



**ADAMAS UNIVERSITY**  
**SCHOOL OF BASIC AND APPLIED SCIENCES**  
**DEPARTMENT OF GEOGRAPHY**

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**Program Name:**

**B.Sc. (GEOGRAPHY)**

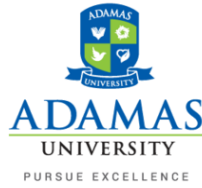
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**Course Structure 2023-24**

(Course Structure modified as per the Board of Studies meeting held on 21<sup>st</sup> June 2023)

SCHOOL OF BASIC AND APPLIED SCIENCES								
UNDERGRADUATE COURSE STRUCTURE								
B.Sc. (Hons) GEOGRAPHY: BATCH 2024-28								
SEMESTER I								
Sl. No.	Type of Course	Code	Title of the Course	Credit				Remarks
				L	T	P	C	
1	CC	GEO101	Geotectonics and Geomorphology	3	0	1	4	CC-1
2	CC	GEO102	Cartographic Techniques	1	0	3	4	CC-2
3	MDC		Choose one from a pool of MDC courses				3	
4	AEC		Choose one from a pool of AEC courses				3	
5	Minor		Choose one from a pool of Minor courses				4	
6	VAC		Choose one from a pool of VAC courses				2	
							<b>Semester Credits: 20</b>	
SEMESTER II								
7	CC	GEO103	Human Geography	3	0	1	4	CC-3
8	CC	GEO104	Thematic Mapping and Surveying	1	0	3	4	CC-4
9	MDC		Choose one from a pool of MDC courses				3	
10	AEC		Choose one from a pool of AEC courses				3	
11	SEC		Choose one from a pool of SEC courses				2	
12	Minor		Choose one from a pool of Minor courses				4	
13	VAC		Choose one from a pool of VAC courses				2	
							<b>Semester Credits</b>	<b>22</b>
SEMESTER III								
14	CC	GEO201	Climatology	3	0	1	4	CC-5
15	CC	GEO202	Statistical Methods in Geography	1	0	3	4	CC-6
16	MDC		Choose one from a pool of MDC courses				3	
17	AEC		Choose one from a pool of AEC courses				2	
18	SEC		Choose one from a pool of SEC courses				2	
19	Minor		Choose one from a pool of Minor courses				4	
20	VAC		Choose one from a pool of VAC courses				2	
							<b>Semester Credits</b>	<b>21</b>
SEMESTER IV								
21	CC	GEO203	Hydrology and Oceanography	3	0	1	4	CC-7
22	CC	GEO204	Economic Geography	3	0	1	4	CC-8
23	CC	GEO205	Fundamentals of GIS	1	0	3	4	CC-9
24	SEC		Choose one from a pool of SEC courses				2	
25	Minor		Choose one from a pool of Minor courses				4	
26	VAC		Choose one from a pool of VAC courses				2	
							<b>Semester Credits</b>	<b>20</b>
SEMESTER V								
27	CC	GEO301	Environmental Geography	3	0	1	4	CC-10
28	CC	GEO302	Regional Planning and Development	3	0	1	4	CC-11
29	CC	GEO303	Fundamentals of Remote Sensing	1	0	3	4	CC-12
30	SEC		Choose one from a pool of SEC courses				2	
31	Minor		Choose one from a pool of Minor courses				4	
32	INT	GEO304	Internship				4	
							<b>Semester Credits</b>	<b>22</b>
SEMESTER VI								
33	CC	GEO305	Geography of India	3	0	1	4	CC-13
34	CC	GEO306	Evolution of Geographical Thought	3	0	1	4	CC-14
35	CC	GEO307	Field Work	0	0	4	4	CC-15
36	SEC		Choose one from a pool of SEC courses				2	
37	Minor		Choose one from a pool of Minor courses				4	
38	Project	GEO308	Project	0	0	4	4	
							<b>Semester Credits</b>	<b>22</b>
<b>Total Credits of the Program after 3<sup>rd</sup> Year</b>				<b>127</b>				

<b>SEMESTER VII</b>								
39	CC	GEO401	Agricultural Geography	3	0	1	4	CC-16
40	CC	GEO402	Urban Geography	3	0	1	4	CC-17
41	CC	GEO403	Advanced Geoinformatics	1	0	3	4	CC-18
42	CC (with research)	GEO404	Research Methodology	3	0	1	4	CC-19 (With Research)
43	CC (without research)	GEO405	Resource Geography	3	0	1	4	CC-19 (Without Research)
44	Minor		Choose one from a pool of Minor courses				4	
							<b>Semester Credit</b>	<b>20</b>
<b>Semester VIII</b>								
45	CC	GEO406	Disaster Management	3	0	1	4	CC-20
46	CC (without research)	GEO407	Population and Settlement Geography	3	0	1	4	CC-21 (Without Research)
47	CC (without Research)	GEO408	Geography of Health and Wellbeing	3	0	1	4	CC-22 (Without Research)
48	Minor (without research)		Choose one from a pool of Minor courses				4	
49	Minor (without research)		Choose one from a pool of Minor courses				4	
50	Dissertation	GEO409	Dissertation	0	0	12	12	
							<b>Semester Credit</b>	<b>20</b>
<b>Total Credits of the Program after 4th Year</b>				<b>167</b>				



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**Program Name:**  
**B.Sc. (Hons) GEOGRAPHY**  
**Program Code: GEO3304**

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**Syllabus 2023-24**

(Course Structure modified as per the Board of Studies meeting held on 21<sup>st</sup> June 2023)

## **Title of the Course: Geotectonics and Geomorphology**

**Code: GEO101**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the composition and structure of the Earth's crust and interior.

CO2. **Explain** the formation of various crustal features created by crustal deformation and tectonic movement.

CO3. **Relate** the fundamental laws and concepts of geomorphology with the evolution of landforms.

CO4. **Interpret** the history of landform development in different morphoclimatic regions.

CO5. **Identify** different type of rocks and minerals.

CO6. **Interpret** the geological structures and landform development from Geological maps

### **Course Content**

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#### **Unit 1: Origin of the Earth and its Interior:**

Structure of the Earth-Interior, Discontinuity and Seismic Waves, Rocks: Igneous, Sedimentary, and Metamorphic

#### **Unit II: Deformation and Tectonics:**

Endogenic and Exogenic Processes; Folds and Faults — Origin and Types, Concept of Isostasy and Isostatic Compensation, Continental Drift, Sea Floor Spreading, Plate Tectonic theory: landforms at plate margins and hotspots; Mountain Building: Orogenic types and Classification - relation with Tectonics, Volcanism and Volcanic landforms

#### **Unit III: Fundamentals of Geomorphology:**

Definition and scope of Geomorphology, Landscape, and Landforms; Uniformitarianism and Neocatastrophic Approaches, Basic Concepts of Geomorphology, Geological time scale, System Approach- Concept and Classification. Development of River Network on Folded, Faulted, Uniclinal, and Domal structures

#### **Unit IV: Geomorphological Processes and Landforms:**

Processes of Rock Weathering, Mass wasting and their effects on landform; General Erosion and Depositional Processes; Landforms on granite, basalt, and limestone; Landforms: Fluvial, Glacial, Fluvio-Glacial, Aeolian, Fluvio-Aeolian; Landscape Evolution Models- Davis, Penck, King, Hack

#### **Unit V: Megascopic Identification of Rocks & Minerals:**

Rocks: granite, basalt, dolerite, shale, sandstone, limestone, conglomerate, laterite, slate, phyllite, schist, marble, quartzite, gneiss; Minerals: talc, gypsum, calcite, mica, feldspar, quartz, chalcopryrite, hematite, magnetite, bauxite, galena.

#### **Unit VI: Geological Map**

Study of Horizontal, Vertical, and tilted beds along with the alignment of contours: Study of strike, dip, and bedding plane, drawing of sections on uniclinal and simple folded structures depicting unconformity, the succession of beds and their thickness, Interpretation of the section covering the geological history and the relation between topography and structure.

### **Recommended Readings:**

1. Husain Majid 2010, Fundamentals of Physical Geography, Second Edition, Rawat Publications, Jaipur and New Delhi.

2. Siddartha K. 2018, Earth Dynamic Surface (Transworld Media & Communications – Publication – Patna,
3. Strahler, A.N. and Strahler, A.H. 1984, Elements of Physical Geography, John Wiley, New York.
4. Selby, M.J., 2005, Earth's Changing Surface, Indian Edition, OUP
5. Singh Savindra (2019), Physical Geography, Prayag Pustak Bhawan, Allahabad.
6. Bloom, A.L. 1992, Geomorphology- Systematic Analysis of Late Cenozoic Landforms, Prentice Hall India, New Delhi.
7. Singh Savindra 2019, Geomorphology, Prayag Pustak Bhawan, Allahabad
8. Strahler, A .N. 1988, Earth Sciences, Harper and Row Publishers, N.D.
9. Thornbury, W.D. 1969. Principles of Geomorphology, 2nd ed, Wiley-India / CBS.
10. Chorley, R.J. 1969: Introduction to Fluvial Processes, Methuen, London
11. Chorley, R.J., Schumm, S. A. and Sugden, D.E. 1984: Geomorphology, Methuen, London
12. Dayal, P. 1996: Textbook of Geomorphology, Shukla Book Depot, Patna.
13. Kale, V. and Gupta, A. 2001: Introduction to Geomorphology, Orient Longman, Kolkata
14. McCullagh, P. 1978: Modern Concepts in Geomorphology, Oxford University Press, Oxford.
15. Morisowa, M. 1968: Streams, their Dynamics and Morphology, McGraw Hill, New York.
16. Ollier, C.D. 1975: Weathering, Longman, London
17. Selby, M. J. 1991: Earth's Changing Surface, Clarendon Press, London
18. Small, R.J. 1978: The Study of Landforms, Cambridge University Press, Cambridge
19. Sparks, B.W. 1960: Geomorphology, Longman, London.
20. Summerfield, M.J. 2003. Global Geomorphology: An Introduction to the Study of landforms, Longman.
21. Strahler, A. 2016. Introducing Physical Geography, 6th ed, Wiley.
22. Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India
23. Harvey, A. 2012. Introducing Geomorphology: A Guide to Landforms and Processes, Dunedin Academic Press.
24. Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.
25. Gregory, K.J., Lewin, J. 2014. The Basics of Geomorphology: Key Concepts, Sage.
26. Billings, M.P. 1971. Structural Geology, Pearson.
27. Frisch, W., Meschede, M., Blakey, R.C. 2011. Plate Tectonics: Continental Drift and Mountain Building, Springer.

**Title of the Course: Cartographic Techniques****Code: GEO102****L-T-P-C: 2-0-2-4****Course Outcomes**

On completion of this course, the students will be able to

CO1. **Understand** the basic concept of different types of scale.

CO2. **Compare** different map scales and area measurement techniques.

CO3. **Demonstrate** the need and calculation techniques of various types of map projections.

CO4. **Construct** various types of planers, conical and cylindrical map projections.

**Course Content**

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**Unit I: Map Scale Representation; Enlargement – Reduction; Area Measurement and Instrument Identification:**

Linear, Diagonal, and Vernier scale drawing, Enlargement and reduction – Mathematical calculations, Area measurement by Graphical Method, Lab instruments: Clinometer, Abney Level, and Slide Caliber.

**Unit II: Map Projections - Planer Case**

Concept, classification, and suitability of map projections, Construction, and properties of Planer (azimuthal) Projection – i. Polar Zenithal Gnomonic Projection. ii. Polar Zenithal Stereographic Projection, iii. Polar Zenithal Orthographic Projection, iv. Polar Zenithal Equidistant Projection, v. Polar Zenithal Equal Area Projections

**Unit III: Map Projection – Conical and Cylindrical Cases**

Construction and properties of Conical Projection –i. Simple Conical Projection with one standard parallel, ii. Bonne's Projection, iii. Sinusoidal Projection, iv. Polyconic Projection. Construction and properties of –i. Cylindrical Equal Area, ii. Mercator's Projection

**Unit IV: Laboratory notebook and viva voce****Recommended Readings:**

1. Dury, G.H. 1972: Map Interpretation, Pitman Publishing, London
2. Ishtiaque, M. 1989: Practical Geography, Heritage Publishers, New Delhi.
3. Monkhouse, F.J. 1971: Maps and Diagrams, Methuen, London
4. Sarkar, Ashis, Practical Geography: A Systematic Approach, Orient Longman Pvt. Ltd., Kolkata.2000
5. Singh, R.L. and Singh, R.P.B. 1992: Elements of practical Geography.
6. Basu Patha. Practical Geography.
7. Gupta K.K. and Tyagi, V. C., 1992: Working with Map, Survey of India, DST, New Delhi.
8. Mishra R.P. and Ramesh, A., 1989: Fundamentals of Cartography, Concept, New Delhi.
9. P Saha and P Basu; Advanced Practical Geography, Books & Allied Ltd. Publisher (3rd Revised edition).
10. Robinson A. H., 2009: Elements of Cartography, John Wiley and Sons, New York.
11. Robinson, A.H., Morrison, J.L., Muehrcke, P.C., Kimerling, A.J. and Guphill, S.C. 1995: Elements of Cartography, John Wiley and Sons, New York.

## **Title of the Course: Human Geography**

**Code: GEO103**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Summarize** the concepts of social structure, social processes, social pattern, and social space.

CO2. **Explain** the social well-being controlled by various social elements and issues.

CO3. **Relate** the elements of culture, cultural groups, and cultural processes contributing in the development of cultural landscapes.

CO4. **Describe** the history and evolution of human societies in different regions.

CO5. **Proficient** in holistic social research and index application.

### **Course Content**

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#### **Unit I: Concept and Components of Social Geography**

Definition, Scope, and Content of Social Geography, Social Structure, and Social Processes: Macro and Micro; Social Patterns, Concept of Space: Social Space, Material Space; Social Elements; Caste, class, religion, race, and their spatial distribution; Social Area Analysis

#### **Unit II: Social Wellbeing and Planning**

Concepts of social well-being, quality of life: Gender and social well-being – Health and nutrition, housing, education, and empowerment; Social geographies of inclusion and exclusion: Poverty, literacy, slums, gated communities, communal conflicts, gender bias and crime; Social Impact Assessment: Concept and importance

#### **Unit III: Cultural Geography**

Concept of culture in Geography; Definition, scope, and content of cultural geography, Cultural Groups: Ethnic, linguistic, and religious; Cultural hearth and realm, Cultural regions, Cultural landscape; Cultural assimilation, integration, and diffusion

#### **Unit IV: Human Adaptation to the Environment:**

Evolution of human societies: Hunting and food gathering, pastoral nomadism, subsistence farming, and industrial society; Development–environment conflict; Human adaptation to the environment: case studies of Eskimo, Bushman, Beduin; Gonds, Masai, Maori, Gujjars

#### **Unit V: Human Perspectives & Development Indices**

Preparation of questionnaire on social problems, perception through ethnographic surveys, Indices to development and inequality: HDI, Poverty Index, GDI, Sopher's Disparity Index

### **Recommended Readings:**

1. Ahmed, A. (2004): Social Geography, Rawat Publication, New Delhi
2. Chapman, K. (1979): People, Pattern, and Process – An Introduction to Human Geography
3. Ghosh, S (2020): A Brief Account of Human Geography, Educreation Publishing.
4. Grover, N. (2004): Cultural Geography: Form and Process, Concept Publishing Co.
5. Guha, R. C: Social Geography. Rawat Publication, New Delhi
6. Chandna, R.C. 2016. Geography of Population: Concepts, Determinants, and Patterns, Kalyani Publishers.
7. Fouberg, E.H., Murphy, A.B., de Blij H.J. 2015. Human Geography: People, Place, and Culture, 11th ed, Wiley.
8. Ghosh, S. 1998. Introduction to Settlement Geography, Sangam Books Ltd.
9. Gould, W.T.S. 2015. Population and Development, Routledge.

10. Gregory, D., Johnston, R., Pratt, G., Watts., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.
11. Knox, P.L., Marston, S.A. 2014. Human Geography: Places and Regions in Global Context, 6th ed, Pearson Education Limited.
12. Knox, P.L., McCarthy, L.M. 2011. Urbanization: An Introduction to Urban Geography, 3rd ed, Pearson Education Ltd.
13. Mandal, R.B. 2001. Introduction to Rural Settlement, 2nd ed, Concept Publishing Company.
14. Moseley, W.G., Perramond, E., Hapke, H.M., Laris, P. 2013. An Introduction to Human-Environment Geography: Local Dynamics and Global Processes, Wiley-Blackwell.
15. Norton, W. 2014. Human Geography, 8th ed, Oxford University Press.
16. Pickering K. and Owen A. A. (1997): An Introduction to Global Environmental Issues, 2nd edition Rutledge, London.
17. Rubenstein, J.M. 2016. The Cultural Landscape: An Introduction to Human Geography, 12th ed, Pearson Education Limited.
18. Short, R.J. 2017. Human Geography: A Short Introduction, 2nd ed, Oxford University Press.

## **Title of the Course: Thematic Mapping and Surveying**

**Code: GEO104**

**L-T-P-C: 2-0-2-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the fundamentals of topographical map interpretation using various symbols and nomenclature.

CO2. **Utilize** the skill of map interpretation for geographical research.

CO3. **Demonstrate** the different techniques of surveying.

CO4. **Apply** the knowledge and skills of surveying and levelling for land measurements with the help of prismatic compass and dumpy level.

### **Course Content**

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#### **Unit I: Nomenclature of Indian Topographical Sheets and Identification of Physical Features**

Principles of toposheet numbering as followed by Survey of India (SOI); Principles of modern toposheet numbering as followed by SOI, study of toposheet of 1:50,000 scale: Identification of macro and micro geomorphic features, Interpretation of a Mountain Area and Plateau Area: Cross and Longitudinal Profiles; Interpretation using Morphometric techniques

#### **Unit II: Identification and analysis of features from Toposheet and interpretation of weather map**

Grid-wise (10 x 12 cm area) Road density and Settlement Frequency Map with interpretation, Drawing, and analysis of profiles and transect chart with interpretation, Analysis of landforms and correlation between physical and cultural elements under the heads of relief, drainage, natural vegetation, settlements, and transport

#### **Unit III: Surveying and Levelling**

Surveying and Levelling - Concept and Classification, Closed and Open traverse survey by Prismatic Compass, Longitudinal /profile leveling by Dumpy Level; Contouring by levelling along the radial line by a Dumpy Level: at least three radial lines to be set out from a common center and their relative position to be obtained by measurement of magnetic bearing and/or included angle by Prismatic Compass, Micro slope analysis using Abney level.

#### **Unit IV: Laboratory Notebook and viva voce**

A project file comprising at least one exercise (as per requirement) from each one using any method on above mentioned themes.

#### **Recommended Readings:**

1. Gopal Singh (1996) – Map Work and Practical Geography, Vikas Publications, New Delhi.
2. Kanetkar, T.P. and Kulkarni, S.V. 1972: Surveying and Levelling, Part I, Pune Vidyarthi Griha
3. Prakashan, Pune.
4. Kanetkar, T.P. and Kulkarni, S.V. 1972: Surveying and Levelling, Part II, Pune Vidyarthi Griha
5. Prakashan, Pune
6. Mishra, R.P. and Ramesh (1989) – Fundamentals of Cartography, Concept, New Delhi.
7. Monk house, F.J and Wilkinson, M.R.(1968) \_ Maps and Diagrams, Methuen, London

8. Negi, B.S. (1998) –Practical Geography, Kedarnath and Ramnath, Meerut.
9. Robinson, A.H. (1995) – Elements of Cartography, John Willey, New York.
10. Sarkar, Ashis, Practical Geography: A Systematic Approach, Orient Longman Pvt. Ltd., Kolkata.2000
12. Misra, R.P. and Ramesh, A. 1986: Fundamentals of Cartography, McMillan, New Delhi.
13. Plat: Basics and Advanced Geological Maps (Selected Exercise)

**Title of the Course: Climatology****Code: GEO201****L-T-P-C: 2-1-1-4****Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the composition and structure of the atmosphere, physical basis of the isolation, regional temperature variations and greenhouse effect.

CO2. **Identify** the fundamental physical laws that govern various planetary wind circulations and its relation with the monsoon variability.

CO3. **Explain** the forms and processes of condensation and precipitation, and their measurements.

CO4. **Demonstrate** the factors and mechanisms responsible for the development of cyclones, and the basis of global climate classifications.

CO5. **Demonstrate** a comprehensive understanding of the key meteorological features

**Course Content**

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**Unit I: Atmospheric Layers and Thermal Variation**

Nature, Composition and Layered Structure of the Atmosphere, Factors Controlling Insolation; Heat Budget of the Atmosphere, Horizontal and Vertical Distribution of Temperature; Inversion of Temperature; Green House Effect and Importance of Ozone Layer.

**Unit II: Global Wind Circulation System**

Global Atmospheric Pressure Belts and Their Oscillation, General Wind Circulation – Primary, Secondary and Tertiary Systems, Stream and Index Cycle; Monsoon Mechanism with Reference To Jet Stream, Monsoon Variability.

**Unit III: Precipitation and Air Mass**

Processes and Forms of Condensation, and Forms of Precipitation- Ice Crystal Theory, Collision-Coalescence Theory, Airmass: Typology, Origin, and Characteristics; Warm and Cold Fronts; Frontogenesis and Frontolysis

**Unit IV: Weather Disturbance and Climatic Classification:(20 hours)**

Tropical Cyclone and Weather Disturbances, Mid-Latitude Cyclone and Anti-Cyclone, Climatic Classification after Koppen and after Thornthwaite: 1931 And 1948

**Unit V: Interpretation of Weather Maps** (Indian Sub-continent) – Pre-monsoon, Monsoon, and Post Monsoon; Season, Representation, and analysis of climatic data with the help of a synoptic chart, Climograph and Hythergraph; Ombro-thermic diagram

**Recommended Readings:**

1. Barry, R.G. and Chorley, R.J. (2009) Atmosphere, Weather and Climate, ELBS, Methuen & Co. Ltd. London.
2. Critchfield, H.J. (2011): General Climatology 4<sup>th</sup> Edition, Pearson India, New Delhi.
3. Lal, D.S. (2011): Climatology, Chaitanya Publishing House, Allahabad.
4. Savindra Singh (2006): Climatology, Prayag Pustak Bhawan, Allahabad
5. Siddhartha, K. (2018): Climatology: Atmosphere Weather Climate, Kitab Mahal, New Delhi.
6. Trewartha, G.T. (1968) Introduction to Climate McGraw Hill, New York.

## **Title of the Course: Statistical Methods in Geography**

**Code: GEO202**

**L-T-P-C: 2-0-2-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the various modes and steps of research design including identifying problems, hypothesis building

CO2. Sampling, data collection

CO3. **Analyze** data using various research techniques and their graphical representation.

CO4. **Design** own research for solving real-world problem using modern tools and technology and skill to write research proposals and research articles to enhance lifelong learning.

### **Course Content**

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#### **Unit I: Basic Concepts**

Significance of statistical techniques in Geography, Descriptive and Inferential Statistics, nature of statistical data: discrete, continuous, parametric and non-parametric statistics; Data types, scales, and ratings; Tabulation and Descriptive Statistics: Frequency distribution – Histogram, Frequency Polygon, Ogive, normal and skewed distribution; Probability of distribution/occurrences - Normal Distribution, sampling techniques: random, systematic and stratified.

#### **Unit II: Measures of Central Tendency and Dispersion**

Measures of central tendency: mean, median, mode, partition values – quartile, deciles, and percentile and data visualization- boxplot, violin plot; Measures of dispersion: mean deviation, quartile deviation, variance, standard deviation, and Coefficient of variation; Hypothesis testing- Student's T-Test, Chi-square test, and Analysis of variance; Association and Correlation – Rank correlation and Product Moment Correlation (Karl Pearson)

#### **Unit III: Data Analysis**

Bivariate scatter diagram and regression trend line - Simple Regression and nonlinear regression; Residuals from regression; Residual Mapping, Time Series Analysis - Moving average, semi average, and least square method.

#### **Unit IV: Laboratory Notebook and viva voce**

A project file comprising at least one exercise (as per requirement) from each one using any method on above mentioned themes.

#### **Recommended Readings:**

1. Alvi, Z. 1995: Statistical Geography-Methods & Application, Rawat Publications, Jaipur.
2. Berry B. J. L. and Marble D. F. (eds.): Spatial Analysis – A Reader in Geography.
3. Clark, W.A.V. and Hosking, P.L. 1986: Geographical Methods for Geographers, John Wiley and Sons, New York
4. Croxton, F.E., Cowden, D.J. & Klein, S 1969: Applied General Statistics, Prentice Hall of India Pvt. Ltd., New Delhi
5. Dickinson, G.C. (1973): Statistical Mapping and Presentation of Statistics
6. Ebdon D., 1977: Statistics in Geography: A Practical Approach

7. Goon, A.M., Gupta, M.K. & Dasgupta, B. 1992: Basic Statistics, Volume 1, The World Press Pvt. Ltd., Kolkata
8. Goon, A.M., Gupta, M.K. & Dasgupta, B. 1992: Fundamentals of Statistics, Volume 1, The World Press Pvt. Ltd., Kolkata
9. Gregory, S. 1985: Statistical Methods and the Geographer, Longman, London
10. Hammond P. and McCullagh P. S., 1978: Quantitative Techniques in Geography: An Introduction, Oxford University Press.
11. King L. S., 1969: Statistical Analysis in Geography, Prentice-Hall
12. Mahmood A., 1977: Statistical Methods in Geographical Studies, Concept.
13. Mahmood, A. 1998: Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
14. Norcliffe, G.B. 1977: Inferential Statistics for Geographers-An Introduction, Hutchinson and Co., London
15. Pal S. K., 1998: Statistics for Geoscientists, Tata McGraw Hill, New Delhi

## **Title of the Course: Hydrology and Oceanography**

**Code: GEO203**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Understand** the physical phenomena and processes of hydrological cycle and their measurement techniques.

CO2. **Evaluate** the groundwater potentials of a region and its flow to solve the real-world crisis.

CO3. **Summarize** the basic principles of Oceanography, including the basic tenets of the sub-disciplines, and to explain complex phenomena in their own sub discipline.

CO4. **Evaluate** the various factors for ocean water pollution and marine ecosystem conservation.

CO5. **Apply** practical skills in real-world hydrological scenarios, contributing to effective water resource management and environmental planning.

### **Course Content**

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#### **Unit 1: Introduction to Hydrology**

Definition, Scope, and Content of Hydrology; Global Hydrological Cycle: Its Physical and Biological Role; Drainage Basin as a Hydrological Unit; Human Impact on the hydrological cycle; Systems Approach in Hydrology; Components of Hydrology and their controlling Factors: interception, evaporation, evapotranspiration, infiltration, ground-water, runoff, and overland flow.

#### **Unit II: Subsurface and Surface Hydrology**

Sub-Surface Zonation of Ground Water; Types of Aquifers, their formations; Controlling Factors of the Movement of the Ground Water - Recharge, Discharge, and Storage; Darcy's Laws; Issues related to their overutilization; Measurement of Surface Runoff and River Discharge; Hydrographs, Rating Curves; Stream flow analysis; River Regimes; Characteristics of river basins; Drainage Basin and its morphometric analysis; Floods and Droughts.

#### **Unit III: Configuration of the Ocean Floor**

Configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches; Relief of Atlantic, Pacific and Indian Oceans, Major features of the ocean floor: formation explained by Plate Tectonics. Coral reefs and atolls: types and factors; Theories of origin of coral and volcanic islands; Oceanic sediments: Origin and classification;

#### **Unit IV: Ocean Properties and Resources**

Major properties (Physical and Chemical) of Ocean water, Concept of water mass; Waves, Tides, Ocean Currents and their influence, Resource potential of the oceans; Exclusive economic zone; Marine Pollution.

#### **Unit V: Hydrology Lab**

Unit Construction and interpretation of rating curves, Construction and interpretation of hydrographs and unit hydrographs, Monthly rainfall dispersion diagram, and Construction of Thiessen polygon from precipitation data.

#### **Recommended Readings:**

1. Linsley, K., Kohler, M. and Paulhus, J.L. (1975): Applied Hydrology, Tata McGraw Hill, New York.
2. Meinzer, O.E. (1942): Hydrology, Dover Publication Inc. New York.
3. Rahgunath, H.M. (1997): Hydrology- Principles, analysis, Design, New Age International Pvt. Ltd, New Delhi
4. Sverdrup, H.U. (1942): The Oceans, their Physics, Chemistry, and General Biology, Prentice-Hall, New York.

5. Todd, D.K. (1959): Ground Water Hydrology, John Wiley and Sons, New York
6. Walton, W.C. (1970): Ground Water Resource Evaluation, McGraw Hill, Tokyo
7. Andrew. D. Ward and Stanley, Trimble (2004): Environmental Hydrology, 2nd edition, Lewis Publishers, CRC Press.
8. Karanth, K.R. (1988): Ground Water: Exploration, Assessment and Development, Tata- McGraw Hill, New Delhi.
9. Ramaswamy, C. (1985): Review of floods in India during the past 75 years: A Perspective. Indian National Science Academy, New Delhi.
10. Singh, Vijay P. (1995): Environmental Hydrology. Kluwer Academic Publications, The Netherlands.
11. Garrison T. (1998): Oceanography, Wordsworth Company, Belmont.
12. Sharma, R.C. and Vatal, M. (1980): Oceanography for Geographers, Chaitanya Publishing House, Allahabad.
13. Sverdrup, K.A. and Armbrust, E.V. (2008): An Introduction to the World Ocean, McGraw Hill, Boston.

**Title of the Course: Economic Geography****Code: GEO204****L-T-P-C: 2-1-1-4****Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Comprehend** resource, types of it and functional ideas around the resource.

CO2. **Locate** the major regions of agricultural activities with the operational procedures around the world.

CO3. **Compare** different theories and concepts of industrial locations

CO4. **Measure** the role of the service sector in as growth engine for the national economy.

CO5. **Present** economic data in a visually insightful manner, aiding decision-making processes related to crop management and production planning.

**Course Content**

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**Unit I: Resources and Economy**

Concept and Classification of Resources: Economic and Environmental Approaches to Resource Utilization, Resource Depletion, and Resource Conservation; Forrester-Meadows Model on Limits to Growth; Sustainable Use of Resources, Economic Activity: Concept and Classification.

**Unit II: Primary Activities**

World View of Primary Activities-- With Reference to Forestry, Fishing and Mining, Critical Appreciation Of Agricultural Systems: Intensive Agriculture (Rice), Extensive Agriculture (Wheat), Plantation Farming (Tea) and Mixed Farming (NW Europe), Fishing: Inland and Ocean (in-shore/offshore), methods, types of fish, storage and marketing, importance, problems, and solutions.

**Unit III: Secondary Activities**

Factors of Industrial Location; Industrial Location and Economic Growth Models: Weber, Losch, Industries-- Their Resource Base, Distribution, Potentials Of Growth And Problems With Reference To Iron And Steel (India, Japan), Cotton Textile (India), Petrochemicals (India and USA) And Food Processing (India), Manufacturing regions; Industrial Association, Integration, Infrastructure and Problems With Reference to Kanto Plains, and Kolkata-Haldia.

**Unit IV: Tertiary Activities**

Tertiary activities and service: concept, classification and importance, international trade: Balance of payment, Ricardian theory, the role of GATT and WTO in international trade. Trade strategies – import substitution and export promotion and impact of information technology on trade in India, SEZ, and Technology Park. Transport: the concept of distance, accessibility, and connectivity, the relative cost advantage of various modes of transport

**Unit V: Economic Geography Lab**

Field trip to observe and analyze diverse agricultural systems/ Site visit to a local industrial area/ Visit to a local service-oriented business; Measuring Crop area, production of major crops; Workers: Main/ Male /Female/ Marginal; Ergograph; Measuring inequality: Lorenz curve and Gini coefficient

**Recommended Readings:**

1. Alexander J.W. (1976): Economic Geography, Prentice Hall of India. New Delhi.
2. Alexanderson G. (1988): Geography of manufacturing, Prentice Hall of India. New Delhi.
3. Berry, Conkling & Ray (1988): Economic Geography Prentice Hall of India, New Jersey.

4. Guha, J.L. and Chattaraj, P.R. 1989: A New Approach to Economic Geography: A Study of Resources, World Press, Kolkata 8.
5. Hartshorne, T. A. and Alexander, J. W. (1988): Economic Geography, Prentice Hall
6. Hurst Elliott (1986): Geography of Economic Behaviour, Unwin, London.
7. Johnson R.J. & Taylor D.J. (1989): A world in crisis, Basil-Blackwell, Oxford.
8. Leong. G.C. and Morgan, G.C. 1975: Human and Economic Geography, Oxford University Press, Hong Kong
9. Lloyd, P. and B. Dicken (1972): Location in space - A theoretical approach to economic geography Harper and Row, New York.
10. Losch (1954): Economics of Location, Yale University Press New York.
11. Redcliff, M. (1987): Development & the environmental crisis. Methuen. London. 8. Sinha B.N.(1971): Industrial geography of India
12. Siddhartha, K. (2000): Economic Geography - Theories, process and patterns, K-isalaya Publications Pvt. Ltd., New Delhi
13. World Development Report, Oxford University Press, New York, (Published annually).
14. Zimmermann, E.W. 1956: World Resources and Industries, Harper Brothers, New York.

**Title of the Course: Fundamentals of GIS**

**Code: GEO205**

**L-T-P-C: 2-0-0-4**

**Course Outcomes**

On completion of this course, the students will be able to

CO1. **Develop** a basic concept of cartography as well as digital cartography.

CO2. **Develop** a concept of digitization and geo referencing.

CO3. **Construct** a project file based on different methods.

**Course Content**

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**Unit 1: Basics of Digital Cartography**

GIS and Digital Cartography: Concept of Digital Cartography, Advantages and Disadvantages of Digital Cartography, GIS Data structure and conversions.

**Unit II: Digital mapping**

Input of Raster Image, Georeferencing, Digitisation, Assigning map scales, Preparation of Map Layout and Printing Setup, Map Projection Systems of the World - Errors and deformations.

**Unit III: Laboratory Notebook**

A project file consisting of 5 exercises on using any method on above mentioned themes.

**Recommended Readings:**

1. Bhatta, B. (2010) Analysis of Urban Growth and Sprawl from Remote Sensing, Springer, Berlin Heidelberg
2. Burrough, P.A., and McDonnell, R.A. (2000) Principles of Geographical Information System-Spatial Information System and Geo-statistics. Oxford University Press
4. Heywood, I., Cornelius, S and Carver, S. (2006) An Introduction to Geographical Information system. Prentice Hall.
5. Jensen J. R., 2004: Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall.
6. Jha, M.M. and Singh, R.B. (2008) Land Use: Reflection on Spatial Informatics Agriculture and Development, New Delhi: Concept.
7. Joseph, G. 2005: Fundamentals of Remote Sensing, United Press India.
8. Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: Remote Sensing and Image Interpretation, Wiley. (Wiley Student Edition).
9. Nag P. and Kudra, M., 1998: Digital Remote Sensing, Concept, New Delhi.
10. Nag, P. (2008) Introduction to GIS, Concept India, New Delhi.
11. Rees W. G., 2001: Physical Principles of Remote Sensing, Cambridge Univ. Press
12. Sarkar, A. (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi
13. Singh, R.B. and Murai, S. (1998) Space Informatics for Sustainable Development, Oxford and IBH, New Delhi.

## **Title of the Course: Environmental Geography**

**Code: GEO301**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Understand** basic concepts of abiotic and abiotic environment, human-environment relationship and environmental degradation.

CO2. Understand the soil forming factor, soil properties and importance and ways of soil conservation

CO3. **Compare** the structures and functions of different ecosystems and environmental problems of different biomes.

CO4. **Understand** the significance environmental movements and the concept of sustainable development

CO5. **Measure** and map soil properties, biological diversity, and hazard in a region.

### **Course Content**

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#### **Unit 1: Nature and Concepts**

Environmental Science: Introduction, Scope, approaches to study of the environment, Components of the environment: Energy, Abiotic and Biotic components, Human-Environment Relationships – Historical Progression, Environmental degradation, and pollution.

#### **Unit II: Soil - An Abiotic Component of the Environment**

Definition and factors responsible for soil formation: Active factors, Passive factors; Process of Soil Formation; Soil types; Soil Profile: Laterite, Podzol; and Chernozem; Physical and chemical properties of soil: Texture, Structure, and Moisture; pH, Organic matter and NPK; Measures of soil conservation.

#### **Unit III: Ecosystem - A Biotic Component of the Environment**

Ecosystem: Concept, structure, and organization: Components, Trophic Structure, Food Chain and Food Web, Keystone Species, Ecological Pyramids; Functions: Energy Flow, Biogeochemical Cycles, Gross and Net Productivity, Concept of Biomes, Niche, Adaptation, and Climax in different Biomes; Ecotone and Community; Ecosystem Types - Terrestrial and Aquatic; Biodiversity: Concepts, Significance and Types of Biodiversity.

#### **Unit IV: Environmental Problems and Policies**

Biodiversity: Threats and conservation; Geodiversity: Concept and conservation; Concept of Hazards and Disaster; Physical, Biological and Social Hazards; Environmental Movements: Bishnoi, Chipko, Silent Valley, Appiko Movement, Narmada Bachao Andholan, Tehri Dam Conflict; Concept of Sustainable Development, Environmental awareness, Environmental Programmes, and Policies – Global, National and Local levels.

#### **Unit V: Field Works and Mapping Techniques**

Soil sample collection, analysing soil texture, construction of ternary diagram, construction of biological diversity index, hazard mapping on GIS platform

#### **Recommended Readings:**

1. Anderson, J.M. (1981): Ecology for Environmental Science: Biosphere, Ecosystems and Man, Arnold, London.
2. Nobel and Wright (1996): Environmental Science, Prentice Hall, New York.
3. Odum, E.P. (1971): Fundamental of Ecology, W.B. Sanders, Philadelphia.
4. Saxena, H.M. (1994): Prayavaranevn Paristhitiki Bhugool (Geography of Environment and Ecology) Rajasthan Hindi Granth Academy, Jaipur.

5. Singh, S. (1991): Environmental Geography, Prayag Pustak Bhawan, Allahabad.
6. Strahler, A.H. and Strahler A.N. (1977): Geography and Mans Environment, John Wiley, New York.
7. William, M.M. and John, G. (1996): Environmental Geography - Science, Landuse and Earth System, John Wiley and Sons, New York.
8. Chandna, R.C. (2002): Environmental Geography, Kalyani, Ludhiana.
9. Cunningham, W.P. and Cunningham, M.A. (2004): Principals of EnvironmentalScience: Inquiry and Applications, Tata Macgraw Hill, New Delhi.
10. Goudie, A. (2001): The Nature of the Environment, Blackwell, Oxford.
11. 4. Mal, S. and Singh, R.B. (Eds.) (2009) : Biogeography and Biodiversity. Rawat Publication, Jaipur
12. Miller, G.T. (2004): Environmental Science: Working with the Earth, Thomson BrooksCole, Singapore.
13. MoEF, (2006): National Environmental Policy-2006, Ministry of Environment and Forests, Government of India.

## **Title of the Course: Regional Planning and Development**

**Code: GEO302**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Identify** different types of the region and their formation processes

CO2. **Summarize** the idea of development and inequality quantitatively.

CO3. **Compare** different theories and concepts of regional development.

CO4. **Articulate** the development trajectories of India as a case study and also sketch the development plan for backward regions.

**CO5. Gain** practical expertise in various regional planning techniques, preparing them for effective analysis and decision-making in regional development scenarios.

### **Course Content**

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#### **Unit I: Regions and Development**

Concept of regions - nature, and types of regions, Formal and Functional Regions; Regionalization – approaches, scale, and dimension; Bases of regional division, Concept Growth, Development, and Underdevelopment; Measuring development (Economic, Social, and Environmental); Human Development.

#### **Unit II: Planning Regions and Allied Theories**

Concept of planning regions – need for regional planning, types of regional planning and planning Regions; Models for Regional Planning and their applications: Growth Pole Model of Perroux; Myrdal, Rostow, and Friedmann.

#### **Unit III: Regional Planning in India**

Regional Approach to Planning in India's Five-Year Plans; NITI Aayog and its functionalities; multi-level planning in India; Regional disparities and measures for balanced development in India.

#### **Unit IV: Regional Planning and Prospects**

Damodar Valley as Planning Region, Kolkata Metropolitan Development Authority (KMDA) as a Planning Region; Jungle Mahal as a backward region; State and development – Comparative study on West Bengal, Kerala, Gujarat.

#### **Unit V: Regional Planning Lab**

Delineation of regions according to given criteria using Weaver's method, Determination of sphere of influence by gravity model, Measurement of inequality by location quotient, Preparation of Z score and composite Index from suitable data; Delineation of formal regions by the weighted index method, Delineation of functional regions by breaking point analysis.

#### **Recommended Readings:**

1. Chatterjee, S. P. (1973): Physiography of India, Gazetteer of India, Vol. I, Chopra, P. N. (Ed.), Govt. of India, New Delhi.
2. Singh, R. L. (1989): India – A Regional Geography, National Geographical Society of India, Varanasi.
3. Spate, O. H. K. and Learmonth, J. A. (1972): India and Pakistan, Methuen Co. Ltd., London.
4. Ganguly, D. S., Damodar Valley Corporation.
5. Mamoria. C.B. 1996, Economic and Commercial Geography of India. Revised edition. Shivlal Aggarwalaan Co. Agral.

6. Bhat L S. – Regional Planning in India, Statistical Publishing Society, Calcutta, 1973.
7. Bhat L. S. et. al.: Micro-Level Planning: A Case Study of Karnal Area, Haryana, K.B. Publishing, New Delhi, 1976.
8. Chand M. & Puri V.K.– Regional Planning in India, Allied Publishers Pvt. Ltd., N.Delhi, 1983.
9. Friedman J. & Alonso W. – Regional Development and Planning – A Reader, M.I.T. Press, Cambridge, Mass, 1967.
10. Friedmann, J. and Alonso, W.: Regional Development Policy – A Case Study of Venezuela, M.I.T. Press, Cambridge, Mass, 1966.
11. Glasson J. - An Introduction to Regional planning: Concept, Theory & Practice, Hutchinson & Co. (Publishers) Ltd., London, 1983.
12. Glikson, Arthur: Regional Planning and Development, Netherlands Universities Foundation for International Cooperation, London, 1955.
13. Gosal, G. S. and Krishan, G.: Regional Disparities in Levels of Socio-Economic Development in Punjab, Vishal Publications, Kurukshetra, 1984.
14. Inamdar, N. R. & Kshire, V.K., - District Planning in India: A Case study of Maharashtra, Oxford & IBH Publishing Co., Delhi, 1986.
15. Kundu A. & Raza M. – Indian Economy: The Regional dimension – Spectrum Publishers, N. Delhi, 1982.

**Title of the Course: Fundamentals of Remote Sensing**

**Code: GEO303**

**L-T-P-C: 2-0-2-4**

**Course Outcomes**

On completion of this course, the students will be able to

CO1. **Understand** the history and fundamentals of Remote Sensing.

CO2. **Interpret** Aerial Photographs and Satellite Imageries.

CO3. **Develop** an idea about different types of Satellites, Sensors and their resolutions.

CO4. **Apply** remote sensing techniques in image processing and land use land cover mapping.

**Course Content**

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**Unit 1: Remote Sensing: Definition and Development; Platforms and Types, Photogrammetry**

Concept of aerial photography; different types of aerial photography, Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth Surface; types of Satellites, Sensors; resolution

**Unit II: Basics of Image Processing**

Image Processing (Manual): Selection of band combination, Mosaicking to FCC image, Categorization Land Use Land Cover -Satellite Image Interpretation.

**Unit III: Laboratory Notebook**

A project file consisting of 5 exercises on using any method on above mentioned themes.

**Recommended Readings:**

1. Bhatta, B. (2008) Remote Sensing and GIS, Oxford University Press, New Delhi.
2. Campbell J. B., 2007: Introduction to Remote Sensing, Guildford Press
3. Jensen, J. R. (2005) Introductory Digital Image Processing: A Remote Sensing Perspective, Pearson Prentice-Hall.
4. Joseph, G. 2005: Fundamentals of Remote Sensing, United Press India.
5. Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: Remote Sensing and Image Interpretation, Wiley. (Wiley Student Edition).
6. Li, Z., Chen, J. and Batsavias, E. (2008) Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences CRC Press, Taylor and Francis, London
7. Mukherjee, S. (2004) Textbook of Environmental Remote Sensing, Macmillan, Delhi.
8. Nag P. and Kudra, M., 1998: Digital Remote Sensing, Concept, New Delhi.
9. Singh R. B. and Murai S., 1998: Space-informatics for Sustainable Development, Oxford and IBH Pub.

**Title of the Course: Internship**

**Code: GEO304**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1.**Demonstrate** the skill learned in classroom to solve practical problems

CO2.**Match** the required competency for real world.

CO3.**Learn** work ethics and in a team.

CO4.**Act** as a bridge in between industry and academia

### **Course Content**

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An Industry Interaction Report to be prepared and submitted individually by each student, based on actual industrial interaction and visits, done jointly or in groups with other students.

## **Title of the Course: Geography of India**

**Code: GEO305**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the physical, social, cultural and economic diversity of India.

CO2. **Establish** the relationship between physical and socio-economic condition of the country.

CO3. **Understand** geographical problems of India and develop an idea about the regional planning in India.

CO4. **State** the physical, social, cultural and economic diversity of West Bengal and know about some geographical problem of the state.

CO5. **Demonstrate** the ability to generate and interpret monthly temperature and rainfall graphs for diverse physiographic regions in India, showcasing comprehensive geospatial analysis skills.

### **Unit 1: Physical Settings of India**

Geological setup of India; Physiographic regions of India (R.L. Singh), Drainage System (Peninsular and Extra Peninsular): Characteristics and classifications; Climatic, Soil, and Vegetation Region of India.

### **Unit II: Demography and Economy**

Population size and growth; age and sex structure; rural-urban distribution; Socio-cultural regions of India (Sopher); Resource distribution: Forest resources – distribution and utilization; Mineral and power resources distribution and utilization of Iron ore, Coal, Petroleum, Natural Gas, Bauxite and Hydroelectricity; Industrial development: Automobile Industry, Information Technology, and Industrial Regions.

### **Unit III: Regional Problems and Planning**

Regional and social conflicts: interstate water disputes; anti-regime and inter-ethnic and communal/inter-religious disputes, and objectives of regional planning in India; Planning regions after Sengupta and Sdasyuk; Liberalization, Privatization, and Globalization; PURA; Bharata Nirman; Five-year plans and Indian economy - a review.

### **Unit IV: Geography of West Bengal**

Physical settings – Physiography, drainage, climate, soils, and natural vegetation, Population distribution – Post independent spatiotemporal distribution of population; Fertility, Mortality and Migration, Economy and development – Distribution of Paddy and Tea Cultivation; Distribution of Power and Mineral resources- coal and iron ore; Industrial development and industrial belts of West Bengal – problems and consequences; Problems of development of SEZ in West Bengal.

### **Unit V: Geography of India Lab**

Monthly temperature and rainfall graphs of five select stations from different physiographic regions of India; Crop Combination: Comparison of any two contrasting districts in West Bengal; Annual trends of production: Mineral resources and manufacturing goods over two decades; Composite Index: Comparison of developed and backward states.

### **Recommended Readings:**

1. Bose, A. et. al. eds, 2001: Population in India's Development, 1947-2000, Vikas, New Delhi.
2. Chatterjee, S. P. (1973): Physiography of India, Gazetteer of India, Vol. I, Chopra, P. N. (Ed.), Govt. of India, New Delhi.

7. Khullar, D. R. (2006): India. A Comprehensive Geography. Kalyani Publishers., New Delhi.
8. Mandal R. B. (ed.), 1990: Patterns of Regional Geography – An International Perspective. Vol. 3 – Indian Perspective.
9. Mita, A. Levels of regional Development India Census of India, Vol. Part I-A (i) and (ii) New Delhi, 1967.
11. Pathak, C. R. 2003: Spatial Structure and Processes of Development in India. Regional Science Assoc., Kolkata
12. Routray, J.K. Geography of Regional Disparity Asian Institute of Technology, Bangkok, 1993.
14. Sdyasuk Galina and P Sengupta (1967): Economic Regionalisation of India, Census of India
15. Sharma, T. C. 2003: India - Economic and Commercial Geography. Vikas Publ., New Delhi.
16. Singh R. L., 1971: India: A Regional Geography, National Geographical Society of India.
17. Singh, Jagdish 2003: India - A Comprehensive & Systematic Geography, GyanodayaPrakashan, Gorakhpur.
18. Spate O. H. K. and Learmonth A. T. A., 1967: India and Pakistan: A General and Regional Geography, Methuen.
19. Tirtha, Ranjit 2002: Geography of India, RawatPubls., Jaipur & New Delhi.
20. Tiwari, R. C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad
22. Wadia, D.N: Geography of India, McMillan & Co., London, 1967.

## **Title of the Course: Evolution of Geographical Thought**

**Code: GEO306**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Explain** the nature and scope of geography as a study of man-environment relationship adopting various approaches of time, space, and system.

CO2. **Describe** the evolution of geographical thinking with reference to classical periods, medieval age and modern era.

CO3. **Explain** the fundamentals of modern geographical approaches.

CO4. **Relate** future of geography with the contemporary spatial concepts.

CO5. **Demonstrate** a nuanced appreciation of how world maps have evolved over time and Analyze the changing perspectives through mapping voyages, exploring the geographical thought processes that influenced the representation of the world.

### **Course Content**

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#### **Unit 1: Nature and Concepts in Geography:**

Nature of Geography and its relation with other disciplines; Human – Environment Relationship, Concepts in Geography: Encyclopaedism; Location, Time and Space, Approaches in Geography: Ideographic and Nomothetic; Areal differentiation and Spatial organization; Systems Approach

#### **Unit II: Paradigms in Geography:**

Early Origins of Geographical Thinking with reference to the Classical periods: Greek, Rome, Evolution of Geographical Thinking during Medieval and Dark Age: Indian and Chinese Philosophies; Arabian School of Thoughts, Modern Trends in Germany, France, Britain, United States of America.

#### **Unit III: Modern Debates and Thoughts:**

Environmental Determinism and Possibilism; Empiricism and Positivism, Systematic and Regional approaches in Geography, Probabilism, and Structuralism

#### **Unit IV: Contemporary Thoughts:**

Quantitative Revolution and its Impact; Radicalism, and Behavioural Approaches; Feminism, towards Post Modernism – Changing Concept of Space in Geography, Future of Geography.

#### **Unit V: Evolution of Geographical Thought Lab**

Changing Perception of maps of the world (Ptolemy, Ibn Battuta, Mercator), Mapping voyages; Columbus, Vasco da Gama, Magellan, Thomas Cook

### **Recommended Readings:**

1. Adhikari, S. (2002): Fundamentals of Geographical Thought, ChaitanyaPublishing. House, Allahabad.
2. Harvey, D. (1969): Explanations in Geography, London.
3. Hartshorne, R. (1939): The Nature of Geography: Association of American Geographers, USA.
4. Harvey, Milton E., and Brian, P. Holly (Ed.) (1981): Themes in Geographical Thought, Rawat Publication, Delhi.
5. Hossain, M. (2004): Evolution of Geographical Thought, Rawat Publications, Jaipur.
6. Johnston, R. J. et al (Ed.) (1981) The Dictionary of Human Geography, Blackwell, England.
7. Peet, R. (Ed.) (1977): Radical Geography, Methuen, London.
8. Haggett.: Geography – A Modern Synthesis.

9. Arentsen M., Stam R. and Thuijjs R. (2000): Post-modern Approaches to Space, ebook.
10. Bonnett, A. (2008): What is Geography? Sage.
11. Dikshit, R. D. (2005): Geographical Thought: A Contextual History of Ideas, Prentice–Hall India.
12. Hartshone, R. (1959): Perspectives of Nature of Geography, Rand MacNally and Co.
13. Holt-Jensen, A. (2011): Geography: History and Its Concepts: A Students Guide, SAGE.
14. Johnston, R. J. (1997): Geography and Geographers, Anglo-American Human Geography since 1945, Arnold, London.
15. Kapur, A. (2001): Indian Geography Voice of Concern, Concept Publications.
16. Martin Geoffrey, J. (2005): All Possible Worlds: A History of Geographical Ideas, Oxford.
17. Soja, E. (1989): Post-modern Geographies, Verso, London. Reprinted 1997, Rawat Publ., Jaipur and New Delhi.

**Title of the Course: Field Work****Code: GEO307****L-T-P-C: 0-0-4-4****Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Identify** appropriate tools and techniques necessary to conduct field survey.

CO2. **Interpret** physical and socio-economic status of the study area based on analysis of the collected data.

CO3. **Identify** appropriate tools and techniques to prepare disaster preparedness plan.

**Course Content**

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**Unit 1: Selection of study area:**

Selection of either a rural area or an urban area based on cadastral or municipal maps to study specific problems (Rural / Urban / Physical / Human / Environmental). Field Techniques and Tools: Merits, Demerits, and Selection of the Appropriate Technique; Observation (Participant / Non-Participant), Questionnaires (Open/ Closed / Structured / Non-Structured); Interview with Special Focus on Focused Group Discussions; Space Survey (Transects and Quadrants, Constructing a Sketch), Field Tour Planning: Collection of Material for Physical and Socio-Economic Surveys.

**Unit II: Physical and Socio-Economic Status Analysis and Report Writing:**

Identification of physical problem, data collection and post field discussion, Preparation of Questionnaire and Survey schedule for assessing data of households, industrial and market for perception study; Post field discussion., Designing the Field Report: Aims and Objectives, Methodology, Analysis, Interpretation, and Writing the Report

**Unit III: Project on Disaster Management:**

The Project Report is based on any field-based case studies among the following disasters and one disaster preparedness plan of the respective college or locality: i. Flood, ii. Drought, iii. Cyclones and Hailstorms, iv. Earthquake, v. Landslides, vi. Human-Induced Disasters: Fire Hazards, Chemical, Industrial Accidents

**Unit IV: Field Notebook and viva – voce:**

Limits with guidelines: a) Each student will prepare an individual report based on primary and secondary data collected during fieldwork. b) The duration of the fieldwork should not exceed 10 days. c) The text of the report should not exceed 20 typed A4 pages (8000 to 12,000 words excluding figures, tables, photographs, maps, references, and appendices) with line spacing of 1.5 and neatly drawn maps and diagrams with photographs and should be submitted in soft binding. d) The report should be written in English. e) Each lesson of the report should be signed by the concerned teacher who conducted the fieldwork. f) Recurrence of visits to the same field area is prohibited. g) Students will give a seminar after completing the project.

**Recommended Readings:**

1. Basu, R. and Bhaduri, S. ed, (2007): Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
2. Hammond, R, and McCullagh, P. (1978): Quantitative Techniques in Geography: An Introduction, Oxford University Press, Oxford.
3. Mukherjee, N. (2002): Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi.
4. Robinson, A. (1998): "Thinking Straight and Writing That Way", in Writing Empirical Research Reports:A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.

**Title of the Course: Project**

**Code: GEO308**

**L-T-P-C: 0-0-4-4**

**Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Identify** appropriate tools and techniques necessary to conduct research on contemporary physical, social and cultural issues.

CO2. **Explain** problem specific research report based on the analysis of the collected data using suitable tools and techniques of geoinformatics.

**Course Content**

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Problem identification, analysis and project writing on contemporary issues using Geoinformatics. [Word Limit = 5000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing= 1½, Arial Narrow / Times New Roman / Helvetica 10 / 11 / 12)]

**Recommended Readings:**

1. Basu, R. and Bhaduri, S. ed, (2007): Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.
2. Hammond, R, and McCullagh, P. (1978): Quantitative Techniques in Geography: An Introduction, Oxford University Press, Oxford.
3. Creswell, J. (1994): Research Design: Qualitative and Quantitative Approaches Sage Publications.
4. Mukherjee, N. (1993): Participatory Rural Appraisal: Methodology and Application. Concept Pubs. Co., New Delhi.
5. Mukherjee, N. (2002): Participatory Learning and Action: with 100 Field Methods. Concept Pubs. Co., New Delhi.
6. Robinson, A. (1998): "Thinking Straight and Writing That Way", in Writing Empirical Research Reports:A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.
7. Special Issue on "Doing Fieldwork" The Geographical Review 91:1-2 (2001).
8. Stoddard, R.H. (1982): Field Techniques and Research Methods in Geography, Kendall/Hunt.
9. Wolcott, H. (1995): The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.

## **Title of the Course: Agricultural Geography**

**Code: GEO401**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to

CO1. **Develop** an idea about the origin and evolution of agricultural system and compare major agricultural types of the world.

CO2. **Estimate** agricultural productivity and efficiency, crop combination and diversification

CO3. **Understand** the characteristics, problems and challenges of Indian agriculture

CO4. **Apply** agricultural geographical knowledge to solve real world agricultural problems.

CO5. **Acquire** practical skills in agricultural assessment and planning, enabling them to contribute to informed decision-making in agricultural development and resource management.

### **Course Content**

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#### **Unit 1: Introduction to Agricultural Geography**

Introduction to Agricultural Geography; Origin of agriculture: Major Gene centers and Diffusion of agriculture – Agriculture and human civilization, Agricultural Region, Concept and techniques of delineation of agricultural regions, Determinants of agriculture (tropical) – Physical, economic, social and technological factors

#### **Unit II: Agricultural Systems:**

Major agricultural types in the world: Shifting cultivation, Subsistence agriculture, Commercial agriculture, Plantation agriculture, Measurement of agricultural productivity and efficiency; Crop combination and Diversification, Model Agricultural Systems of the world: Von Thunen and Whittlesey; Land use model: L.D.Stamp

#### **Unit III: Agriculture in India**

Characteristics and challenges of Indian agriculture; Agro-climatic, Agro-ecological & Crop Combination Regions of India, Role of Technological Changes in Agricultural Productivity and Efficiency, Green, White, Blue, and Pink Revolution-success and failures in India, Problem associated with Indian agriculture – National Agricultural Policy; Impact of Globalization, Food Security and Corporate Farming

#### **Unit IV: Applied Agricultural Geography**

Problems and Prospects of Tropical Agriculture – droughts, over-irrigation, land fragmentation, and marketing, areas in agriculture and Agricultural Development - Dairy farming, Poultry, Sheep and Goat farming, Agro –Tourism, Beekeeping, Poly houses, Sustainable Agricultural Practices in Tropical Region - Ecological conservation, organic farming, Crop rotation and group plantation, pest, and weed management.

#### **Unit V: Agriculture Lab**

Preparation and interpretation of crop calendar using Ergograph, Preparation of crop-combination regions by Weaver, Determination, and mapping of cropping intensity, Determination and mapping of crop diversity.

#### **Recommended Readings:**

1. Basu, D.N., and Guha, G.S., 1996: Agro-Climatic Regional Planning in India, Vol.I& II, Concept Publication, New Delhi.
2. Bryant, C.R., Johnston, T.R, 1992: Agriculture in the City Countryside, Belhaven Press, London.

3. Burger, A., 1994: Agriculture of the World, Aldershot, Avebury.
4. Dhillon, J.S. Agricultural Geography
5. Gregory H. P. (1970), "Geography of Agricultural", Prentice Hall New York
6. Grigg, D.B., 1984: Introduction to Agricultural Geography, Hutchinson, London.
7. Husain, Majid. (1999), "Agricultural Geography", Rawat Pub. New Delhi
8. Ilbery B. W., 1985: Agricultural Geography: A Social and Economic Analysis, Oxford University Press.
9. Mohammad, N., 1992: New Dimension in Agriculture Geography, Vol. I to VIII, Concept Pub., New Delhi.
10. Mohammad, N., 1992: New Dimension in Agriculture Geography, Vol. I to VIII, Concept Pub., New Delhi.
11. Roling, N.G., and Wageruters, M.A.E.,(ed.) 1998: Facilitating Sustainable Agriculture, Cambridge University Press, Cambridge.
12. Shafi, M., 2006: Agricultural Geography, Doring Kindersley India Pvt. Ltd., New Delhi
13. Singh, J. and Dhillon, S.S. (1984), "Agricultural Geography", 2nd edition, Tata McGraw-Hill, New Delhi.
14. Singh, J., 1974: An Agricultural Atlas of India: A Geographical Analysis, Vishal Publications, Kurukshetra.
15. Singh, J., and Dhillon, S.S., 1984: Agricultural Geography, Tata McGraw Hill, New Delhi.

## **Title of the Course: Urban Geography**

**Code: GEO402**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Explain** the major disciplinary changes that have occurred in the field of urban geography over the course of the last century.

CO2. **Identify** processes and patterns of urbanization associated with the evolution of urban landscapes.

CO3. **Describe** the fundamentals of urban classifications.

CO4. **Interpret** major urban problems with reference to planning.

CO5. **Acquire** practical skills in analyzing urbanization dynamics, interpreting census data, and utilizing satellite imagery for mapping urban land use, contributing to a holistic understanding of urban geography.

### **Course Content**

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#### **Unit 1: Introduction to Urban Geography:**

Definition of Urban Geography: Nature and scope; Approaches: Positivist approaches, Behavioural and humanistic approaches, Structuralist approaches, Urbanization: Definition and measurements; the process of urbanization during the ancient, medieval, modern and postmodern period; Globalization and the political economy of Urbanization.

#### **Unit II: Patterns of Urbanization in Developed and Developing Countries:**

Process of urbanization in developed and developing countries; Pattern of world cities: Global cities, represented city, Hybrid City, Intransitive City and the Creative City, Suburbanisation, Segregation, and Gentrification; Urban Aesthetics and changing urban spaces: working in the skyline, mobile and wireless in urban place; Cyborgization and Smart City

#### **Unit III: Classification of Urban Places:**

Urban Space and Urban Place: Urban Image, Centrality, Mobility, Transnational Urbanism; La Corbusier's Model of Sustainable City; Demographic Characteristics of urban populations; Gradients of Population Density within Cities, Occupational Structure of urban populations, Functional Classification of Towns in Medieval period with reference to India; Recent Developments in Urban Classification with reference to India.

#### **Unit IV: Urban Problems and Issues:**

City Employment issues, Displacement issues, Subsidy issues, Housing issues, Cultural issues, Urban green spaces, Urban transport, sustainability issue, Case studies of Delhi, Kolkata, Mumbai, Chennai, Bangalore, and Chandigarh with reference to Land use, Urban and Environmental Issues, and planning; Urban Planning in India- Policies, framework, and reforms.

#### **Unit V: Urban Geography Lab**

Hierarchy of urban settlements: Rank-size rule; State-wise variation and trends of urbanization; Temporal analysis of urban growth using census data; Preparation of urban land use map from satellite images

#### **Recommended Readings:**

1. Graham, S. and Marvin, S. (2001): Splintering Urbanism: Networked Infrastructures, Technological Motilities, and the Urban Condition, Routledge
2. Hall T. (2006): Urban Geography, Taylor and Francis.
3. Harvey, David (1989) The Conditions of Postmodernity, Blackwell Oxford.

4. Kaplan, D.H., Wheeler, J.O. and Holloway, S.R. (2008): Urban Geography, John Wiley.
5. Knox, P.L. and McCarthy, L. (2005): Urbanization: An Introduction to Urban Geography, Pearson Prentice Hall New York.
6. Knox, P.L. and Pinch, S. (2006): Urban Social Geography: An Introduction, Prentice-Hall.
7. Kundu, A (1992) Urban Development and Urban Research in India, Khanna Publication, New Delhi.
8. Mayer H.M. and Kohn, C.F. (1958), Reading Urban Geography. University of Chicago Press, Chicago.
9. Pacione, Michael (2001), Urban Geography - A Global Perspective, Routledge, London.
10. Ramachandran, R. (1992): The Study of Urbanisation, Oxford University Press, Delhi.
11. Singh, K. and Steinberg, F. (eds.) (1987) Urban India in Crisis, New Age International, New Delhi.
12. Singh, R.B. (Ed.) (2015): Urban development, challenges, risks and resilience in Asian megacities.

**Title of the Course: Advanced Geoinformatics**

**Code: GEO403**

**L-T-P-C: 2-0-2-4**

**Course Outcome:**

**Upon completion of the course students will be able to:**

CO1. Apply Advanced Remote Sensing Concepts

CO2. Navigate GIS Data Types and Structures

CO3. Conduct Image Processing and Interpretation

## **Course Content**

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### **Unit I: Advances in Remote Sensing**

Advances in remote sensing: Concepts and applications of Multispectral, Hyperspectral, Thermal, and Microwave remote sensing; Open-source satellite data acquisition: Landsat and IRS data; Digital image concepts: Pixels, DN values, Grey level, histogram, Color image fundamentals – RGB, HSI models.

### **Unit II: GIS Data Structure and Operations**

GIS data types: spatial and non-spatial, Digitization, Raster, and Vector data Structure: Geodatabase, Non-topological and topological vector data models; Raster Data Analysis – Local, Focal, Global and Zonal; Vector Data Analysis- Map Manipulation Techniques, Buffering, and Overlay operations; Scale design; Preparation of thematic map

### **Unit III: Image Processing and Applications**

Image preprocessing: Radiometric and Geometric Correction, Image enhancement: Linear enhancement and Filtering; Concept of band combination and selection of band combinations for identifying distinct objects; Image classification schemes: Supervised and Un-supervised; Interpretation and Application of Remote Sensing and GIS: Land use/ Land Cover, Urban Sprawl Analysis; Forests Monitoring

### **Unit IV: Laboratory Notebook**

A project file consisting of two exercises will be done from Unit II (Raster, Vector operations, Thematic maps, scale, orientation, and interpretation) and 3 exercises on Land use/ Land Cover, Urban Sprawl Analysis; Forests Monitoring.

### **Recommended Readings:**

1. Bhatta, B. (2008) Remote Sensing and GIS, Oxford University Press, New Delhi.
2. Campbell, J. B. (2007): Introduction to Remote Sensing, Guildford Press.
4. Jensen, J. R. (2004): Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall.
5. Joseph, G. 2005: Fundamentals of Remote Sensing, United Press India.
6. Li, Z., Chen, J. and Batsavias, E. (2008) Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences CRC Press, Taylor and Francis, London
7. Lillesand T. M., Kiefer R. W. and Chipman J. W., 2004: Remote Sensing and Image Interpretation, Wiley. (Wiley Student Edition).
8. Lo, C.P. and Yeung, A.K.W. (2002): Concepts and Techniques in Geographic Information Systems. Upper Saddle River, New Jersey: Prentice Hall.
9. Mukherjee, S. (2004) Textbook of Environmental Remote Sensing, Macmillan, Delhi.
10. Nag P. and Kudra, M., 1998: Digital Remote Sensing, Concept, New Delhi.
11. Narayan, L.R.A. (1999): Remote Sensing and Its Application, Universities Press (India) Ltd., Hyderabad.

**Title of the Course: Research Methodology**

**Code: GEO404**

**L-T-P-C: 1-1-2-4**

**Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** meaning, objectives and approaches to research in geography

CO2. **Explain** the basic process of conducting research

CO3. **Identify** the data collection methods in Geography

CO4. **Examine** research assumptions based on the sample dataset.

**Course Content**

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**Unit I: Fundamentals of Research**

Meaning of Research, Nature, and objectives of the research; Research Types: descriptive-analytical, pure-applied, conceptual-empirical, qualitative-quantitative; Motivations in Research

**Unit II: Research Process**

Needs and objectives of Literature Review; Conducting literature survey- searching literature, reviewing selected literature, developing theoretical and conceptual frameworks, Reporting literature review; Citation methods- footnote, text note, end note, bibliography, annotated bibliography, and citation rules; Research Problems- meaning, importance, and sources; selecting, defining, stating and evaluating a research problem; Selection of research objectives; Exercises on writing introduction of a research article; Research Strategies: Case studies, Experiments, Ethnography, Phenomenology, Grounded Theory, Action Research

**Unit III: Data Collection Methods**

The questionnaire, Interview, Focus Group, Participant Observation; Sampling- Concept, principles, and factors affecting inferences drawn from a sample; Sampling: Probability and Non-Probability sampling- types and criteria for selection; Sample size calculation and developing sampling Frames.

**Unit IV: Reading and Writing a Scientific Research Paper**

Introduction Section: Background, Hypothesis/Research Question, Premise, Logic, Novelty; Material and Method Section: Research Design, Data/Materials used, Sampling Strategy, Techniques used; Result Section: Coherence, Reliability, and validity of data; Important observations; Discussion Section: Interpretation of results and main conclusions;

**Recommended Readings:**

1. Best and Kahn, Research Methodology, PHI Limited.
2. Kothari, C.R. Research Methodology (Methods and Techniques), New Age Publisher.
3. Kerlinger, Foundation of Research.
4. Fundamentals of modern statistical methods by Rand R. Wilcox.
5. Power Analysis for Experimental Research a Practical Guide for the Biological, Medical and Social Sciences by R. Barker Bausell, Yi-Fang Li Cambridge University Press.
6. Design of Experience: Statistical Principles of Research Design and Analysis, by Robert O. Kuehl Brooks/Cole.

**Title of the Course: Resource Geography****Code: GEO405****L-T-P-C: 2-1-1-4****Course Outcomes**

On completion of this course, the students will be able to:

CO1. **Define** different types of resources and characterize their properties.

CO2. **Explain** myriad processes of resource management.

CO3. **Solve** complexities arising from resource utilization.

CO4. **Summarizes** resource related policies to achieve sustainable development goals

CO5. **Demonstrate** laboratory techniques to conduct resource mapping, case studies on resource scarcity, and estimations of resource depletion

**Course Content**

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**Unit I: Concept and Nature of Resources**

Concept, Scope, Nature, and Classification of resources, Economic and Environmental approaches to resource utilization; Process of resources: Zimmerman model, Principles of resource adequacy and resource scarcity: Pressure on resources.

**Unit II: Distribution and Management of Natural Resources**

Resources; the problem of land acquisition in developing countries; Extensive Economic Zones (EEZ) of the world, Global scenario of utilization, problems, and trend of management of resources: Forests and Energy Resources, Distribution, depletion and management of resource: Mineral and Soil Resources.

**Unit III: Environmental Crisis and Management**

Environment as a resource system; Technology, Market, Culture and resources, Environmental crisis-nature and management of deforestation, Flood and droughts, Land degradation, Depletion of freshwater resources and their management.

**Unit IV: Concept of resource conservation and Sustainability**

Conservation of natural resources in the context of environment, population, and development., Sustainable Resource Development Eco-friendly technology and sustainable development, National policies, plans, programs, processes, and patterns of resource development

**Unit V: Resource Analysis Lab**

Resource mapping in a local region, case study on resource scarcity; Resource depletion estimation: deforestation, soil moisture, draught, water crisis.

**Recommended Readings:**

1. Adams, W.M.1995: Green development: Environmental sustainability in the Third World, London: Rout ledge.
2. Burton, I. and Kates, R.W. 1978: Readings in Resources Management and Conservation, McGraw Hill, New York.
3. Canter, L. W. 1996: Environmental Impact Assessment, 2nd edition, New York: McGraw Hill.
4. Chapman J.L. and Reiss, M.J. 1993: Ecology: Principles and applications, Cambridge: Cambridge University Press.

5. Clark, G.L; Feldman, M.P. and Gertler, M.S. (eds.) 2000: The Oxford Handbook of Economic Geography, Oxford University Press, Oxford and New York.
6. Cutter S. N., Renwick H. L., and Renwick W., 1991: Exploitation, Conservation, Preservation: A Geographical Perspective on Natural Resources Use, John Wiley and Sons, New York.
7. David W. Pearce and Kerry R. Turner 1999: Economics of Natural Resources and the Environment, The Johns Hopkins University Press, Baltimore.
8. 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. The USA.
9. Holechek J. L. C., Richard A., Fisher J. T., and Valdez R., 2003: Natural Resources: Ecology, Economics and Policy, Prentice Hall, New Jersey.
10. Hoyt, J.B. (1973) Man and the earth, Prentice Hall, New Jersey.
11. Husain, M. (2010) Human Geography, Rawat Publication, Jaipur.
12. John Bowers (1997), Sustainability and Environmental Economics, Addison Weley Longman Ltd, Singapore.
13. Jones G. and Hollier G., 1997: Resources, Society and Environmental Management, Paul Chapman, London.
14. Klee G., 1991: Conservation of Natural Resources, Prentice Hall, Englewood.

**Title of the Course: Sustainability and Disaster Management**

**Code: GEO406**

**L-T-P-C: 2-1-1-4**

**Course Outcomes**

On completion of this course, the students will be able to

CO1. **Describe** the evolution of perception towards environment in different stages of civilization and learn about concept, scope of environmental geography and components of environment.

CO2. **Analyze** the cause and impacts of environmental pollutions and hazards.

CO3. **Evaluate** the global environmental issues in the perspective of sustainable development.

CO4. **Explain** the problems related environmental degradation in India and know about their management options.

CO5. **Acquire** practical skills in comprehensive environmental monitoring, enabling them to contribute to effective environmental management and sustainable practices.

**Course Content**

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**Unit I: Environmental Pollution**

Geographers' approach to environmental studies; Environmental perception: significance; Physical Components of Environment: Lithosphere, Hydrosphere, Atmosphere, Biosphere, and their relationship; Pollution: Air, Water, Soil, Noise pollutions, their sources, impacts, and management; green technology

**Unit II: Concept of Hazards and Disasters**

Concepts of vulnerability, hazards, disaster, and risk; natural, quasi-natural, and man-made hazards and disasters; Social response; Natural hazards: Forest hazard, Desertification, Jhum cultivation; Social hazards: Poverty, Disease, Ward, and Crime - factors, impact, and redressal; Hazard and disaster reduction and management

**Unit III: Environmental Issues**

Global resource crisis and population equilibrium, History of Earth Summits and significance of Sustainable Development, Relevance of Montreal and Kyoto Protocols, Biodiversity conservation and Genetically Modified Organisms, Big dams, and their viable alternatives; International and Inter-State Water Dispute in the Indian subcontinent, Conservation of wetland and wasteland management

**Unit IV: Impact of land use land cover dynamics on the environment**

Fundamental concepts of land as the basis of environment and society; Concept of land use and land cover; factors of land-use land cover change; Impact on the environment; Land degradation types, processes, and causes of land degradation, mapping, and monitoring of land degradation; Land Capability Classification (USDA)

**Unit V: Environmental Monitoring and Management**

Measuring pH, EC, TDS, and DO in Water, Measurements of Air-pollutants, Soil Pollutants, Noise pollution; Land degradation and landscape pattern analysis - patches, corridors, and mosaics; measuring metrics (Shannon's Diversity Index and Simpson Diversity Index); Preparation of Environmental Management Plan

### **Recommended Readings:**

1. Anderson J.M. (1981): Ecology for Environmental Science: Biosphere, Ecosystems and Man, Arnold, London.
2. Nobel and Wright (1996): Environmental Science, Prentice Hall, New York.
3. Odum, E.P. (1971): Fundamental of Ecology, W.B. Sanders, Philadelphia.
4. Saxena, H.M. (1994): PrayavaranevParisthitikiBhugool (Geography of Environment and Ecology) Rajasthan Hindi Granth Academy, Jaipur.
5. Singh, Savinder (1991): Environmental Geography, Prayag Pustak Bhawan, Allahabad.
6. Strahler, A.N. and Strahler, A.H. (1973): Environmental Geosciences: Interaction between natural systems and Man, John Wiley and Sons, New York.
7. Strahler, A.H. and Strahler A.N. (1977): Geography and Mans Environment, John Wiley, New York.
8. William, M.M. and John, G. (1996): Environmental Geography - Science, Landuse and Earth System, John Wiley and Sons, New York.
9. Alexander, D. (1993): Natural Disasters, Research Press, New Delhi, 619 P.
10. Blaikie, P. Cannon, Davis and Wisenes (1994): At Risk, Natural Hazards, People's Vulnerability and Disasters, Pouthledge, London, 320 P. 15.
11. Bryant, E. A. (1991): Natural Hazards: Cambridge University Press, Cambridge, Pg 294.
12. Burotn, I. Kates, R. W. and White, G. F. (1974): The Environment as a Hazard, Oxford University Press.
13. 17. Coch, N. C. (1994): Geo-Hazards, Prentice Hall, N. Y., Pg.305.
14. Environment and Development: R. Bhattacharyya, (Edited).
15. Environmental Geology: B. W. Murck and et al, John Willey.
16. Gilbert, F. White, ed. (1974): Natural hazards – Local, Natural and Global, Oxford University Press, N.Y.
17. Morrisawa, M., (1996): Geomorphology and Natural Hazards,Elscvia, Amsterdam, pg 411
18. Natural Hazard: Edited by White.
19. Smith, K. (1996): Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge, Pg.398.
20. Turner, M.G., Gardner, R.H. and O'Neill, R.V. (2001): Landscape Ecology in Theory and Practice: Pattern and Process, Springer Science & Business Media, New York
22. Jana, N.C. and De, N.K. (1997): The Land - Multifaceted Appraisal and Management, Sribhumi Publishing Company, Kolkata

## **Title of the Course: Population and Settlement Geography**

**Code: GEO407**

**L-T-P-C: 2-1-1-4**

### **Course Content**

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#### **Unit I: Population Dynamics**

Population Geography: Nature, scope and trends, Sources of Data with special reference to India (Census, Vital Statistics, and NSS). The concept of population density and its types: Factors influencing the spatial distribution and density of population; World distribution of population, Population - Resource Region, Population Dynamics: Fertility, Mortality and Migration – Measures, Determinants, and Implications.

#### **Unit II: Demographic Attributes and Concerns**

Population structure and composition: Age and Sex-specific, Rural and Urban Composition, Literacy Theories of Population Growth: Malthus and Marx, Demographic Transition; Population policy with reference to India and China; Theories of Migration: Ravenstein, Lee and Todaro, Emerging issues and concerns - Ageing of Population; Declining Sex Ratio; HIV/AIDS; nutrition and morbidity with special reference to India

#### **Unit III: Introduction to Rural and Urban Settlements**

Definition, nature, types and characteristics of settlements; Morphology of rural settlements: site and situation, Social segregation rural land use morphology; Types and Patterns of Rural Settlements; Rural house types and forms with reference to India, Urban settlements: Characteristics and definition, Census definition and categories in India; Concept of Metropolitan, Conurbation, Megacity, Megalopolis, Ecumenopolis and Necropolis, Morphology and Functions of Settlements: Classical models of Burgess, Homer Hoyt, Harris and Ullman, Central Place theory of Christaller; City Region, Umland and Rural-urban Fringe and Continuum

#### **Unit IV: Rural-Urban Infrastructure: Issues and Concerns**

Problems of Rural settlements: Housing, Drinking water, Power, Education and Finance, Urban Housing problem: study of outgrowth and urban sprawl with reference to India; Urban Redevelopment, Renewal and New Town – case studies with reference to India. Urban basic infrastructure and issues: Water supply and sanitation; solid waste management; the role of National policies and JNNURM

#### **Unit V: Spatial Demography and Settlement Patterns**

Mean centre of population and its shift over time; Population potential using Gravity Model. Calculation of Fertility and Mortality Rate; Population growth rate - linear, geometric and exponential, Population Projection –Construction of Life Table; Nearest Neighbor Analysis; Density functions and pattern analysis of distribution of settlement: Randomness and Spacing Indices; Rank size distribution of towns: Zipf and Berry – Garrison; Population density gradient in urban area, Breaking point analysis; Classification of towns

#### **Recommended Readings:**

1. Carter, H.1975: The Study of Urban Geography, Edward Arnold, London
2. Daniel, P. 2002: Geography of Settlement, RawatPubls., Jaipur & New Delhi.
3. G. Dickinson, R. E. (1964): City and Region.
4. Ghosh, S. 1998: Settlement Geography, Orient Longman Ltd., Kolkata.
5. Hudson, F. S. (1976) : Geography of Settlement.

6. Johnson, J.H. 1977 Urban Geography- An Introductory Analysis, Pergamon Press, Oxford
7. Mandal, R.B. 2001: Introduction to Rural Settlements, Concept Publishing Company, New Delhi
8. Misra, H.N. (1987) Rural Geography, Vol. IX, Contributions to Indian Geography, Heritage Publishers, New Delhi.
9. Ramachandran R., 1989: Urbanisation and Urban Systems of India, Oxford University
10. Singh R.L. & K.N. Singh: Readings in Rural Settlement Geography, NGSi Varanasi, 1975
11. Agarwala, S.N. 1985: India's Population Problems, Tata McGraw Hill, New Delhi
12. Chandna, R.C. 1986: A Geography of Population, Kalyani Publishers, New Delhi
13. Clarke, J. I. 1971: Population Geography and the Developing Countries, Pergamon Press, Oxford
14. Clarke, J. I. 1972 Population Geography, Pergamon Press, Oxford
15. Hassan, M.H. 2005: Population Geography, Rawat Publications, New Delhi
16. Mamoria, C.B. India's Population Problem, KitabMahal New Delhi, 1981.
17. Mitra, Ashok India's Population: Aspects of Quality and Control Vol I & II. Abhiman Publications, New Delhi, 1978.
18. Trewartha, G.T. 1969: A Geography of Population- World Patterns, John Wiley, New York.
19. Zacharia, E. and Sinha, V.C., 1986: Elements of Demography, Allied Publishers Pvt Ltd, New Delhi

## **Title of the Course: Geography of Health and Wellbeing**

**Code: GEO408**

**L-T-P-C: 2-1-1-4**

### **Course Outcomes**

On completion of this course, the students will be able to:

**CO1.** Explain various perspectives of health and wellbeing associated with the geography, environment, development, population dynamics, poverty and inequality.

**CO2.** Relate anthropogenic activities with the degrading environmental quality and health risks.

**CO3.** Describe the concepts, measurements and classification of diseases with reference to its genesis and distribution.

**CO4.** Describe the role of national and international organisations in addressing the issues of healthcare disparity with special reference to India.

**CO5.** Gain practical skills in utilizing GIS software for health research, including geocoding, spatial data manipulation, and thematic mapping, with a focus on communicating health-related information effectively.

### **Course Content**

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#### **Unit 1: Basic Concepts:**

Introduction to geography of health and wellbeing: Definition, Nature and Scope, Perspectives on Health and wellbeing: Linkages with environment, development and health; Driving forces in health and environmental trends – population dynamics, urbanization, poverty and inequality.

#### **Unit II: Exposure and Health Risk:**

Exposure: concept and types, Pathways and routes of exposure, duration of exposure, dose-response, Environmental pollution: Air, Water, soil and noise pollution, Indoor-outdoor exposures in developed and developing nations, climate change and human health – heat and cold; Biological disease agents; food production and nutrition, Diseases causing factors and agents: Environmental, Hereditary, Behavioural, and deficiency diseases, Xenobiotics, Pathogens, Geogens, Tetragens, Allergens, Carcinogens etc. Occupational health and safety.

#### **Unit III: Disease Distribution and Epidemiology:**

Mortality and Morbidity: concept and measurements, Diseases – Concepts and classifications - genetic, communicable and non-communicable; WHO classification of diseases; Principles of Epidemiology: concept, measures and techniques, Spatial and Geographical Epidemiology: Infectious diseases modelling, Epidemiological Transition Theory. Temporal distribution of disease in Environmental Context with special reference to India, Types of Diseases and their regional pattern (Communicable and Lifestyle-related diseases).

#### **Unit IV: National and Global Issues in Healthcare Systems:**

Health care systems of developed and developing countries; Financing of Health care System, regional disparity in healthcare distribution - issues of accessibility and availability of healthcare, Role of international organization and healthcare - World Health (WHO), UNICEF and Red Cross. Health Care Systems in India; National Health Policies, Health Care Programmes – Family welfare, Immunization, National Disease Eradication, and National Rural Health Mission.

#### **Unit V: Geography of Health and Wellbeing Lab:**

Acquisition and Visualization of Disease Data: Methods for acquiring disease data, Introduction to data visualization techniques using spreadsheets and Cartograms, Techniques for creating thematic maps of health data; Geographic Information Systems (GIS) in Health Research: Importance of considering spatial factors in health research, Introduction to GIS software and basic functionalities, Historical context of John Snow's cholera outbreak investigation, Geocoding health data and performing spatial data assessing Interpreting spatial patterns in health data, Overlay analysis in health , Analysing and mapping health disparities across different geographic regions; Assessing healthcare accessibility using GIS tools, Introduction to spatial clustering techniques, Identifying clusters of disease using spatial analysis tools, Analysing environmental and health indicators using satellite imagery; Case Studies and Applications: Application of GIS in epidemiology and disease surveillance, Case studies exploring health disparities in urban and rural areas, Mapping the risk of different communicable diseases across West Bengal.

### **Recommended Readings:**

1. Akhtar Rais (Ed.), 1990: Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.
2. Avon Joan L. and Jonathan A Patzed. 2001: Ecosystem Changes and Public Health, Baltimin, John Hopling Unit Press(ed).
3. Bradley,D.,1977: Water, Wastes and Health in Hot Climates, John Wiley Chichesten.
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**Title of the Course: Dissertation**  
**Code: GEO409**  
**L-T-P-C: 0-0-12-12**

### **Course Outcomes**

On completion of this course, the students will be able to:

- CO1. **Analyze** data to solve research problems for specified research objectives
- CO2. **Design** research report writing and scientific articles for publication.
- CO3. **Construct** own research design for life-long learning.
- CO4. **Appraise** ethical aspects of research and development work for professional development.
- CO5. **Develop** writing and communication skills.

### **Course Content**

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Dissertation Paper comprises an Object-specific goal-oriented Geographical Study based on the following types: 1) those which test a hypothesis or theory, as virtually all aspects of Geography have theories attached to them, 2) those which compare the geographical characteristics of two places or phenomena. A variation on this theme is a comparison of the geographical characteristics of one place or phenomena at two or more stages of time, i.e., a study of changes over time, and 3) those which study a geographical problem related to the habitat, economy, and society of people.

- 1) Each Examinee shall prepare a Dissertation Paper individually under the supervision of a Departmental Faculty on his / her own chosen Theme.
- 2) The Report must be documented in triplicate (1 = examinee, 2 = seminar library, 3 = supervisor) under the following Heads – *Introduction & Conceptual Background; Statement of the Problem; Objectives of Study; Literature Review; Methodology including data/information/map collection; Location of the Study Area; Analysis, Display and Interpretation of Data (relating to each Objective separately); and Conclusion.*
- 3) The Dissertation Paper should contain *Acknowledgement, Preface, Table of Content, List of Tables,*
- 4) *List of Figures, List of Photographs, List of References, Appendix, and Bibliography/Reference.*
- 5) Pages containing Illustrations (Sketches, Graphs, Diagrams, Maps, Photographs, etc.) = 25(maximum).
- 6) Word Limit = 8000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing= 1½, Arial Narrow / Times New Roman / Helvetica 10 / 11 / 12).
- 7) Each Examinee shall submit a copy of the Report before the actual day of Examination (to be announced by the convener each year).
- 8) Each Examinee shall present his / her Paper before an audience comprising Internal / External
- 9) Examiners and others on the day of Examination using OHP or LCD Projector (maximum 25 slides about —*concept / idea / theme; major objectives; methodology; study area; observations and analysis; conclusion.*)
- 10) Time allotted for each presentation = 20 minutes (maximum).
- 11) Marks on Report and Presentation shall be separately awarded by the Internal and External
- 12) Examiners and then averaged.

### **Recommended Readings:**

Good research articles published from reputed journals on their specific research domain.