Health and Welfare. Routledge, New York, 1996.
3. Elliot P.J., et al (ed.), 1992 : Geographical and Environmental Epidemiology Methods for

Small Area Studies, Oxford University Press.

4. Gatrell A.C. Geographies of Health: An Introduction, Blackwell, 2002
5. Gatrell, A., and Loytonen, : GIS and Health, Taylor and Francis Ltd, London, 1998
6. Hazra, J. (ed.): Health Care Planning in Developing Countries. University of Calcutta, Calcutta, 1997.
7. A.T.A. : Patterns of Disease and Hunger. A Study in Medical Geography. David & Charles, Victoria, 1978.
8. May, J.M.: The World Atlas of Diseases, Nat. Book Trust, New Delhi, 1970.
9. Mc. Glashan, N.D. : Medical Geography, Methuen, London, 1972.
10. McKeown T. The Modern Rise of Population. New York, NY: Academic Press; 1976.
11. Meade.M.S and Emch M: Medical Geography, The Guilford Press, London
12. Moeller Dade wed., 1993: Environmental Health, Cambridge, Harvard Univ. Press.
13. Murray C. and A. Lopez, 1996 : The Global Burden of Disease, Harvard University Press.
14. Narayan, K.V.: Health and Development- Inter-Sectoral Linkages in India. Rawat Pub., Jaipur, 1997.
15. Phillips, D. and Verhasselt, Y., 1994: Health and Development, Routledge, London.
16. Phillips, D.R. : Health and Health Care in the Third world. Longman, London, 1990.
17. Pyle, G. : Applied Medical Geography. Winston Halsted Press, Silver Springs, Md, U.S.A., 1979.
18. Rais, A. and Learmonth, A.T.A.: Geographical Aspects of Health and Diseases in India.
19. Rais, Akhtar (Ed.), 1990 : Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.
20. Smith, Andrew T., 2000: The Health of Nations, The MIT Press, Cambridge.

#### 2.4.18

### URBANIZATION AND MIGRATION

#### Unit-I Conceptual Framework on Urbanization

Origin & historical development of cities; Process of Urbanization & base of urban development; Urban Economic base: Basic & Non-basic functions and Classification of cities; Urbanization in India: Pre & Post, Post-Independence period; Measures of urban concentration, Problems and policies of Urbanization; Role of Urban Local Bodies (ULB) in Urbanization

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#### UNIT-III URBANISATION, MIGRATION AND DEVELOPMENT:

Industrialization, Migration and Urbanization inter-relationship, Poverty and Migration, Access to Basic Amenities and Urban security, The Millennium Development Goals and the Role of Cities

1. Kundu, A. Urban Development and Urban Research in India. Khama Publishers, New Delhi.

- 2 .Ministry of Housing and Urban Poverty Alleviation, GoI, (2009): India Urban Poverty Report-Oxford University Presss, New Delhi
1. Carter, Herald (1995): The Study of Urban Geography, Arnold, Fourth Edition, London.
  2. Mandal R.B. Urban Geography
  3. Zelinsky Wilbur, A Prologue to Population Geography, Prentice Hall, 1966.
  4. Hassan, Mohammd Izhar (2005): Population Geography, Rawat Publications, Jaipur, New Delhi.
  5. Chandna, R.C. Geography of Population; concept, Determinants and Patterns. Kalyani Publishers, New York 2000
  6. Socio Economic made Simple, Rupa Publications

### **SEMESTER –IV Special Paper (Social Geography)**

#### **Paper -2.4.16**

#### **ADVANCED SOCIAL GEOGRAPHY**

UNIT-I: Social well Being: Concepts of social well being, physical quality of life, human development; measurement of human development with social and economic indicators;

UNIT-II: Rural-urban deprivation in India with respect to health care; education and shelter; deprivation and discrimination issues relating to women and under-privileged groups.

UNIT-III: Public policy and social planning in India; Review of five year plans and area plans towards social policy in India; Strategies to improve social well being in tribal, hill, drought and flood prone areas; social and environmental impact assessment of development projects

#### **Reading List :**

- Ahemd, Aijazuddin (1999) **Social Geography**, Rawat: New Delhi.
- De Blij. B.d. **Human Geography**. John Wiley and Son, New York.
- Dreze Jean, Amartya Sen(1996) **Economic Development and Social Opportunity**, Oxford University press, New Delhi.
- Dubey, S.C(1991) **Indian Society**, National Book Trust, New Delhi, 1991.
- Gregory, D. and UJ. Larry. (eds.) **Social relations and Spatial Structures**, McMillan, 1985
- Haq, Mahbulul: **Reflection on Human Development**. Oxford University Press.New Delhi
- Planning Commission, **Government of India**: Report on Development of Tribal areas.1981
- Rao, M.S.A.: **Urban Sociology in India**. Orient Longman, 1970 .
- Schwartzberg Joseph: **An Historical Atlas of South Asia**. University of Chicago Press. Chicago, 1978 .
- Sen, Amartya and Dreze Jean, **Indian Development Selected Regional Perspectives**. Oxford University Press,1996 .

## Paper -2.4.17

### CULTURAL GEOGRAPHY

**UNIT-I: Introduction:** Nature and scope of Cultural Geography; Components of culture, Convergence and Divergence processes; cultural changes: perception, behaviouralism and cultural relativism.

**UNIT-II:** Cultural Diversity-: race, religion and language, ethnic groups; Cultural Diversity in the World, Cultural Diversity and Regionalization in India.

**UNIT-III:** Patterns of livelihood: various economic activities & cultural adaptations; agriculture, industrialization and modernization; technological changes and their geographic implications.

#### Reading List:

Brook, J.C and Webb, J.W: A Geography of Mankind, McGraw Hill, New York, 1978

Crang, Mike: Cultural Geography, Routledge publications, London, 1978.

Harmandorf, Tribes of India: The struggle for survival, Oxford University Press, Delhi, 1989.

Hazra, (ed.), Dimensions in Human Geography, Rawat Publication , Jaipur, 1997.  
Hutchinson, and Smith, D: Ethnicity; Oxford University Press, Delhi, 1996

Jordon & Lester G : The Human Mosaic, Harpar & Row, Newyork;1979

Massey,D & Jess P. A Place in the world: Places, cultures and Globalisation Oxford University, New York,1995.

Massey,et .al (ed), Human Geography Today, Polity Press, Combtidge,1999

Mukherjee, A.B.,Aijazuddin,A : India: Culture, society and economy, Inter –India Publication, New Delhi, 1985

Stevw. P & Michael . K (ed): Places and the politics of Identity, Routledge, London, 1993

Schwartzberg, J.E: Historical Atlas of South Asia, University of Chicago, 1978.

Sopher, D.E: Exploitation of India: Geographical perspectives on society & culture, Longman, London, 1980.

## Paper -2.4.18

### POLITICAL GEOGRAPHY

### **Unit –I : Nature and Scope of Political Geography**

Meaning and Scope of Political Geography;

Historical Development of Political Geography;

Approaches to the study of Political Geography: Functional and Unified- field theory.

### **Unit-II: Themes in Political Geography**

State, Nation, Nation-State, Frontiers and Boundaries, Capitals, Core-Periphery;

Colonization, decolonization and neocolonialism, globalization of capital.

Federalism and other forms of government

### **UNIT – III : Geopolitics and Global Geostrategic Views**

Concept of Geopolitics and its changing discourse;l

New World Order Geopolitics; Environmental Geopolitics;

Global Geostrategic Views: Mahan, Mackinder, Spykman and de. Seversky

India's Foreign Policy in Current Context

### **Reading List**

Dixit R. D., (2004). *Political Geography-The Spatiality of Politics*, Tata McGraw-Hill Publishing Company Limited.

Sukhwai B. L. (1968). *Modern Political Geography of India*, Sterling Publishers Private Limited.

Cox K. R., Low M. and Robinson J., (2008): *The Sage Handbook of Political Geography*, Sage Publications.

Cox K., (2002). *Political Geography: Territory, State and Society*, Wiley-Blackwell.

Gallaher C., et al, (2009). *Key Concepts in Political Geography*, Sage Publications.

Jones M., (2004). *An Introduction to Political Geography: Space, Place and Politics*, Routledge.

Mathur H M and M M Cernea (eds.) *Development, Displacement and Resettlement - Focus on Asian Experience*, Vikas, Delhi

Taylor P. and Flint C., (2000): *Political Geography*, Pearson Education.

Verma M K (2004). *Development, Displacement and Resettlement*, Rawat Publications, Delhi

Hodder Dick, Sarah J Llyod and Keith S McLachlan (1998). *Land Locked States of Africa and Asia* (vo.2), Frank Cass

Prescott, JR. V (1972). *Political Geography*, London, Methuen & Co Pounds N.J.G.(1972):

*Political Geography*. McGraw Hill, New York.

Adhikari, Sudipta. *Political Geography*, Rawat Publication, New Delhi.

Adhikari, Sudipta. *Political Geography of India*, Sarda Pushtak Bhawan.

Gearoid O Tuathail, *The Geopolitics Reader*, Taylor & Francis, UK.

### **Unit I: Principles of Remote Sensing (RS)**

Definition, types and application of remote sensing; Stages in remote sensing data acquisition; Electromagnetic radiation and electromagnetic spectrum, Interaction of EMR with atmosphere and Earth's surface features.

Remote sensing platforms; Types and characteristics of sensors; IRS, LANDSAT, SPOT, IKONOS, Quick Bird; remote sensing data products

### **Unit II: Thermal & Microwave Remote Sensing**

Thermal Remote Sensing; Thermal properties of materials: emissivity of materials; thermal inertia of Earth surface features; Thermal data sets: LANDSAT, and ASTER; Concept and Principles of microwave remote sensing; Microwave data sets SLAR, LIDAR and SAR

Image interpretation: Factors affecting image interpretations; Image characteristics and preparation of image interpretation keys; Elements of Image interpretation; methods and techniques of image interpretation; Multi concepts in image interpretation

Introduction to Global Positioning System; GPS satellites constellations; GPS segments: Space, Control, User; GPS antennas, signals and codes; GPS receivers; Application of GPS

### **Unit III: Introduction to Geographic Information System (GIS)**

Definition and scope of GIS; Functional requirements of GIS: GIS components; Cartography GIS interface; Recent trends and applications of GIS; Open source GIS

Geographic data: Spatial and non-spatial; Data models: Raster and vector; Database Management System (DBMS); Data Structures: Relational, hierarchical and network; Data input: Digitizing of maps and imageries; Coordinate Transformation; Attribute data generation.

### **References list:**

American Society of Photogrammetry, 1993, Manual of Remote Sensing, Falls Church, Virginia

American Society of Photogrammetry, 1968, Manual of Color, Photogrammetry, Falls Church, Virginia

Curran, P. J. 1985, Principles of Remote Sensing, Longman, London

Ekstrom, M. P. 1984, Digital Image Processing Techniques, Academic Press, New York

Eastes, J.E. and L W Senger, 1974, Remote Sensing techniques for environmental Analysis, Hamilton Santa Barbara, California