

# **COURSES OF STUDIES** **UNDER GRADUATE** **GEOGRAPHY**

**AS PER NEP-2020**



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**ADMISSION BATCH-2024**

**POST GRADUATE DEPARTMENT OF**  
**GEOGRAPHY**  
**S.C.S. (AUTONOMOUS) COLLEGE**  
**PURI**  
**ODISHA-752001**

[www.scscollege.nic.in](http://www.scscollege.nic.in)

# PROGRAMME SPECIFIC OUTCOME

## DEPARTMENT OF GEOGRAPHY

Student graduating with a Bachelor of Arts degree in Geography will have demonstrated an ability to:

- Students will have a general understanding of physical geographic processes, the global distribution of landforms and ecosystems, and the role of the physical environment on human populations.
- Students will have a general understanding of global human population patterns, factors influencing the distribution and mobility of human populations including settlement and economic activities and networks, and human impacts on the physical environment.
- Students will be able to think in spatial terms to explain what has occurred in the past as well as using geographic principles to understand the present and plan for the future.
- Students will have a general understanding of how the physical environment, human societies, and local and global economic systems are integral to the principles of sustainable development.
- Students will have a general understanding of the various theoretical and methodological approaches in both physical and human geography and be able to develop research questions and critically analyze both qualitative and quantitative data to answer those questions.
- Students will develop a solid understanding of the concepts of "space," "place" and "region" and their importance in explaining world affairs.
- Students will understand general demographic principles and their patterns at regional and global scales.
- Students will be able to locate on a map major physical features, cultural regions, and individual states and urban centres.
- Students will understand global and regional patterns of cultural, political and economic institutions, and their effects on the preservation, use and exploitation of natural resources and landscapes.
- Students will understand the key concepts in physical geography of environmental systems, process linkages, variable scale, and

"cause and effect" and how they relate to the influence of climate, geology, and human activities in shaping the earth surface.

- Students will be able to use accepted field, laboratory, geospatial, and statistical techniques to quantify the quantity, characteristics, and history of physical phenomena for geographic research and natural resources management.
- Students will be able to use the scientific method including critical thinking, sampling, hypothesis formulation and testing, and controlled experimentation to assess environmental problems, and be able to effectively communicate research objectives, methodology, results, interpretations, and conclusions in oral and written formats.

Model Curriculum for Three/Four Year Degree Course  
(With Multiple Entry /Exit Option)  
Based on NEP-2020

# Geography



**Odisha State Higher Education Council, Bhubaneswar**  
**Government of Odisha**

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3. Multidisciplinary Courses.....  
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with 3 credits each)
4. Ability Enhancement Courses.....  
(Odia and English are the compulsory courses under Semester-I/II respectively  
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5. Skill Enhancement Courses (SEC).....  
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with 3 credits each)
6. Value Added Courses.....
  - a. *Environmental Studies and Disaster management compulsory under Semester-I with 3 Credits*
  - b. 3 courses to be chosen from **baskets of VAC** for Semester-III/V/VI with 3 credits each
7. Summer Vocational Course .....  
(Students may choose vocational courses after 2<sup>nd</sup> Semester and 4<sup>th</sup> Semester for Certificate Course or Diploma Course respectively with 4 credit each opt for exit)

## **Programme Outcomes**

1. Upon program completion, graduates will proficiently analyze and comprehend various global geographical challenges, adeptly proposing viable solutions.
2. Integral to the learning journey, students will develop foundational expertise in spatial analysis techniques, encompassing Remote Sensing and GIS methodologies.
3. Through adept training, students will master the art of effectively conveying geographical concepts, data, and discoveries, employing an array of suitable tools and methodologies.
4. They will grasp the intricate interdependencies between human societies, cultures, and their surrounding environments, fostering a holistic understanding of geographical dynamics.
5. Graduates will emerge equipped with essential fieldwork and research proficiencies, enabling them to craft and execute meticulous geographical field studies, harness spatial data for analysis, and adeptly interpret findings to advance geographic comprehension and knowledge.

**Unit- I:****Learning Outcome:**

Comprehend the fundamentals of geomorphic processes, landforms, climate systems, and hydrology, enabling them to analyze and explain the interconnectedness of these elements within global ecosystems

Meaning, scope, and components of physical geography, Interior of the Earth; Origin of continents and oceans; Isostasy; Earthquakes and volcanoes; Earth movements; Faults, folds; Continental Drift and Plate Tectonic Theories; ; Cycle of erosion: Davis and Penck; Weathering and Mass Wasting.

**Unit-II:****Learning Outcome:**

Gain comprehensive understanding of the Earth's atmospheric structure, composition, and characteristics, and be able to analyze and interpret climate patterns, factors influencing climate, and the impact of climatic changes on various ecosystems and human societies.

Elements of weather and climate; Structure and composition of atmosphere. Insolation and heat budget, vertical and horizontal distribution of temperature; Atmospheric pressure and winds-Air mass, Frontogenesis, Tropical Cyclone and Origin; and mechanism of Monsoon.

**Unit-III:****Learning Outcome:**

Acquaint themselves with thorough understanding of the hydrological cycle, the movement and distribution of water across terrestrial and marine systems, allowing them to ocean bottom topography, ocean temperature and salinity, ocean currents, and sediment deposits.

Hydrological Cycle: Factors affecting run-off, infiltration and groundwater. Water Storage and Circulation; Ocean bottom topography; Temperature and salinity of ocean water; Ocean current and deposits.

**Unit-IV: (Practical)**

## Learning Outcome:

Honed their fieldwork and laboratory skills, enabling them to apply physical geographic methods to collect, analyze, and interpret data from real-world environments.

proficient in representing relief features such as Mountains, Valleys (U shaped and V shape), Waterfalls, Plateaus, and

1. Drawing of Contour Features – Mountain, Valley (U shaped and V shape), Waterfall, Plateau and Escarpment;
2. Calculation of time of place with reference to GMT;
3. Introduction to use of simple weather observation instruments: Thermometer (Wet and dry bulb temperature), Barometer, hygrometer, anemometer, wind vane, Rain Gauge, Stevenson Screen,
4. Interpretation of weather maps; Construction and interpretation hydrographs and unit hydrographs; T-S Diagram.
5. Practical Record and Viva.

## Suggested Readings:

### Text Books:

- ✓ Singh, S. (2020). *Physical Geography*. Prayag Pustak Bhawan, Allahabad.
- ✓ Strahler, A. H., & Strahler, A. (2005). *Introducing Physical Geography*. John Wiley & Sons, New York.

## Reference Books:

- ✓ Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). *Applied Hydrology*. Retrieved from [https://ponce.sdsu.edu/Applied\\_Hydrology\\_Chow\\_1988.pdf](https://ponce.sdsu.edu/Applied_Hydrology_Chow_1988.pdf)
- ✓ Critchfield, H. (1975). *General Climatology*. Prentice-Hall, New York.
- ✓ Garrison, T. (1998). *Oceanography*. Wadsworth.com. USA 1998.
- ✓ Getis, V., Getis, A., & Bjelland, M. D. (2020). *Introduction to Geography*. McGraw Hill India.
- ✓ Holden, J. (2017). *An Introduction to Physical Geography and the Environment*. Pearson Education Ltd., Harlow, UK.
- ✓ King, C. A. M. (1975). *Oceanography for Geographers*. E. Arnold, London.
- ✓ Lohani, A. K. (n.d.). *Practicing Hydrology-An Overview*. Retrieved from <http://nihroorkee.gov.in/sites/default/files/uploadfiles/Practicing-Hydrology.pdf>
- ✓ Monkhouse, F. J. (1960). *Principles of Physical Geography*. Hodder and Stoughton, London.
- ✓ Pitty, A. (1960). *Introduction to Geomorphology*. Methuen, London.
- ✓ Steers, J. A. (1964). *The Unstable Earth: Some recent views in geography*. Kalyani Publishers, New Delhi.



- ✓ *Strahler, A. N., & Strahler, A. H. (1992). Modern Physical Geography. John Wiley & Sons.*
- ✓ *Thornbury, W. D. (1969). Principles of Geomorphology. Wiley Eastern.*
- ✓ *Ward, A. D., Trimble, S. W., Burckhard, S. R., & Lyon, J. G. (2015). Environmental Hydrology. Boca Raton.*
- ✓ *Wooldridge, S. W., & Morgan, R. S. (1959). The Physical Basis of Geography - An Outline of Geomorphology. Longman Green & Co., London, 1959.*

## **Core II**

## **HUMAN GEOGRAPHY**

### **Unit-I:**

#### **Learning Outcome:**

Analyse the complex relationships between humans and their physical and social environments. Identify and analyze the key concepts of human geography and its evolution.

Meaning, Nature and Scope of Human Geography; Its Contemporary Relevance; Major Themes and concepts of Human Geography (Location, Place, Region and Movement, Accessibility, Agglomeration, Mental Map, Space, Space-time continuum, Landscape, Regionalism, Topophilia and topophobia, Diffusion, and Distribution) Man-nature inter-relationship (Determinism, Possibilism and Neo-determinism), Development of human geography- contributions of Germans, French and Americans.

### **Unit - II:**

#### **Learning Outcome:**

Understand patterns and processes of population growth and its implications. Demonstrate cultural awareness and sensitivity in understanding diverse race, religion, linguistic, ethnicity and cultural practices and beliefs that shape human geography and their implications for society.

World Distribution of racial, religious, linguistic and ethnic groups; Evolution of Culture and Cultural realms of the world; World Population Growth, Population Problems. Global cultural diversities- diffusion of culture.

### **Unit-III:**

### **Learning Outcome:**

Understand types and patterns of human settlement and its dynamism. understand different forms of inequalities.

Types and Patterns of Rural Settlements; Concept and Classification of Urban Settlements; World Urbanization with special reference to developing countries, Salient Features of cultural globalization. Regional diversity and disparity (Gender, Ethnicity and Income).

### **Unit-IV: Practical**

#### **Learning Outcome:**

Design and implement research projects related to human geography, including the collection, analysis, and interpretation of data related to socio-cultural and economic status of local/regional ethnic communities. Communicate complex ideas related to human geography to a range of audiences, both orally and in writing.

Project Report and Presentation on

1. Socio-cultural and economic status of any ethnic group in India.  
Or
2. Evolution of the settlement where you live/local settlement.

### **Suggested Readings:**

#### **Text Books:**

- ✓ Hussain, Majid (2012) *Human Geography*, Rawat Publications, Jaipur.
- ✓ Harm d. Blij. (1992). *Human and Economic Geography*, Mac Millan, New York.
- ✓ Singh, L.R. (2005). *Fundamentals of Human Geography*. Sharda Pustak Bhawan, Allahabad.

#### **Reference Books:**

- ✓ Ahmed, A. (1999). *Social Geography*, Rawat Publication, New Delhi.
- ✓ Daniel, P.A. and Hopkinson, M.F. (1989). *The Geography of Settlement*, Oliver & Boyd, London. Human Geography, Rupa Publication.
- ✓ Fellmann, J. D., Getis, A., Getis, J. (2000). *Human Geography- Landscape of Human Activity*, McGraw Hill, New York.
- ✓ Fouberg, E.A, Murphy, A.B. & de Blij, H. J. (2015). *Human Geography: Culture, Society and Space*. Wiley
- ✓ Johnston, R; Gregory D, Pratt G. et al. (2008) *The Dictionary of Human Geography*, Blackwell Publication.

- ✓ Jordan-Bychkov et al. (2006). *The Human Mosaic: A Thematic Introduction to Cultural Geography*. W. H. Freeman and Company, New York.
- ✓ Knox, P. & Marston, S. (2013): *Human Geography: Places and Regions in Global Context*, 6th Edition, Pearson Education, New Delhi.
- ✓ Leong, G.C. and Morgan, G.C. (1975). *Human and Economic Geography*, Oxford University Press, Hong Kong.
- ✓ Rubenstein, James M. (2022) *Contemporary Human Geography*, Pearson, U.S.A

## **Semester -II**

### **Core III**

### **Population Geography**

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

##### **Learning Outcome:**

Explain meaning, scope and development of population geography as a distinct branch of Geography

Defining the Field, Nature and Scope of population geography; Sources of population data with

special reference to India (Census, National Family Health Survey and NSS); Demographic Balancing Equation; Population Distribution and Growth – Measures, Factors, and World Patterns; Concept of Doubling Time, Concepts of Rate, Ratio and Proportion.

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

##### **Learning Outcome:**

Understand key concepts, different components of population along with its drivers

Population Dynamics: Fertility, Mortality and Migration - Measures, Determinants and Implications; Theories of Population Growth – Malthusian Theory, Optimum Population Theory and Demographic Transition Theory; Population Resource Regions.

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

##### **Learning Outcome:**

Examine population dynamics and resultant socioeconomic issues and problems.

Population Composition and Characteristics – Age-Sex, Rural-Urban, Literacy, Occupational Structure; Contemporary Population Issues – Population Ageing, Declining Child Sex Ratio, HIV/AIDS; Population problems and policies in Developed and Developing countries with Special reference to India.

## **Unit-IV: Practical**

### **Learning Outcome:**

compare and relate population growth and distribution of developed and developing countries

1. Estimation of Population Growth
2. Arithmetic and Geometric Projection calculation and graphical display
3. Population distribution maps using symbols – Simple and Multiple Dots, Circles and Spheres
4. Construction of Lorenz Curve
5. Construction of Population Pyramid
6. Practical Record and Viva-Voce

### **Suggested Readings:**

#### **Reference Books:**

- ✓ Chandna, R. C. (2015). *An Introduction to Population Geography*, Kalyani Publishers.
- ✓ Clarke, J. I. (1965). *Population Geography*, Pergamon Press, Oxford.

### **Suggested Readings:**

- ✓ Barrett, H. R. (1995). *Population Geography*, Oliver and Boyd.
- ✓ Bhende, A. and Kanitkar T. (2000). *Principles of Population Studies*, Himalaya Publishing House.
- ✓ Hassan, M.I (2020). *Population Geography: A Systematic Exposition*, Routledge, London and New York.
- ✓ Jones, H. R. (2000). *Population Geography*, 3rd ed. Paul Chapman, London.
- ✓ Newbold, K. B. (2009). *Population Geography: Tools and Issues*, Rowman and Littlefield Publishers.
- ✓ Pathak, K.B and F. Ram (2016). *Techniques of Demographic Analysis*, Himalaya Publishing House, Mumbai.
- ✓ Maurya, S. D. (2017). *Population Geography*, Sharda Putak Bhawan, Allahabad.
- ✓ Srinivasan, K (1998). *Basic Demographic Techniques and Applications*, Sage Publications, New Delhi.

## **Core IV**

## **Cartography and Geo-Spatial Techniques**

### **Unit-I:**

### **Learning Outcome:**

Develop the ability to design and produce effective and aesthetically appealing maps using modern cartographic techniques and software. They will understand principles of cartographic design, color theory, and typography to create maps that convey spatial information clearly and accurately.

Scientific basis of Cartography, needs of map making, characteristics of maps, Geographical Coordinates (Latitude and Longitude), Graticules, types of Scales (Plain, and Diagonal Scale.)

### **Unit-II**

#### **Learning Outcome:**

Acquire knowledge in selecting and applying appropriate map projections for representing geographical data accurately, as well as mastering the skills to create and interpret dip strike maps to analyze geological structures effectively.

Meaning, Uses and types of Map Projection, Transformation of area, Distance and Direction, Choice of map projection, Interpretation of Bedding plane, Strike, Dip, structure & stratigraphy of Geological map, methods of determination of slope (Wentworth's method and Smith).

### **Unit-III**

#### **Learning Outcome:**

Gain proficiency in using GIS software to capture, store, manipulate, and analyze geospatial data. They will learn how to integrate various data layers, perform spatial queries, and create interactive maps to solve real-world geographical problems.

History of Geographical Information System, Components of GIS, Dimensions of GIS data- Conceptual (field/object) and logical (raster/vector), Data sources, data types (raster/vector/attribute), History of Remote Sensing, Types of Platform, Sensor characteristics, Aerial photographs and Visual interpretation of Satellite images, Global Positioning System (GPS) and Global Navigation Satellite System (GNSS), Applications of GIS and RS.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Acquire hands-on cum practical skills in using modern cartographic tools and geospatial technologies to create visually compelling maps and effectively analyze spatial data for various applications in geography, environmental studies, and other related fields.

1. Construction of Graphical, RF & Statement Scale, Diagonal Scale
2. Construction of Map Projections: Cylindrical and Conical Projection with one and two standard parallels and Zenithal.
3. Drawing of Choropleth and isopleth maps,
4. Slope Analysis (Wentworth's method).
5. Identification and mapping of water bodies from satellite imageries
6. Digitization of map and drawing of few point, line and polygon features.
7. Practical record and viva-voce

### **Suggested Readings:**

#### **Text Books:**

- ✓ Mishra R.P. and Ramesh, A., (1989) *Fundamentals of Cartography, Concept, New Delhi.*
- ✓ Monkhouse F. J. and Wilkinson H. R. (1973). *Maps and Diagrams. Methuen, London.*

#### **Reference Books:**

- ✓ Anson R. and Ormelling F. J., 1994: *International Cartographic Association: Basic Cartographic Vol. Pregmen Press.*
- ✓ Burrough, P. A. Donnell, & Rachael, Mc. (1998). *Principles of Geographical Information Systems' Oxford University press, New York.*
- ✓ Burrough, P.A., (1986). *Geographical Information System for land Resources System. Oxford Univ. Press, UK.*
- ✓ Bhatta, B. (2008). *Remote Sensing and GIS. Oxford University Press, New Delhi.*
- ✓ Lillesand and T. M., Kiefer R. W. and Chipman J. W. (2004). *Remote Sensing and Image Interpretation. Wiley.*
- ✓ Magwire, D.J. Goodchild, M.F. and Rhind, D.M. (2005). *Geographical Information Systems: Principles and Applications. Longman Group, U.K*
- ✓ Lo, C.P. & Yeung, A. K.W. (2006). *Concepts and Techniques of Geographic information Systems. Prentice Hall of India, New Delhi.*
- ✓ Robinson A. H. (2009). *Elements of Cartography. John Wiley and Sons, New York.*
- ✓ Sarkar, A. (2015). *Practical geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi.*
- ✓ Singh, R. L. & Singh R. P. B. (1999). *Elements of Practical Geography. Kalyani Publishers.*

## **Semester-III**

### **Core V**

### **Environmental Geography and Biogeography**

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

##### **Learning Outcome:**

Understand the concept of the environmental ecosystem, their types, structure, and functions, again they can also get a clear idea about biogeochemical cycles including Carbon, Oxygen, Nitrogen cycle etc.

Environment: Concept, Types and Characteristics and Principles; Environmental Controls and Concept of tolerance; Ecosystem: Concept, Types, Structure and Functions (Food Chain and Food Web, Trophic Level, Ecological Pyramid); Energy flow in Ecosystem; Bio-geo-chemical Cycles (Nitrogen, Carbon, Oxygen); Concept and Types of Biomes: (Equatorial, Subtropical, Temperate and Polar).

#### **Unit-II**

##### **Learning Outcome:**

Recognize the spatial aspects of biodiversity including the processes, dynamics, and distributions. They also get an idea about the different biodiversity including critical, endangered, and threatened and their related issues.

Introduction to Biogeography: Nature, Scope, Development; Ecological Succession: Succession, Change and Equilibrium; Key processes in Biogeography: Evolution, Speciation, Extinction, Dispersal; World Distribution patterns of Biota: Biogeographical Regions; Distribution of World's Biodiversity hotspots: Critical and Endangered, Threatened, relatively stable/intact.

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

##### **Learning Outcome:**

Gain the basic knowledge about pedology, including, the origin of soil, factors affecting soil formation, elements of soils and classification of soil on the basis of different criteria.

Soil Colour, Soil Texture and Soil Structure; Soil horizons; Soil forming Processes and Factors; Soils Classification: (a) Soil Classification by Maturity (Entisols, Inceptisols, Alfisols, Spodosols, Ultisols, Oxisols), (b) Soil Classification by Climate (Mollisols, Ardisols, Gelisols), (c) Soils Characterized by Parent Material (Vertisols, Andisols).

#### **Unit-IV: Practical**

##### **Learning Outcome:**

Students will realize the extension of different biomes and Man-Environment relationship in different biomes.

1. Submission of a Project Report on any environmental problem of global/national/local significance.

Or

2. Prepare a Seminar paper on biodiversity hotspots of India with special reference to the distribution, biotic characteristics, major threats, and possible solutions.
3. Report and Viva-Voce

### **Suggested Readings:**

#### **Text Books:**

- ✓ Chandna R. C. (2002). *Environmental Geography*. Kalyani, Ludhiana.
- ✓ Singh S. (1997). *Environmental Geography*. Prayag Pustak Bhawan. Allahabad.

#### **Reference Books:**

- ✓ Cunningham W. P. and Cunningham M. A., (2004). *Principles of Environmental Science: Inquiry and Applications*, Tata Macgraw Hill, New Delhi.
- ✓ Goudie A. (2001). *The Nature of the Environment*. Blackwell, Oxford.
- ✓ Huggett, R. John. (1998). *Fundamentals of Biogeography*. Routledge.
- ✓ Miller, G. T., (2004). *Environmental Science: Working with the Earth*. Thomson Brooks Cole, Singapore.
- ✓ Odum, E. P. et al, (2005). *Fundamentals of Ecology*. Ceneage Learning India.
- ✓ Sharma P.D. (2005). *Ecology and Environment*. Rastogi Publications, Meerut, UP.
- ✓ Strahler, A. (2013). *Introduction to Physical Geography*. Sixth Edition, Wiley.

## **Core VI**

## **Quantitative Techniques in Geography**

### **Unit-I:**

#### **Learning Outcome:**

Understand the nature and scope of Quantitative Techniques in Geography.

Data Processing in Geography: Sources of Data, Tabulation of data, Scales of Measurements in Geography, Frequency Distribution, Data Matrix. Sampling Methods: Probability and non-probability sampling, Types of Sampling (Simple Random, Systematic, Stratified and Purposive)



## **Unit-II:**

### **Learning Outcome:**

Acquire skills to handle Statistical Techniques in Geography

Descriptive Statistics: Central Tendencies – Mean, Median, Mode; Measures of Partitions - Quartile, Decile, Percentile; Measures of Dispersion- Standard Deviation and Coefficient of Variation, analysis of variance; Measures of inequality. Theoretical Distribution: Concept of Probability Distribution (Theoretical only), Normal Distribution – Characteristics, Area under Normal Curve. Relationship Analysis:

## **Unit-III:**

### **Learning Outcome:**

Apply the acquired skills to solve Statistical problems in Geographical Studies.

Correlation - Spearman's and Karl Pearson's coefficient of correlation; Simple Regression, test of significance. Logistic regression, multivariate factor analysis & Discriminate function analysis

## **Unit-IV: Practical**

### **Learning Outcome:**

*Proficiently apply quantitative methods and statistical techniques to analyze and interpret geographical data, enabling them to make well-informed and evidence-based decisions in various geographical contexts.*

1. Drawing of histogram, frequency curve and ogive in grouped and discrete data.
2. Calculation & drawing of graphs showing mean, median, mode in grouped and discrete data.
3. Calculation of mean deviation, standard deviation and coefficient of variation.
4. Calculation Rank correlation, Product moment correlation and Simple linear Regression
5. Practical Record and Viva-Voce.

### **.Suggestive readings:**

#### **Text Books:**

- ✓ Mahmood A. (1999). *Statistical Methods in Geographical Studies*. Rajesh Publications, New Delhi.
- ✓ Sarkar, A. (2013). *Quantitative Geography Techniques and Presentations*, Orient Blackswan.

#### **Reference Books:**

- ✓ Alvi, Z. (1995). *Statistical Geography: Methods and Applications*. Rawat

*Publications, Jaipur.*

- ✓ *Deshpande, B.R. (2007). Statistical Methods for Geography. Pragati Publications, Pune.*
- ✓ *Ebdon D. (1977). Statistics in Geography: A Practical Approach. Oxford, UK. Blackwell.*
- ✓ *Gupta, S.C., and Kapoor, V.K. (2018). Fundamentals of Mathematical Statistics. Sultan Chand & Sons, New Delhi.*
- ✓ *Katti, C.B. (2008). Basic Statistics for Geographers. Rawat Publications, Jaipur.*
- ✓ *Pal, S. K. (1998). Statistics for Geoscientists. Tata McGraw Hill, New Delhi.*
- ✓ *Rogerson P.A. (2014). Statistical Methods for Geography: A Student's Guide. Sage, New Delhi.*
- ✓ *Sarker, P.C. (2013). Fundamental Statistics for Geographers. Rawat Publications, Jaipur.*
- ✓ *Singh D. (2018). Elementary Statistical Methods. R K Books, New Delhi.*
- ✓ *Triola, M.F. (2019). Elementary Statistics. Pearson,*
- ✓ *Walford N. (2011). Practical Statistics for Geographers and Earth Scientists. Wiley-Blackwell, West Sussex, United Kingdom.*

## **Core VII**

## **Economic Geography**

### **Unit-I:**

#### **Learning Outcome:**

Understand and differentiate different types of economic activities and their utilities. Analyse the factors responsible for the location and distribution of economic activities.

Meaning and scope of economic geography; classification of economic activities; Factors affecting location of Economic Activity with special reference to agriculture, manufacturing and Services; Classification of world agricultural system of Whittlesey. Von Thunen theory of location of agricultural activity.

## Unit-II

### Learning Outcome:

Evaluate the significance and relevance of theories in relation to the location of different economic activities.

**Secondary Activities:** Manufacturing (Cotton Textile, Iron and Steel, Petrochemical), Major Industrial Regions of the world, Special Economic Zones and Technology Parks. **Tertiary Activities:** Transport (Land, Air, Water and Pipelines), Trade (National and International) ; Weber and Smith's Industrial location Theory.

## Unit-III:

### Learning Outcome:

Define and differentiate types of resources, their management and sustainable use.

Resource - Concept and Classification, Functional Theory of Resources, Distribution, Utilization, Problems and Management of World's Resources (Land, Water, Forest and Energy (Coal, petroleum and non-conventional), Mineral resources (Iron, Bauxite). Resource Development Regions of India; Resource depletion, conservation and Sustainable use of resources.

## Unit-IV: Practical

### Learning Outcome:

Create different types of thematic maps, charts and diagrams.

1. Determination and representation of agricultural efficiency (Kendall and Bhatia method).
2. Method of delineation of crop combination regions by Weaver and Doi's method.
3. Traffic flow diagram and Drawing of Isochrones, Isotims, Isodapanes.
4. Practical Record and viva –voce.

### Suggested Readings:

#### Text Books:

- ✓ Alexander J. W. (1963). *Economic Geography*. Prentice-Hall Inc., Englewood Cliffs, New Jersey.
- ✓ Roy, Prithwish (2014). *Economic Geography - A study of Resources*. New Central Book Agency, Kolkata

#### Reference Books:

- ✓ Durand L. (1961). *Economic Geography*. Crowell
- ✓ Gadgil M. and Guha R. (2005). *The Use and Abuse of Nature: Incorporating This Fissured Land: An Ecological History of India and Ecology and Equity*. Oxford University Press. USA.
- ✓ Gautam, Alaka (2016). *Advanced Economic Geography*. Sarada Pushtak Bhawan,

Allahabad.

- ✓ Gautam, Alaka (2018). *Geography of Resources: exploitation, conservation and management*. Sarada Pustak Bhawan, Allahabad
- ✓ Guha, J.L. and Chattaraj, P.R. (1989). *A New Approach to Economic Geography: A Study of Resources*. World Press Ltd., Kolkata 7. Hall, C.M. and Page.
- ✓ Harikesh N. Misra. (2014). *Managing Natural Resources- Focus on Land and Water*. Prentice Hall India Learning Private Limited.
- ✓ Hussain, M. (2017). *Resource Geography*. Anmol Publications, New Delhi.
- ✓ Klee G. (1991). *Conservation of Natural Resources*. Prentice Hall, Englewood
- ✓ Leong. G.C. and Morgan, G.C. (1975). *Human and Economic Geography*. Oxford University Press, Hong Kong
  
- ✓ Mahmood Aslam (2008). *Statistical Methods in Geographical Studies*. Rajesh Pub. New Delhi.
  
- ✓ Mishra R. P (1969). *Fundamentals of Cartography*. Concept Publication Company, New Delhi.
  
- ✓ Rees J. (1990). *Natural Resources: Allocation, Economics and Policy*. Routledge. London.
  
- ✓ Saxena, H.M. (2018). *Economic Geography*. Rawat Publication, New Delhi.
  
- ✓ Siddhartha K. (2017). *Economic Geography*. Kitab Mahal Publishers, New Delhi.
  
- ✓ Singh, R.L. and Singh R.P.B. (1999). *Elements of Practical Geography*. Kalyani Publishers, New Delhi.
  
- ✓ Sundaram. M, and M. Mrityunjay. (2004). *Natural Resources Management and livelihood Security Survival Strategies and Sustainable Policies*. Bhoovigyan Vikas Foundation.
  
- ✓ Zimmermann, E.W. (1933). *World Resources and Industries - A Functional Appraisal of the Availability of Agricultural and Industrial Materials*. New York.

## **Semester-IV**

### **Core VIII**

### **REMOTE SENSING AND GIS**

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

##### **Learning Outcome:**

Understand the nature and scope of GIS and RS vis a vis conventional Maps.

Sources and characteristics of spatial data: Maps vs RS images, Concept of Remote Sensing, Meaning and significance of EMR Spectrum, Elements of a RS image: Pixel, Digital Number (DN), Band, Resolution of Remote sensing data; Visual Interpretation of Aerial Photograph and Satellite imagery.

#### **Unit-II**

**LO:** apply the acquired skills to spatial problem solving situations and evaluate their efficacy over other methods.

Abstraction and representation of Spatial Data: Data Models in GIS, Vector Data Model, Types and Components of Vector data, Attribute data Management, Query of Spatial and non-spatial Data, Processing and Analysis of Vector Data, Geoprocessing, Overlay Analysis

#### **Unit-III**

##### **Learning Outcome:**

Able to interpret and analyze various satellite images and decode the information.

Working with Continuous spatial Data: Nature and processing of Raster Data, Various Gridded Data Sources and application, DEM, Interpretation of Remote Sensing images: Visual and Digital interpretation, Supervised and Unsupervised classification, LULC classification, NDVI, Accuracy assessment, Facility Information System using spatial data, Various other applications: Land Use planning, disaster management etc.

#### **Unit-IV: Practical**

**Learning Outcome:**

Acquire of skills to handle popular GIS and RS softwares to process and analyse spatial data

1. Visual Image Interpretation;
2. Vectorisation: digitisation, attribute data query, SQL;
3. Geoprocessing: Buffering, Union, intersection, merge, dissolve;
4. Subsetting and mosaicking Images, Indices, Image enhancement Rectification,
5. Image classification- supervised and unsupervised, accuracy assessment.
6. Report and Viva-Voce

**Suggested Readings:****Text Books:**

- ✓ Bhatta B., (2020). Remote Sensing and GIS, New Delhi: Oxford University Press.
- ✓ Jensen, J.R. and Jensen, R.R. (2018). Introductory Geographic Information Systems, Pearson Education.

**Reference Books:**

- ✓ Bernhardsen, T. (2002) *Geographical Information System: An Introduction*. Norway: John Wiley and Sons.
- ✓ Burrough, Peter. A., Rachel, A. M. and Lloyd C. D. (2015). *Principles of Geographical Information System*, Clarendon: Oxford University Press.
- ✓ Lillesand, K. C., (2008). *Remote Sensing and Image Interpretation*, New York: John Wiley and Sons.
- ✓ Chang, K. T., (2008). *Introduction to Geographical Information System*, Toronto: McGraw Hill Higher Education.
- ✓ Heywood, I., Sarah, C. and Steve, C., (2011). *An Introduction to Geographical Systems: Pearson Education Limited, India*.
- ✓ Lo, C.P. and Albert, K.W. Y., (2008). *Concepts and Techniques of Geographical Information System*, New Delhi: John Wiley and Sons.
- ✓ DeMers, Michael M. (2009) *GIS for Dummies*. New Jersey: John Wiley and Sons.
- ✓ Jensen, J.R, (2012). *Remote sensing of the environment: an Earth resource perspective*, New Delhi: Prentice Hall.
- ✓ Jensen, J R. (2018). *Introductory Digital Image Processing: A remote sensing perspective, 4<sup>th</sup> Edition (Indian Sub-continent edition): Pearson India Education Services*.
- ✓ Mohammad, N., Singh, R.B. and Dutta, A., (2007). *Spatial Information Technology*

*for Natural Resource Management, New Delhi: Concept Publishing Company.*

- ✓ Nag, P. and Sengupta, S., (2008). *Introduction to Geographical Information System*, New Delhi: Concept Publishing Company

## Core IX

## Geomorphology

### Unit-I

#### Learning Outcome:

Apply theoretical knowledge of geomorphology to real-world scenarios: demonstrate the ability to analyze and interpret various landforms and geological features in the field, applying geomorphic principles to understand their formation processes and evolutionary history.

Applied Geomorphology: Nature, Scope and significance; **Principles of Geomorphology**; Modern techniques in geomorphology and their application- Profile, Hypsometry, Altimetry and Clinographic Drainage Basin: Network Characteristics, Morphology, Phases of drainage network development; Major Landforms (Fluvial, Aeolian, Glacial, Karst and Coastal)

### Unit-II

#### Learning Outcome:

Assess and mitigate geomorphic hazards and to identify potential geomorphic hazards, such as landslides, erosion, and riverbank failures, and develop effective strategies to mitigate risks and protect communities and infrastructure in vulnerable areas.

Environmental Geomorphology: Meaning and Application; Natural hazards and environmental management; Geomorphic hazards: Volcanic, Earthquakes, Landslide and Floods; Anthropogenic activities and their effects on erosion and sedimentation. Urban geomorphology: Study of previous terrain of the cities; Application in urban planning. Concept of economic geomorphology.

### Unit-III

## Learning Outcome:

Evaluate human impacts on geomorphic processes and landforms and will examine the influence of human activities on the Earth's surface, including construction, mining, and deforestation, and assess their effects on geomorphic processes and long-term landform evolution.

Case Studies in Applied Geomorphology: Geomorphic application in soil studies; Geomorphology and Disaster Management; Geomorphology in engineering construction: Construction of large dams, roads, tunnels, and their impact; Coastal Geomorphology and Management; Land Degradation and Restoration; sustainable Geomorphological Practices;

## Unit IV: Practical

### Learning Outcome:

Design sustainable land use and development plans: Through integrating geomorphological data and analysis, learner will be equipped to propose and implement sustainable land use and development plans that consider geomorphic factors, ensuring long-term environmental stability and minimizing adverse impacts on landscapes and ecosystems.

1. Practical methods for geomorphic field surveys and data collection. Conducting field survey for collection data at different geomorphic settings
2. Hands-on experience with topographic maps, aerial photographs, and GPS for landform identification.
3. Utilizing remote sensing data and geographic information systems (GIS) for landform mapping and analysis
4. Digital terrain modeling and visualization of geomorphic features.
5. Drainage Morphometry: delineation of watershed, stream ordering; Morphometric analysis: mean stream length, drainage density and drainage frequency.
6. Integrating geomorphic data and analysis into land use planning for sustainable development.
7. Report and Viva- Voce

### Suggested Readings:

#### Text Books:

- ✓ Hussain, M. (2014). *Physical Geography*. Anmol Publication. New Delhi.
- ✓ Strahler, A. N., & Stahler, A. M. (2016). *Modern Physical Geography*. Wiley India, New Delhi.
- ✓ Thornbury, W. D. (1969). *Principles of Geomorphology*. Wiley Eastern.

#### Reference Books:

- ✓ Alcántara, I., & Goudie, A. S. (Eds.). (2010). *Geomorphological hazards and disaster prevention*. Cambridge University Press.
- ✓ Bird, E. C. (2008). *Coastal geomorphology: an introduction*. John Wiley & Sons.
- ✓ Bryant, R. H. (2016). *Physical Geography*. Rupa Publication. New Delhi.



- ✓ Chorley, R. J. (1972). *Spatial Analysis in Geomorphology*. Methuen, London.
- ✓ Garner, H. F. (1974). *The Origin of Landscape – A Synthesis of Geomorphology*. Oxford University Press, London.
- ✓ Hooke, J. M. (2020). *Changing landscapes: Five decades of applied geomorphology*. *Geomorphology*, 366, 106793.  
[https://livrepository.liverpool.ac.uk/3055638/1/Applied%20Geomorph%20%20Hooke%20\\_final.pdf](https://livrepository.liverpool.ac.uk/3055638/1/Applied%20Geomorph%20%20Hooke%20_final.pdf)
- ✓ Mitchell, C. W. (1973). *Terrain Evaluation*. Longman, London.
- ✓ Pandit, R., et.al (2020). *A framework to evaluate land degradation and restoration responses for improved planning and decision-making*. *Ecosystems and People*, 16(1), 1-18. <https://www.tandfonline.com/doi/pdf/10.1080/26395916.2019.1697756>
- ✓ Robinson, P. J., & Henderson, S. (1999). *Contemporary Climatology*. Henlow.
- ✓ Singh, S. (1998). *Geomorphology*. Prayag Publications, Allahabad.
- ✓ Singh, S. (2016). *Physical Geography*. Pravalika Publications, Allahabad.
- ✓ Stoddart, D. R. (Ed.). (1996). *Process and Form in Geomorphology*. Routledge, New York.
- ✓ Summerfield, M. (2013). *Global Geomorphology*. Routledge, New York.
- ✓ Wooldridge, S. W., & Morgan, R. S. (1959). *The Physical Basis of Geography - An Outline of Geomorphology*. Longman, London.

## **Core X**

## **Evolution of Geographical Thought**

### **Unit - I**

#### **Learning Outcome:**

Students will have specialized knowledge on the contribution of ancient and medieval geographers to the real character of geography.

Geographical concepts of ancient and medieval period: Contributions of Greek, Roman , Indian and Arab scholars.

### **Unit-II**

#### **Learning Outcome:**

Students will have improved knowledge on systematic and regional approaches in geography.

Modern period: Contributions of Alexander Von Humboldt, Carl Ritter, Ratzel, Vidal De La Blache and Mackinder.

### **Unit-III:**

### **Learning Outcome:**

Students will have greater understanding about different schools of thoughts enriching the subject matter of geography.

Dichotomy and dualism in Geography– Environmental Determinism and Possibilism, Systematic and Regional Geography, Ideographic and Nomothetic, Physical and Human Geography. Recent Trends in Geography– Quantitative Revolution, Behaviouralism and Radicalism.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Students will have greater understanding through report writing and seminar presentation on various geographical perspectives, approaches and methods from ancient classical period to the present scenario.

Submission of Project Report and Presentation on any of the following:

1. Analysis and Comparison of areas of geographical works between Classical Greek vs Roman Geographers.
2. Analysis of different perspectives in historical development of geographical thinking in the modern period.
3. Analysis of different perspectives, approaches and methods involved in the advancement of geographical thinking in recent times.
4. Report and Viva-Voce.

#### **Suggested Readings:**

##### **Text Books:**

- ✓ Dixit, R.D. (1994). *The Art and Science of Geography: Integrated Readings*. Printice Hall of India.
- ✓ Martin. J. Geoffrey. (2005). *All Possible Worlds: A history of Geographical Ideas*. Oxford University Press, New York

##### **Reference Books:**

- ✓ Adhikari, S. (1992). *Fundamentals of Geographical Thoughts*. Chaitanya Publishing House, Allahabad, India.
- ✓ Rana, L. (2014). *Geographical Thought: Classical to Contemporary*. Concept Publishing Company, New Delhi.
- ✓ Hartshorne, R. (1959). *Perspectives of Nature of Geography*. Rand MacNally and Co.
- ✓ Holt-Jensen A. (2011). *Geography: History and Its Concepts: A Students Guide*,

SAGE.

- ✓ *Husain, Majid (2015). Evolution of Geographical Thought. Rawat Publications, Jaipur.*
- ✓ *Peet, R. (1998). Modern Geographical Thought. Blackwell Pub, UK.*

## **Semester-V**

### **Core XI REGIONAL PLANNING AND DEVELOPMENT**

#### **Unit-1**

##### **Learning Outcome:**

Understand regional dynamics and can delineate the boundary of different regions.

Concept of Region, Types of regions: Formal, Functional and Planning Region, Need for Regional Planning, Characteristics of an Ideal Planning Region and delineation of Formal and Functional regions. Planning Regions; Approaches and Methods.

#### **Unit-II**

##### **Learning Outcome:**

Understand the theories and models associated with regional planning at global and local level.

Theories and Models for Regional Planning: Growth Pole Model of Perroux; Myrdal, Hirschman, Rostow, Export Base Model, Core-Periphery Model and Modified Growth Foci approach of R.P.Mishra.

#### **Unit-III**

### **Learning Outcome:**

Acquainted with different type's plans associated with urban and rural planning as well as their method of preparation.

Regional Disparity and Imbalances in India, Strategies for balanced regional development in India through Policies and Programmes in FYPs, concept and characteristics of city master plan, NCR Planning, Decentralised planning in India: District Plan and Multi Level Planning in India, Formulation and function of Niti Ayog, Development planning skills, Welfare program of different sectors, Special Component plan: Tribal Sub Plan and Weaker Section plan Allocation and Principles and Methods of participatory planning.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Plan, manage and deliver the end quality product required by the country in the field of regional planning, at various levels and in various areas.

1. Regional Disparity based on socio-economic indicators at C.D Block/ Tehsil / District/ state by range equalization/ Z-Score method and prepare choropleth maps.
2. Practical record and viva-voce.

#### **Suggested Readings:**

##### **Text Books:**

- ✓ Misra, R.P. (1992) *Regional Planning: Concepts, techniques, Policies and Case Studies*. Concept, New Delhi.
- ✓ Chand, M and Puri V.K. (1983). *Regional planning In India*, Allied Publishers, New Delhi.

##### **Reference Books:**

- ✓ Bhat L.S. (1972). *Regional Planning In India*, Statistical Publishing Society.
- ✓ Claval, P.I. (1998). *An Introduction to Regional Geography*, Blackwell Publishers, Oxford and Massachusetts
- ✓ Friedmann J. and Alonso W. (1975). *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
- ✓ Glasson, J. (1974). *An introduction to regional planning: Concepts, theory and practice*.
- ✓ Kulshetra, S.K (2012): *Urban and Regional Planning in India: A handbook for Professional Practitioners*. Sage Publication, New Delhi.

- ✓ *Misra, R.P, Sundaram K.V, PrakashRao, VLS (1974). Regional Development Planning in India. Vikas Publication, New Delhi.*
- ✓ *Peet R., (1999). Theories of Development. The Guilford Press, New York.*
- ✓ *UNDP (2001-04). Human Development Report. Oxford University Press.*
- ✓ *World Bank (2001-05). World Development Report. Oxford University Press, New Delhi.*

## **Core XII**

## **Geography of Odisha**

### **Unit-I:**

#### **Learning Outcome:**

Understand the locations, physiography, climatic conditions, and distribution of soils in Odisha.

Geological Structure: Distribution of Major Rock Systems; Physiographic Divisions; Factors Influencing Climate of Odisha; Climatic Regions; Major Soil Types; Natural Vegetation.

### **Unit-II**

#### **Learning Outcome:**

Acquaint themselves with thorough understanding of the demographic structure

Growth, Distribution and Density of Population; Population Composition: Linguistic, Rural-Urban; Distribution of Cities and Towns; Regional Variation in Folk Housing Types in Rural Odisha; Processes and Dynamics of Migration in Odisha.

### **Unit-III**

#### **Learning Outcome:**

Familiar with the socio-cultural activity in Odisha.

Geographical Factors Behind Odisha's History and Culture; Evolution of Odia Language and Regional Variations; Diversity of Tribes and Social Formation; Regional Variation of Food Preferences and Habits; Folk and Popular Odia Cultures; Identifying Vernacular Cultural Regions of Odisha.

### **Unit-IV**

#### **Learning Outcome:**

Understand economy and Natural Disaster of Odisha.

Major Farming Types; Industrial Belts of Odisha; Cottage and Handicraft Industries of Odisha; Fisheries: Fresh and Marine; Aspirational districts and other major welfare schemes, Natural Disaster and Odisha (Cyclone, Flood): Risk and Vulnerability; Paradigm Shifts in Disaster Management: Success Stories of Odisha.

### **Suggested readings:**

#### **Text Books:**

- ✓ *Sinha, B. N. (2017). Geography of Odisha, National Book Trust, New Delhi*
- ✓ *Roy, G. C. (2023). Geography of Odisha. Kitab Mahal, Cuttack.*

#### **Reference Books:**

- ✓ *Pati, M. (1992). West Orissa: A study in Ethos. Sambalpur University Publication, Sambalpur.*
- ✓ *O'Malley, L.S. S. (2017). Provincial Geographies of India: Bengal, Bihar, Odisha and Sikkim. Eds. T. H. Holland. Cambridge University Press, New York.*
- ✓ *Sterling, Andrew and James Peggs. (1846). Orissa. John Snow, London.*
- ✓ *Behera, J.K. and G.K. Panda. (2020). Vulnerability Analysis of Cyclone Hazards and the Changing Dimensions of Disaster Risk management in Odisha along the East Coast of India. International Journal of Recent Scientific Research 11 (08): 39445-39453.*
- ✓ ଆଦିକନ୍ଦ୍ର ସାହୁ. (2003). ସମ୍ବଲପୁର: ଭାଷା, ସାହିତ୍ୟ, ସଂସ୍କୃତି. ସମ୍ବଲପୁର ବିଶ୍ୱବିଦ୍ୟାଳୟ ପ୍ରକାଶନ, ସମ୍ବଲପୁର.
- ✓ ଆଶୁତୋଷ ପ୍ରସାଦ ପଟ୍ଟନାୟକ. (2017). ଆକା ମା ବୋଇ: ସାମୁଦ୍ରିକ ବାଣିଜ୍ୟ ଓ ସାଂସ୍କୃତିକ ବିବର୍ତ୍ତନ. ଫ୍ରେଣ୍ଡସ୍ ପବ୍ଲିଶରସ୍ କଟକ.

## **Core XIII**

## **Climatology and Oceanography**

### **Unit-I:**

#### **Learning Outcome:**

Acquaint with the overview of the fundamental concepts of Earth's climate and weather system.

Weather: Stability and instability, barotropic and baroclinic conditions; Inversion of temperature: types, causes and consequences; Condensation: Process and forms. Mechanism of precipitation: Bergeron-Findeisen theory, collision and coalescence. Forms of precipitation;

### **Unit-II**

### **Learning Outcome:**

Understand the basic thermodynamic concepts for the atmosphere related to atmospheric stability and LOfud formation, and to be able to explain weather phenomena

Air mass: Typology, origin, characteristics and modification; Fronts: Warm and cold, frontogenesis and frontolysis; Circulation in the atmosphere: Planetary winds, jet streams, index cycle; Monsoon circulation and mechanism with reference to India; Climatic classification-Koppen and Thornthwaite. Overview of climate change: Warm and cold climatic phases; Greenhouse effect. Formation, depletion and significance of the ozone layer.

### **Unit-III**

#### **Learning Outcome:**

To demonstrate a systematic, extensive, and coherent knowledge and understanding of the ocean and atmospheric system, its manifestations, variability and change, and their applications and implications for society

Major relief features of the ocean floor: Characteristics and origin according to plate tectonics; Physical and chemical properties of ocean water; Ocean temperature and salinity: Ocean circulation, wave and tide; Distribution and determinants; Coral reefs: Formation, classification and threats; Marine resources: Classification and sustainable utilization; Sea level change: Types and causes.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Equipped with relevant skills in the field of ocean and atmospheric sciences, along with a critical thinking of the established theories, latest developments, and ability to use modern state-of-the-art techniques for observations and analyses

Measurement of weather elements using analogue instruments: Mean daily temperature, air pressure, relative humidity, rainfall; Construction and interpretation of hythergraph and climograph (G. Taylor); Construction and interpretation of wind rose; Construction and interpretation of rating curves

#### **Suggested Readings:**

##### **Text Books:**

- ✓ *Critchfield, H. J. (2010). General Climatology. Prentice Hall India Ltd.*
- ✓ *Lal, D.S. (2013) Climatology and Oceanography. Sharda Pustak Bhawan, Allahabad.*

##### **Reference Books:**

- ✓ *Barry, R.G. & Chorley R.J. (2009). Atmosphere Weather and Climate. Routledge.*
- ✓ *Garrison, T. (1998). Oceanography. Wordsworth Cp, Bedmont*
- ✓ *K. Siddhartha (2001) Atmosphere, Weather and Climate. Kisalaya publication, New Delhi*

- ✓ Lal, D.S. 2012. *Climatology*. Sharda Pustak Bhawan.
- ✓ Lutgens, F.K., Tarbuck, E.J. 1998. *The Atmosphere: An Introduction to Meteorology*, 9th Ed, PrenticeHall Inc.
- ✓ Monkhouse, F.J., Wilkinson, H.R. 1971. *Maps and Diagrams: Their Compilation and Construction*, 3<sup>rd</sup> ed (2017 reprint), Alphaneumera-Kolkata.
- ✓ Oliver, J.E., Hidore J.J. 2002. *Climatology: An Atmospheric Science*, Pearson Education India.
- ✓ Raghunath, H.M. 2006. *Hydrology: Principles, Analysis, Design*, 3rd ed, New Age International Publishers.
- Ahrens, C.D. 2012. *Essentials of Meteorology: An Invitation to the Atmosphere*. 9th Ed, Cengage Learning.
- ✓ Sen, P.K. 1989. *Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters*, University of Burdwan.
- ✓ Singh, S. (2003). *Physical Geography (English and Hindi Editions)* Prayag Pustak Bhawan, Allahabad.

## Semester-VI

### Core XIV

### Geography of India

#### Unit-I:

#### Learning Outcome:

Understand the locations, physiography, climatic conditions, and distribution of soils in India.

Physiography divisions of India, Himalayan and Peninsular rivers, watershed and interlinking rivers, India's Climatic classification by Koeppen and Trewartha, Mechanism of Indian monsoon, Soils: distribution and characteristics of major soil groups.

#### Unit-II

#### Learning Outcome:

Acquaint themselves with thorough understanding of the Indian Agriculture and regional disparities in agricultural development.

Agricultural regionalization-Agro climatic zones, regional disparities in agricultural development, Govt. Schemes related to Agriculture; Green revolution, white, blue revolution and its socio economic cum ecological implications. Joint Forest Management, Social



forestry, Conventional and non-conventional sources of energy, Energy Crisis and Conservation, Biosphere reserves and National Parks.

### **Unit-III**

#### **Learning Outcome:**

Familiar with the Industries, industrial policy and transport networks of India.

Industries: Types and classifications, Factors of location and development of jute, Tea, Paper, Fertilizer and IT industries, Industrial policies in India, SEZs, Transport system of India: Roadways, Railways, Ports, Inland waterways, Airways and Pipeline network, Growing importance of ports in national and foreign trade.

### **Unit-IV**

#### **Learning Outcome:**

Understand the regional development and planning and political Aspects of India.

Experience of regional planning in India: Five year plans; integrated rural development programmes; Panchayati Raj and decentralized planning; Command area development; Watershed management; planning backward area, desert, drought-prone, hill tribal area development, Multi-level planning, Geographical basis of Indian federalism, State reorganization, Emergence of new states, Regional consciousness and inter-state issues, International boundary of India and related issues.

#### **Suggested readings:**

##### **Text Books:**

- ✓ *Khullar, D. R. (2018). India: A Comprehensive Geography. New Delhi: Kalyani Publishers.*
- ✓ *Deshpande C. D. (1992). India: A Regional Interpretation. ICSSR, New Delhi.*

##### **Reference Books:**

- ✓ *Husain, M. (2022). Geography of India. New Delhi: Tata McGraw-Hill Education.*
- ✓ *Sharma, T. C. (2003). India - Economic and Commercial Geography. Vikas Publ., New Delhi.*
- ✓ *Singh, J. (2003). India - A Comprehensive & Systematic Geography. Gyanodaya Prakashan,*
- ✓ *Gorakhpur.*
- ✓ *Sharma, T.C. (2013). Economic Geography of India. Rawat Publication, Jaipur*

**Unit-I:**

**Learning Outcome:**

Get an idea about development of urban Geography and its relevance.

Concept of Urban, Urbanization and Urbanism; Nature and scope of urban geography; Urban geography: a sub discipline (evolution); Classification of towns and cities: Census (Census vs. statutory towns) and functional classification (million plus cities, metropolitan, megalopolitan, cosmopolitan, compact city, virtual city, network city, world class city, global city, inclusive city, sustainable city and concept and planning of smart city).

**Unit-II:**

**Learning Outcome:**

Understand the concepts and critically recent concepts in urban geography

Origin and evolution of urban settlements; Hierarchy of urban settlements; concept of urban region; slum: a unique character of Indian cities, concept of ghettoization and gentrification; Urban public places; Peri-urban: concept, challenges and opportunities; unequal cities; urban planning, policy and governance.

**Unit-III:**

**Learning Outcome:**

Comprehend the emerging patterns of urban settlements and related issues

Models of Internal Structure of the City-Burgess, Hoyt, Harris and Ullman; Central Place theory of Christaller; Trends and patterns of urbanization in World and India; Urbanization: problems and opportunities; Recent urban changes.

**Unit-IV: Practical**

**Learning Outcome:**

To ensure the practical knowledge on urban geography.

1. Calculate the applicability of Law of Primate City and Rank Size Rule in the context of India.
2. Analyse the trends of urban growth in Odisha by using census data.
3. Identify the major cities of Odisha (Class I) and local urban centres of your concern district in the Odisha map.

**Suggested Readings:**

### **Text Books:**

- ✓ *Alan Latham, Derek McCormack, Kim Mcnamara, Donald Mcneill. 2009. Key concepts in urban geography. Sage.*
- ✓ *Michael Pacione. 2009. Urban Geography: a global perspective. Routledge.*
- ✓ *R. Ramachandran. 1997. Urbanization and urban systems in India. OUP India.*
- ✓ *Surender Singh and Jitender Saroha. 2021. Urban geography. Pearson Education.*
- ✓ *Tim Hall. 2006. Urban geography. Routledge.*

### **Reference Books:**

- ✓ *Daniel, P.A. and Hopkinson, M.F. (1989). The Geography of Settlement. Oliver & Boyd, London.*
- ✓ *Ghosh, Sumita. (1998). Settlement Geography. Orient Longman, Hyderabad.*
- ✓ *Hudson, F.S. (1970). A Geography of Settlements. Macdonald and Evans Ltd.*
- ✓ *Knowles, R and J. Wareing. (1976). Economic and social geography. Rupa Publications India Pvt Ltd, New Delhi.*
- ✓ *Leong, G.C & Morgan, G.C. (1982). Human and Economic Geography. Oxford university press, Oxford.*
- ✓ *Singh, R.Y. (2003). Geography of Settlements. Rawat, Jaipur.*
- ✓ *Stone. K.H. (1965). The Development of a Focus for the Geography of Settlement. Economic Geography. 41 (4): 346-355.*

## **Semester-VII**

### **Core XVI**

### **Research Methodology**

#### **Unit -I**

##### **Learning Outcome:**

The learners will get the initial training on various steps involved in geographical research.

Research in Geography: Meaning and significance; Need for research; Types of research; Research Design; Defining research problems; Development of theoretical background- literature review, identifying research gap and research questions and objectives of study; Hypothesis building; Framework of research writing; research ethics.

#### **Unit -II**

##### **Learning Outcome:**

They will develop the idea on fundamentals of research methodology including data collection, methodology and report writing.

Definition and type of research materials and methods; Methods of data collection- primary and secondary; Differentiating Questionnaire and Schedule; Techniques of writing dissertation: preparing drafts, abstract and keywords, citations, references, bibliography; Plagiarism: classification and prevention.

### **Unit -III**

#### **Learning Outcome:**

This course also aims to develop fundamental research aptitude among all the students. Besides the course explores the theoretical background to some extent

Fieldwork in Geographical studies: role and significance; Selection of study area and objectives; Pre-field academic preparations. Ethics of fieldwork. Field techniques and tools: Observation (participant, non-participant), questionnaires (open, LOsed, structured, non-structured); Interview; Landscape survey using transects and quadrants, constructing a sketch, photo and video recording; Post-field tabulation, processing and analysis of quantitative and qualitative data; Fieldwork: logistics and handling of emergencies.

### **Unit IV: Practical**

#### **Learning Outcome:**

Above all consists of practical components with programs built on open source. Basic programming is included

1. Identification of research problem
2. Keyword and search query development
3. Searching literature using google scholar and dimension
4. Effective summarizing of literature and writing literature review
5. Problematization/mapping research gap
6. Framing research objective and methodology
7. Development and submission of a research proposal
8. Viva-Voce

#### **Suggested Readings:**

##### **Text Books:**

- ✓ Murthy, K.LN. 2004. *Research Methodology in Geography: A Text Book*, Concept Publishing Co.
- ✓ Clifford, N., Cope, M., Gillespie, T.W., French, S. (Eds) 2016. *Key Methods in Geography*, 3rd ed, Sage.

##### **Reference Books:**

- ✓ Gomes, B., Jones III, J.P. (Eds) 2010. *Research Methods in Geography: A Critical Introduction*, WileyBlackwell.
- ✓ Lenon, B., Cleves, P. 2015. *Geography Fieldwork and Skills*, Harper-Collins.
- ✓ Montello, D.R, Sutton, P. 2012. *An Introduction to Scientific Research Methods in Geography and Environmental Studies*, 2nd ed, Sage.

- ✓ Northey, N., Draper, D., Knight, D.B. 2015. *Making Sense in Geography and Environmental Sciences: A Student's Guide to Research and Writing*, 6th ed, Oxford University Press.
- ✓ Parsons, T., Knight, P.G. 2015. *How To Do Your Dissertation in Geography and Related Disciplines*, 3rd ed, Routledge.
- ✓ Riordan, D. 2013. *Technical Report Writing Today*, 10th ed, Wadsworth Publishing.
- ✓ Phillips, R., Johns, J. 2012. *Fieldwork for Human Geography*, Sage.
- ✓ Thornbush, M.J., Allen, C.D., Fitzpatrick, F.A. (Eds) 2014. *Geomorphological Fieldwork*, Elsevier.
- ✓ Monkhouse, F.J. and Williamson, R.H. (1963): *Maps and Diagrams: Their Compilation and Construction*, Methuen, London
- ✓ Saha, P.K. and Basu, P. (2009): *Advanced Practical Geography, Books and Allied (P) Ltd., Kolkata*
- ✓ Sarkar, A. (2008): *Practical Geography: A Systematic Approach*, Orient Black Swan, Kolkata
- Narasinha Murthy, R.L. (2014) *Research Methodology in Geography*, Concept, New Delhi

## **Core XVII**

## **Natural Hazards and Disaster Management**

### **Unit-I:**

#### **Learning Outcome:**

To understand the nature and scope of Climate Change and Disaster Management.

Understanding Climate Change: Overview of climate change: Definition of climate change and climate variability, climate risks, Disasters, Hazards, Risk, Vulnerability- Definition, Concept and Classification. Global warming, Greenhouse effect, sea level rise, Climate change adaptation strategy.

### **Unit-II:**

#### **Learning Outcome:**

To learn the Climate Change and Disaster Adaptation and Mitigation strategy.

Physical, social and economic vulnerability, disaster management- Disaster Management Cycle, Community Based Disaster Management. Role of NDMA and SDMA in Disaster Mitigation Strategy.

### **Unit-III:**

**Learning Outcome:**

To learn the extreme climatic events and their effects.

Types of Disasters: Natural and Man made, Floods, Droughts, Cyclones, thunderstorms, tornado, Earthquakes and landslides, lightning, Oil spills, Chemical and Biological attacks.

**Unit-IV: Practical:****Learning Outcome:**

To apply the tools and techniques for disaster awareness and mitigation.

**Project report/Term paper**

1. Disaster management: International- Yokohama Strategy for a Safer World 1994,
2. Hyogo framework for Action 2005-2015; Sendai Framework for Disaster Risk Reduction 2015-2030;
3. Indian Policy for disaster management: Disaster Management Act 2005,
4. 10 point Agenda of Prime minister on DRR.
5. Viva-Voce.

**Suggestive readings:****Text Books:**

- ✓ Ravindranath, N.H., & Joshi, P.K. (2012). *Climate change, disasters and vulnerabilities in India*. Springer.
- ✓ Singh, S. (2021). *Disaster Management*. Pravalika Publication.

**Reference Books:**

- ✓ Asthana, N.C. and Asthana P. (2014). *Disaster Management*. Pointer Publishers
- ✓ Bryant, E. (2004). *Natural Hazards*. Cambridge University Press, India
- ✓ Barry, R.G, Chorley R.J. 2009. *Atmosphere Weather and Climate.*, Routledge.
- ✓ Huq, S., Rajan, S.C., & Pachauri, R.K. (2014). *Climate change and disaster management in India*. Springer.
- ✓ Kapur, A. (2010). *Vulnerable India: A Geographical Study of Disasters*. Sage Publications,
- ✓ Smith, Keith (2013). *Environmental Hazards: Assessing risk and reducing disasters*. Routledge, Taylor and Francis Group.
- ✓ Wisner, B., Blaikie P et al. (2004). *At Risk: Natural Hazards, People's Vulnerability and Disasters*. Routledge, Taylor and Francis Group , NY, ([https://www.preventionweb.net/files/670\\_72351.pdf](https://www.preventionweb.net/files/670_72351.pdf))
- ✓ Singh R.B. (ed.) (2006). *Natural Hazards and Disaster Management: Vulnerability and Mitigation* . Rawat Publications, Jaipur.
- ✓ Singh, J. (2007). *Disaster Management: Future Challenges and Opportunities*. IK International Pvt. Ltd, New Delhi. Sinha, A. (2001). *Disaster Management: Lessons drawn and Strategies for Future*. New United Press, New Delhi.
- ✓ Modh, S. (2010). *Managing Natural Disaster: Hydrological, Marine and Geological Disasters*. Macmillan, Delhi.

## **Core XVIII     Natural Resource Management and Geo informatics**

### **Unit-I**

#### **Learning Outcome:**

Understand and appreciate the importance of natural resources and identify different challenges associated with the natural resources

Natural Resource Base (land, water, forest, biodiversity, minerals), classification of resources,

Resource depletion and problem of pollution, Resource Curse, historical evolution of NRM

Measures: policy and practices; threats to NR and need for management, Valuation methods of

Natural resources.

### **Unit-II:**

#### **Learning Outcome:**

Analyse the outcome of managing the Natural resources under different resource regimes and evaluate various options available to carry out sustainable resource management.

Management of Resources under different property regimes: (Public, Private, Commons and Open Access). Threats to commons, tragedy of commons, Ostrom's idea on institutional designs; Measures of NRMs: Watershed Management, Forest Management, JFM-Forest Rights Act, CAMPA, Wetland Management, Grassland Management, Ecosystem services of Nature as per MEA (Millennium Ecosystem Assessment).

### **Unit-III:**

#### **Learning Outcome:**

Understand the debate between environment and development and evaluate the alternative options available to plan for sustainable development.

Application of Geoinformatics in mapping and monitoring NR: watershed delineation, soil erosion estimation, forest area and health monitoring, forest fire studies, water body monitoring, ground water management, Conjunctive use of tank-groundwater, Adaptive crop planning. Examples from governmental and -governmental practices of NRM.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Apply different GIS techniques to measure, analyse challenges of NR degradation and create suitable models for management.

1. Open sources Remote sensing data, watershed management
2. Geo-spatial analysis operation using DEM data, USLE through GIS, NDVI and other indices, change detection, hot spot analysis.
3. Field visit and reporting on Common Property Resource/ Open Access Resource/Ecosystem Services (from a nearby area in Odisha)
4. Viva-Voce

### **Suggested Readings:**

#### **Text Books:**

- ✓ Chiras, Daniel D., and Reganold, John P. (2014), *Natural Resource Conservation: Management for a sustainable future*. (10<sup>th</sup> Edition) Edinburgh Gate, England: Pearson Education Limited.
- ✓ Mohammad, N., Singh, R.B. and Dutta, A., (2007). *Spatial Information Technology for Natural Resource Management*, New Delhi: Concept Publishing Company.

#### **Reference Books:**

- ✓ Gibson-Graham, J. K., & Miller, E. (2015). *Economy as ecological livelihood. Manifesto for Living in the Anthropocene*, 7-16.
- ✓ Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science*. 162:1243- 1248  
<https://www.youtube.com/watch?v=pohA4DNUGo8>
- ✓ Huron, A. (2015). *Working with strangers in saturated space: Reclaiming and maintaining the urban commons*. *Antipode*, 47 (4), 963-979.
- ✓ Jensen, J R. (2018). *Introductory Digital Image Processing: A remote sensing perspective, 4th Edition (Indian Sub-continent edition): Pearson India Education Services*.
- ✓ Jensen, J.R, (2012). *Remote sensing of the environment: an Earth resource perspective*, New Delhi: Prentice Hall.
- ✓ Jensen, J.R. and Jensen, R.R. (2018). *Introductory Geographic Information Systems*, Pearson Education.
- ✓ Jodha, N S (1998): 'Poverty and Environment Resource Degradation – An Alternative Explanation and Possible Solutions', *Economic and Political Weekly*, September 5-12, pp 2384-90
- ✓ Nadkarni, M. V. (2000). *Poverty, environment, development: A many patterned nexus*. *Economic and Political Weekly*, 1184-1190
- ✓ Nayak, P. K., & Berkes, F. (2008). *How to keep commons as commons in the long run: Formation and distortions of property regimes in Chilika Lagoon, India*.
- ✓ Ostrom, E. (Ed). (2001). *Drama of commons*, Washington DC: National Academy Press.
- ✓ Singh C. (1986). *Common property and common poverty: India's Forests, forest dwellers & the Law: Proceedings of the National Level Meeting of SPWD held at Delhi*.
- ✓ Temper, L., & Martinez-Alier, J. (2013). *The god of the mountain and Godavarman: Net Present Value, indigenous territorial rights and sacredness in a bauxite mining conflict in India*. *Ecological Economics*, 96, 79-87.



- ✓ Yanagisawa, H. (2008). *The decline of village common lands and changes in village society: south India, c. 1850–2000. Conservation and Society*, 6(4), 293-307.

## **Core XIX                      Human Development and Sustainable Development**

### **Unit-I**

#### **Learning Outcome:**

Understand the concepts of sustainable development, human health and well-being.

Development: Concept and Indicators, Physical Quality of Life Index (PQLI) and Human Development Index (HDI), Goals of Development-Economic Growth, Distributive Justice, Ecological Sustainability; Sustainable development-Concept and Approaches.

### **Unit-II**

#### **Learning Outcome:**

Comprehend the need, importance and features of SDGs.

Goals to Sustainability- UN's 17 SDGs; Localizing sustainable development goals; Population dynamics and Sustainable Development goals, Global health and Sustainable development goals.

### **Unit-III**

#### **Learning Outcome:**

Deliberate the basic concepts of epidemiology and public health.

Concepts of Health and Wellbeing; Factors affecting Human Health and Diseases; Concepts of morbidity and its measurements, WHO International Classification of Diseases; communicable and non-communicable diseases; Epidemiological Transition Theory; Evolution of population and health policies in India; Health Inequalities in India with special reference to Odisha-Regional, Social and economic; India's performance in health related SDGs.

### **Unit-IV: Practical**

#### **Learning Outcome:**

Can accomplish various practical outlines about the SDGs.

1. Identification and estimation of development indicators
2. Measurement of PQLI
3. Measurement of HDI
4. Tracking SDGs with reference to health indicators.
5. Viva-Voce

## Suggested Readings

### Text Books:

- ✓ Sundaram, K.V. (1983). *Geography of Underdevelopment: Spatial Dimensions of Underdevelopment, Concept, New Delhi*
- ✓ United Nations (1990). *Human Development Report-1990*

### Reference Books:

- ✓ Desai, V and Potter. R (2001). *The Companion to Development Studies*, Hodder Arnold.
- ✓ Gatrell, A.C. (2002). *Geographies of Health: An Introduction*, Blackwell,
- ✓ Gatrell, A., and Loytonen (1998). *GIS and Health*. London: Taylor and Francis Ltd.
- ✓ Gesler, W.M. (1992). *Therapeutic landscapes: Medical issues in light of the new cultural geography*. *Social Science and Medicine* 34: 735–46.
- ✓ Meade. M.S and Emch M (2010). *Medical Geography*. London: The Guilford Press.
- ✓ Rais, A. and Learmonth, A.T.A (2018). *Geographical Aspects of Health and Diseases in India*. Concept Publishing Company Pvt. Ltd
- ✓ Smyth, Fiona (2008). *Medical geography: Understanding health inequalities*. *Progress in Human Geography* 32 (1): 119-127.
- ✓ Niti Ayog (2019). *Localising SDGs: Early Lessons from India*,
- ✓ [https://www.niti.gov.in/sites/default/files/2020-07/LSDGs\\_July\\_8\\_Web.pdf](https://www.niti.gov.in/sites/default/files/2020-07/LSDGs_July_8_Web.pdf)
- ✓ <https://sdgs.un.org/goals>
- ✓ <https://sdghelpdesk.unescap.org/e-library/localizing-sdgs-strategies-and-plans>
- ✓ <https://mphdegree.usc.edu/blog/global-public-health-the-sustainable-development-goals-report/>
- ✓ <https://populationmatters.org/un-sdgs/>
- ✓ <http://sdg.iisd.org/news/unfpa-report-highlights-role-of-population-dynamics-in-sustainable-development-agenda/>

## Semester-VIII

### Geospatial Modelling, Artificial Intelligence and Machine Learning Core XX

#### Unit-I: Basics of Modeling

##### Learning Outcome:

Understand the principles of spatial modeling and its applications in geography.

Introduction to spatial modeling concepts, Types of spatial models: deterministic, stochastic, and hybrid; Spatial interpolation techniques: IDW, Kriging, Spline interpolation; Regression analysis in geography: Linear, Logistic, and Spatial regression; Agent-based modeling and its applications in geography

## **Unit-II: Machine Learning**

### **Learning Outcome:**

Gain knowledge of fundamental concepts and algorithms in machine learning.

Fundamentals of machine learning; Types of machine learning: supervised, unsupervised, and reinforcement learning; Key machine learning algorithms: Random forest (RF), Support vector machines (SVM), decision trees; Unsupervised machine learning: K-means clustering, k-nearest neighbors, Neural networks, Principle Component Analysis; Feature selection methods: filter methods, wrapper methods, embedded methods and Dimensionality reduction techniques: PCA, LDA (Linear Discriminant Analysis), feature hashing; Model evaluation metrics: accuracy, precision, recall, F1-score, AUC-ROC curve; Applications of machine learning in geography: land cover classification, spatial data analysis (Landslide, Flood, Forest fire, species distribution modeling, urban growth prediction etc.).

## **Unit-III: Basics of Big Data Science and Internet of Things**

### **Learning Outcome:**

*Explore the concepts and applications of Big data Science and the Internet of Things (IoT) in geography and spatial analysis.*

Understanding big data in the context of geography; Introduction to big data technologies: Hadoop, MapReduce, Spark; Geospatial big data analytics: spatial indexing, spatial clustering, spatial data mining; Overview of the Internet of Things (IoT) and its applications in geography; IoT devices and sensors for collecting geospatial data: GPS, remote sensors, drones; IoT architectures and communication protocols: MQTT, CoAP, LoRaWAN; Integration of IoT data with geographic information systems (GIS).

## **Unit-IV: Practical**

### **Learning Outcome:**

To be equipped with the knowledge and skills to tackle complex geographic challenges and leverage emerging technologies for innovative solutions in various domains such as environmental science, urban planning, natural resource management, and disaster risk reduction.

### **Practical Exercise 1: Implementing IDW, Kriging, and Spline Interpolation**

Students will be provided with spatial datasets containing point data (e.g., rainfall, temperature measurements) and tasked with interpolating values across a spatial grid using various interpolation techniques. They will use GIS software (QGIS) to perform the interpolation and visualize the results.

### **Practical Exercise 2: Conducting Linear, Logistic, and Spatial Regression**

Description: Students will analyze spatial datasets related to a specific geographic phenomenon (e.g., land cover changes over time) and evaluate the model's goodness of fit and statistical significance; Perform regression analysis to identify relationships between predictor variables (e.g., flood risk levels), Interpret the coefficients and odds ratios and the response variable of interest. They will use statistical software (e.g., R or Python) to fit regression models and assess model performance.

### **Practical Exercise 3: Building an Agent-Based Model**

Description: Students will develop a simple agent-based model to simulate the behavior of entities (agents) within a geographic environment. They will define rules and interactions between agents and their environment, run simulations, and analyze model outputs to understand emergent spatial patterns and dynamics. They can use platforms like NetLogo or develop custom simulations using programming languages like Python.

### **Practical Exercise 4: Implementing Random Forest, Decision Trees, Support Vector Machines (SVM), and Neural Networks**

Description: Students will work with geospatial datasets (e.g., satellite imagery, and species occurrence data) and apply supervised and unsupervised machine learning algorithms to classify or predict geographic phenomena (e.g. LULC, flood, Landslide hazard, etc.). Assess the model's performance using metrics such as accuracy, precision, recall, and ROC curve analysis.

### **Practical Exercise 5: Spatial Indexing and Clustering with Big Data Technologies**

Description: Students will work with large-scale geospatial datasets and utilize big data technologies such as Hadoop and Spark to perform spatial indexing and clustering operations. They will implement algorithms like R-tree indexing and k-means clustering to efficiently process and analyze spatial data distributed across multiple nodes.

### **Practical Exercise 6: Integrating IoT Sensor Data into GIS**

Description: Students will collect geospatial data from IoT sensors (e.g., weather stations, and air quality monitors) and integrate it with GIS software for visualization and analysis. They will use protocols like MQTT or APIs provided by IoT platforms to access real-time sensor data and develop workflows to ingest, process, and visualize IoT data within GIS environments.

### **Suggested Readings**

#### **Text Book**

- ✓ Parker, R. N., & Asencio, E. K. (2009). *GIS and spatial analysis for the social sciences: Coding, mapping, and modeling*. Routledge.

- ✓ Arjun, P. (2019). *Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes*. Apress: London, UK.S
- ✓ Bishop, Christopher. *Neural Networks for Pattern Recognition*. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
- ✓ Duda, Richard, Peter Hart, and David Stork. *Pattern Classification*. 2nd ed. New York, NY: Wiley-Inter science, 2000. ISBN: 9780471056690.
- ✓ Hastie, T., R. Tibshirani, and J. H. Friedman. *The Elements of Statistical Learning: Data Mining, Inference and Prediction*. New York, NY: Springer, 2001. ISBN: 9780387952840.
- ✓ MacKay, David. *Information Theory, Inference, and Learning Algorithms*. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989. Available on-line here.
- ✓ Mitchell, Tom. *Machine Learning*. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.

## Other References

- ✓ *Spatial Modeling in GIS and R for Earth and Environmental Sciences*. (2019). *Spatial Modeling in GIS and R for Earth and Environmental Sciences*. Elsevier. <https://doi.org/10.1016/c2017-0-02950-6>
- ✓ Heppenstall, A. J. J., Crooks, A. T., See, L. M., & Batty, M. (2012). Agent-based models of geographical systems. *Agent-Based Models of Geographical Systems* (pp. 1–759). Springer Netherlands. <https://doi.org/10.1007/978-90-481-8927-4>.
- ✓ Lovelace, R., Nowosad, J., & Muenchow, J. (2019). *Geocomputation with r*. *Geocomputation with R* (pp. 1–335). CRC Press. <https://doi.org/10.1201/9780203730058>.
- ✓ Arshdeep, B. (2019). *Big Data Analytics: A Hands-On Approach*. Resonance (Vol. 21, pp. 695–716).
- ✓ Müller, A. C., & Guido, S. (2016). *Introduction to machine learning with Python: a guide for data scientists*. " O'Reilly Media, Inc."
- ✓ Lea, P. (2018). *Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security*. Packt Publishing Ltd.
- ✓ Garrard, C. (2016). *Geoprocessing with python*. Simon and Schuster.
- ✓ Dixon, A. P. (2015). Review of GIS Tutorial for Python Scripting. *Cartographic Perspectives*, (80), 51–52. <https://doi.org/10.14714/cp80.1306>
- ✓ De Smith, M. J., Goodchild, M. F., & Longley, P. (2007). *Geospatial analysis: a comprehensive guide to principles, techniques and software tools*. Troubador publishing ltd.
- ✓ Cielen, D., & Meysman, A. (2016). *Introducing data science: big data, machine learning, and more, using Python tools*. Simon and Schuster.

Heppenstall, A. J., Crooks, A. T., See, L., & Batty, M. (n.d.). *Agent-Based Models of Geographical Systems*. [E-book]. Retrieved from [Link]

Torgo, L., & Bertrand, P. (Eds.). (n.d.). *Machine Learning for Geospatial Data Analysis: Techniques, Tools, and Applications*. [E-book]. Retrieved from [Link]

Lovelace, R., Nowosad, J., & Muenchow, J. (n.d.). *Geocomputation with R*. [E-book]. Retrieved from [Link]

Bahga, A., & Madiseti, V. (n.d.). *Big Data Science & Analytics: A Hands-On Approach*. [E-book]. Retrieved from [Link]

Lea, P. (n.d.). *Internet of Things for Architects: Architecting IoT Solutions by Implementing Sensors, Communication Infrastructure, Edge Computing, Analytics, and Security*. [E-book]. Retrieved from [Link]

Allen, D. W. (n.d.). *GIS Tutorial for Python Scripting*. [E-book]. Retrieved from [Link]

de Smith, M. J., Good child, M. F., & Longley, P. A. (n.d.). *Geospatial Analysis: A Comprehensive Guide*. [E-book]. Retrieved from [Link]

Stanton, J. (n.d.). *Introduction to Data Science*. [E-book]. Retrieved from [Link]

Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (n.d.). *Geographic Information Science and Systems*. [Textbook]. Retrieved from [Link]

## Core XXI

## Field Survey: Tools and Technique

### Unit-I

#### Learning Outcome:

understand the rationale, principles and classifications of field survey

**Field survey:** Understand the rationales of field survey in Geography; approaches to field survey; basic principles of field survey; Classification of field survey;

### Unit-II:

#### Learning Outcome:

understand different types of physical survey, their scope and limitations

**Physical survey:** Plain Table survey: meaning and definition, instruments, steps, methods, advantages & limitations; Dumpy level survey: Definition, components, steps, methods,

advantages & limitations; Prismatic Compass survey: Definition, components, steps, methods, advantages & limitations;

### **Unit-III:**

#### **Learning Outcome:**

understand the concepts of different types of quantitative and qualitative socio-economic survey

**Socio-economic survey** : Meaning and concept, Objectives, Sources of data, methods of data collection (quantitative and qualitative), Quantitative survey: basic concepts of sampling, planning a primary socio-economic survey, questionnaire preparation and pretesting of questionnaire, data collection using pen and paper or digital devices, types of possible errors (sampling and non-sampling), data management and quantitative data analysis; Qualitative survey; , key informant interview (KII), Focus Group discussion (FGD), Participatory Rapid Appraisal (PRA), preparation of discussion guideline for KII and FGDs; qualitative quantitative data analysis, content analysis, ethics of primary data collection,

### **Unit- IV: Practical**

**LO:** acquire skill set to conduct different physical and socio-economic primary survey in geographical research

1. Plain Table Survey/ Dumpy Level survey/ Prismatic Compass Survey
2. For a project report using socio-economic survey data in a selected village, preparation of questionnaire for a quantitative household survey and preparation of guideline for FGDs with a group of women/ men on a social issue and PRA
3. Preparation of project report on socio-economic survey in a village using above quantitative and qualitative data\
4. Viva-Voce

#### **Suggested Readings:**

##### **Text Books:**

- ✓ Kothari, C.R.: *Research Methodology. (2004). Methods and Techniques, New Age, New Delhi.*
- ✓ *Social Survey Methods by Paul Nicholas (2009), Oxfarm Publishers Delhi.*

##### **Reference Books:**

- ✓ Hammond, R. and McCullagh, P.S. (1987): *Quantitative techniques in Geography: An Introduction, OPU Oxford.*
- ✓ Krishnan, G. and Singh, Nina. (2017). *Researching Geography, Routledge, London,*
- ✓ Kumar, Ranjit: *Research Methodology. (2011). A step-by-step guide for beginners, Sage, New Delhi.*
- ✓ Kultar Singh (2007): *Quantitative Social Research Methods , Sage Publication*
- ✓ Mishra R.P. Ramesh. A (2000): *Fundamentals of Cartography. Concept Publishing Company, New Delhi*
- ✓ Nicholas, Paul (2009), *Social Survey Methods, Oxfarm Publishers Delhi.*

- ✓ Robinson, A.H., et al. (2009): *Elements of Cartography*. 6th edn. John Wiley & Son, New York. Robinson, A.H., et al. (2009): *Elements of Cartography*. 6th edn. John Wiley & Son, New York.
- ✓ Saha, P. and Basu, P. (2013): *Advanced Practical Geography*. Book & allied Ltd. Kolkata.
- ✓ Sarkar, A. (1997): *Practical Geography: A Systematic Approach*, Orient BlackSwan Ltd. Hyderabad. Singh. 10.R.L and Singh. R.P.B. (2010). *Elements of Practical Geography*. Kalyani Pub. New Delhi.
- ✓ Saldaña, J. (2011). *Fundamentals of qualitative research*. New York, NY: Oxford University Press.
- ✓ *Social Survey Methods* by Paul Nicholas (2009), Oxfarm Publishers Delhi.
- ✓ Sjoberg, Gideon and Nett, Roger. (2009): *methodology for social research*. Rawat, New Delhi Sjoberg, Gideon and Nett, Roger. (2009): *methodology for social research*. Rawat, New Delhi

## Core XXII

## Political Geography and Globalisation

### Unit-I

#### Learning Outcome:

understand the complex contemporary world power structure and the role of geography in global politics.

Political geography: concept, nature, scope and evolution; Concept of state, nation and nation-state; Attributes of state: frontiers, boundaries, buffer zone, population, territory, sovereignty; Geopolitics: concept, and theories (Heartland and Rimland)

### Unit-II

#### Learning Outcome:

differentiate the State, Nation and Nation State and carry research on strategies compatible to the present technological development

Political geography and systems of government: Federalism, Local self-government administration, Creation of new states; Political geography of resource conflicts: inter-state river water sharing disputes; Conflicts on forest rights and mineral resources; Politics of Displacement: Issues of relief, compensation and rehabilitation with special reference to Dams and Special Economic Zones (SEZs)

### Unit-III



**Learning Outcome:**

establish a clear idea about the relationship of India with its neighbouring countries and also about some international organizations along with their role and importance.

Geo-Economic and Political Blocks: UNO, SAARC and ASEAN, NATO, EU, OPEC and BRICS; India as a global power with special reference to G20; India and its relationship with neighbouring countries: Pakistan, China, Nepal, Bhutan, Bangladesh, Myanmar and Sri Lanka

**Unit-IV: Practical****Learning Outcome:**

impart knowledge about political processes operating in society, and how the global and local orders have been reshaped by the power structure and geopolitical factors.

- 1: Prepare a map of the performances of political parties in the last general election in the constituencies of Odisha by using digital cartography by using the data from Election Commission of India.
- 2: Prepare a suitable visualization on State wise percentage share of electors in India by using the data from Election Commission of India.
- 3: Map the types of parliamentary constituencies (SC, ST, GEN) in Odisha by using the data from Election Commission of India.
- 4: Mapping the Indian Ocean region: trade and maritime boundaries.

**Suggested Readings****Text Books:**

- ✓ *Dikshit, R.D. (2000). Political Geography: A Contemporary Perspective. New Delhi: Prentice-Hall.*
- ✓ *Cox K., (2002). Political Geography: Territory, State and Society. Wiley-Blackwell.*

**Suggested Readings**

- ✓ *Agnew J., (2002). Making Political Geography. Arnold.*
- ✓ *Agnew J., Mitchell K. and Toal G., (2003). A Companion to Political Geography. Blackwell.*
- ✓ *Cohen, S. (1964). Geography and Politics in a World Divided. New York: Random House.*
- ✓ *Cox K. R., Low M. and Robinson J., (2008). The Sage Handbook of Political Geography. Sage Publications.*

- ✓ *de Blij, H.J. and Glassner, M. (1968). Systematic Political Geography. New York: John Wiley & Sons.*
- ✓ *Dikshit, R.D. (1987). Political Geography and Geopolitics. New Delhi: Tata McGraw Hill.*
- ✓ *Dwivedi, R.L. (2004). Fundamentals of Political Geography. Allahabad: Chaitanya.*
- ✓ *Gallaher, C., Dahlman, C.T., Gilmartin, M., Mountz, A. and Shirlow, P. (2009). Key Concepts in Political Geography. London: Sage Publications Ltd.*
- ✓ *Glassner, M., (1993). Political Geography. New York: John Wiley & Sons.*
- ✓ *Hodder D., Sarah J L. and Keith S. M. (1998). Landlocked States of Africa and Asia (vo.2). Routledge.*
- ✓ *Jones, M., (2004). An Introduction to Political Geography: Space, Place and Politics. London: Routledge.*
- ✓ *Mathur H. M. and M. M. Cernea (ed.). (1995). Development, Displacement and Resettlement – Focus on Asian Experience, Delhi: Vikas.*
- ✓ *Painter, J. and Jeffrey, A. (2009). Political Geography. London: SAGE Publications Ltd.*
- ✓ *Prescott, J.R.V. (1972). The Political Geography. London: Methuen.*
- ✓ *Taylor, P. and Flint, C. (2000). Political Geography. Essex: Pearson Education, Harlow.*
- ✓ *Verma M. K. (2004). Development, Displacement and Resettlement. Delhi: Rawat Publications,*

#### **Data sources for Practical (Unit 4)**

- ✓ *Election Commission of India, Elections, 2019 (17 LOK SABHA), 9 - STATE WISE NUMBER OF ELECTORS. <https://eci.gov.in/files/file/13587-9-state-wise-number-of-electors/>*
- ✓ *Election Commission of India, Elections, 2019 (17 LOK SABHA), 4 - LIST OF SUCCESSFUL CANDIDATE – 2019. <https://eci.gov.in/files/file/13597-4-list-of-successful-candidate/>*

### **Core XXIII**

### **Social and Cultural Geography**

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

#### **Learning Outcome:**

Understand the spatial dimensions of socio-cultural diversities for promoting equality, social justice and wellbeing, harmony.

Definition and Nature of Social Geography; Social Geography in the Realm of Social Sciences; Concept of Social Structure and its importance in Indian Social Realities;

Understanding early Cultural differentiation and Social Formation in India: Spatial distribution of *Sodasa* (Sixteen) *Mahajanapadas*, Mughal Provinces and British Provinces.

## **Unit-II**

### **Learning Outcome:**

enhance the socially aware conscience by knowing the social and cultural components of social groups, regions, and localities for sustainable coexistence

Concepts of Social Justice and Wellbeing; Social Inclusion and Exclusion: Conceptual understandings; Geographies of Gated Communities and Slums; Social Empowerment: Major Schemes of Social Empowerment in India; Affordable Housing Schemes for Low and Moderate-income Resident in India: Concept and Government Initiatives in India (Pradhan Mantri Awas Yojana and Biju Pucca Ghar Yojana).

## **Unit-III:**

### **Learning Outcome:**

Comprehend the cultural dimensions of space and their correlates.

Meaning and definition of Culture and Cultural traits, Types of Culture: Folk and Popular Culture, Cultural Realms of the World, Cultural Hearth; Diffusion of Innovations: Spatial Dimensions; Concept, Types and Conservation of Geo-heritage.

## **Unit-IV: Practical**

### **Learning Outcome:**

Highlight and ponder upon the socio-culturally induced local problems and their solutions.

1. Delineate the prominent residential localities and social morphology of your village or town/city in accordance with the distribution of housing units in terms of caste, tribe, class, religion, and ethnicity.
2. Prepare a sketch map based on field observation.
3. Identify a few Geo-heritage sites and explore the role of culture and local initiatives in its conservation.
4. Produce a brief report with field photographs.
5. Prepare a brief report on how the adoption of popular culture in the wake of cultural globalization is a major cause of environmental pollution and degradation in your localities with evidence and examples.
6. Report and Viva-Voce

### **Suggested Readings:**

### **Text Books:**

- ✓ Ahmed A., (1999). *Social Geography*. Rawat Publications.
- ✓ Ali, A. & Hemant (2023). *An Introduction to the Social Geography of India: Concepts, Problems and Prospects*. Routledge.

### **Reference Books:**

- ✓ Casino V. J. D., Jr., (2009). *Social Geography: A Critical Introduction*. Wiley Blackwell.
  - ✓ Cater J. and Jones T., (2000). *Social Geography: An Introduction to Contemporary Issues*. Hodder Arnold.
  - ✓ Holt L., (2011). *Geographies of Children, Youth and Families: An International Perspective*. Taylor & Francis.
  - ✓ Panelli R., (2004). *Social Geographies: From Difference to Action*. Sage.
  - ✓ Rachel P., Burke M., Fuller D., Gough J., Macfarlane R. & Mowl G. (2001). *Introducing Social Geographies*. Oxford University Press.
  - ✓ Smith D. M. (1977). *Human geography: A Welfare Approach*, Edward Arnold, London.
  - ✓ Smith D. M. (1994). *Geography and Social Justice*, Blackwell, Oxford.
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