

**Four Year Undergraduate Programme in Geography
under
National Education Policy, 2020**

Curriculum



2023

**Department of Geography
Cotton University
Panbazar, Guwahati
Assam**

Courses of the Four Year Undergraduate programme in Geography, Cotton University

Semester	Courses	Level	
I	I. Geomorphology	100 – Introductory	
II	II. Population and Settlements	100	
III.	III. Geography of India	200 – Intermediate	
	IV. Climatology	200	
IV	V. Soil Biogeography and Oceanography	200	
	VI. Statistical Methods	200	
	VII. Cartographic Technics – Maps and Diagram	200	
V	VIII. Geographic Thought	300 – Higher	
	IX. Regional Development and Planning	300	
	X. Cartographic Methods- Surveying and Projection	300	
	XI. Political Geography	300	
VI	XII. Social and Cultural Geography	300	
	XIII. Environmental Geography	300	
	XIV. GIS and RS	300	
	XV. Geography of Resources and Economic Activities	300	
VII	XVI. Advanced Geographic thought/Philosophical foundation	400 -Advanced	To be reviewed
	XVII. Political Economy of Regional Development	400	Do
	XVIII. Urban and Industrial Studies	400	Do
	XIX. Regional Geography of the World	400	Do
	XX. Southeast Asia	400	Do
VIII.	XXI. Applied Statistics	400	Do
	XXII Research Methodology	400	Do
	XXIII. Advanced Geomorphology	400	Do
	XXIV. Advanced GIS and RS	400	Do
	XXV. Geography of Health and Wellbeing	400	Do
	XXVI. Population Studies	400	Do
	XXVII. Agriculture in Regional Development	400	Do

Multi-disciplinary Elective Courses at Department of Geography

Semester I.	Environmental concerns of contemporary times and institutional measures for mitigation	Introductory
II	Hill and Mountain Agriculture in Northeast India: Traditions, Continuity and Changes	Introductory
III.	Rural Development	Intermediate
	Sustainable Development	Intermediate

Value Added Courses at Department of Geography

Semester I	Indigenous Ecological Knowledge Systems: Native wisdom for a better future	Introductory
Semester I	Introduction to Ecology and Environment	Introductory

Skill Enhancement Course

Semester I	Global Navigation and Satellite Systems	
Semester II	Measuring Dimensions of Human Development	

Semester I

Course I: Geomorphology: Forms and Processes: 4 Credits (Lecture -3; Practical -1) (Level 100)

This course will help the students to build up conceptual and theoretical foundation of geomorphology. The students will understand the functioning of the earth system; appreciate and explore how the natural operating factors shape the landform developments, and the ideas of landform at different environmental dimensions getting them acquainted with certain basic measures.

Specific learning outcome of this course are –

1. Understand the forms and process relationship and theories of geomorphology
2. Identify and understand the landforms in our own vicinity and the changes, if there are any, observed at the present time.
3. Understand the diversified landforms of the world

Unit	Content	No. of classes
Theory		
1	Geomorphology: Meaning, scope, and nature	3
2	Structure and composition of earth's interior, rocks and minerals, Concept of Isostasy and Eustasy	7
3	Geotectonic and Endogenic Geomorphic Processes: Earth Movements, Earthquakes and Volcanoes, mountain building theory Kober's and Holmes, Types of Folds and Faults and their formation mechanisms	15
4	Exogenic Geomorphic Processes: Weathering, Mass Wasting, Erosion, Transportation and Deposition	10
5	Landforms developed in Fluvial, Aeolian, Glacial, Karst, Coastal environment	10
Practical	<ol style="list-style-type: none">1. Identification of landforms from topographical map2. Profile drawing – serial, superimposed, projected and composite,3. Measurement of slope and gradient4. Altimetric frequency curve and histogram5. Block diagram (one point perspective)	15

Reading list:

- Ahmed, E., 1985: Geomorphology, Kalyani Publishers, New Delhi
- Bloom A. L., 2003: Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, Prentice-Hall of India, New Delhi.
- Bridges E. M., 1990: World Geomorphology, Cambridge University Press, Cambridge.
- Dayal, P. (2nd Ed.) 1996: A Textbook of Geomorphology, Shukla Book Depot, Patna

- Kale V. S. and Gupta A., 2001: Introduction to Geomorphology, Orient Longman, Hyderabad.
- Khullar D.R. 2012: Physical Geography, Kalyani Publishers, New Delhi
- Monkhouse, F. J., 2009: Principles of Physical Geography, Platinum Publishers, Kolkata
- Singh, R. L. and Singh, R. P. B. 1999: Elements of Practical Geography, Kalyani Publishers
- Singh, Satyendra, 2007: Geomorphology, Prayag Pustak Bhawan, Allahabad.
- Strahler, A.N., 1960: Physical Geography, John Wiley & Sons, New York, London
- Thornberry, W.D., 1968: Principles of Geomorphology, Wiley Eastern Reprint.
- Waugh, D. 2002: An Introduction to Physical Geography, Nelson Thornes, U.K.

Semester II

Course II: Population and Settlements Geography: Credits 4 (Lecture 3, Tutorial 1) (Level -100)

The objective of the course is to familiarize the students with the data sources, particularly population census, Sample Registration System (SRS) and National Family and Health Survey (NFHS) to study population and settlements. The course aims to introduce the students to the nature and scope and fundamentals of population and settlement studies in geography, and the current population and settlement issues in India.

The following learning outcomes will be achieved:

1. Exposing the students to the scope and nature of population and settlement geography
2. Familiarize the students with the fundamentals of population and settlement studies in geography
3. Familiarize the students with the current population and settlement issues in India.
4. Exposing the students with the data sources to study population and settlements

Unit	Content	Number of lectures
1	Definition, nature and scope of Population Geography; development of population geography. Sources and nature of population data (Census, SRS, and NFHS)	10
2	Population dynamics: fertility, mortality, and migration- basic measures: World population distribution, growth and trend; demographic transition theory	10
3	Age-sex structure of population: population pyramids; trends of dependency ratio, problems relating to ageing population	5
4	Definition, nature, and scope of Settlement Geography: rural, urban and peri-urban settlement	5
5	Rural settlements: origin and growth, types, pattern and characteristics of rural settlements, hill settlements – case studies from Northeast India. Urban settlements: origin, growth, and classifications; Concept of city, metropolis; megalopolis, conurbation; Census classifications of towns and cities of India; trend and pattern of urbanisation	10
6	Concepts of urban fringe, urban sprawl; rural-urban dichotomy and continuum	5

Reading list:

- Barrett H. R., 1995: Population Geography, Oliver and Boyd.
- Bhende A. and Kanitkar T., 2000: Principles of Population Studies, Himalaya Publishing House.
- Chandna R. C. and Sidhu M. S., 1980: An Introduction to Population Geography, Kalyani Publishers.
- Clarke J. I., 1965: Population Geography, Pergamon Press, Oxford.

- Jones H. R., 1990: Population Geography, Sage.
- Jones, H. R., 2000: Population Geography, 3 ed. Paul Chapman, London.
- Lutz W., Warren C. S. and Scherbov S., 2004: The End of the World Population Growth in the 21st Century, Earthscan
- Newbold K. B., 2009: Population Geography: Tools and Issues, Rowman and Littlefield Publishers.
- Pacione M., 1986: Population Geography: Progress and Prospect, Taylor and Francis.
- Peters G. L. and Larkin R. P., 1979: Population Geography – Problems, Concepts and Prospects, Kendall Hunt Publication Co.
- Chisholm M., 2007: Rural Settlement and Land Use, Transaction Publishers.
- Daniel, P. 2002: Geography of Settlement, Rawat Publications, Jaipur & New Delhi.
- Ghosh, Santwana 1999: A Geography of Settlements, Orient Longman, Kolkata.
- Kalia Ravi, 1999: Chandigarh: The Making of Indian City, Oxford University Press.
- Kaplan D. H., Wheeler J. O. and Holloway S. R., 2008: Urban Geography, John Wiley.
- Krishan G., 1999: Inner Spaces – Outer Spaces of a Planned City: A Thematic Atlas of Chandigarh, Celebrating Chandigarh.
- Ramachandran R., 1989: Urbanisation and Urban Systems of India, Oxford University Press.
- Ramachandran, R., 1992: The Study of Urbanisation, Oxford University Press, Delhi.
- Singh R. Y., 1994: The Geography of Settlement, Rawat Publication, New Delhi.
- Misra, R. P. & Misra, K. eds. 1998: Million Cities of India, Sustainable Development Foundation, New Delhi

Semester III

Course III: Geography of India: 4 Credits (Lecture 3; Tutorial 1) (Level -200)

This course will help gain a wide-ranging idea on India from geographical perspective. The paper is aimed to familiarize the students with the physical and human aspects of India and develop a regional perspective. The course is designed to broaden the understanding of various natural and cultural factors in India to help appreciate the interaction between the two sets of factors over space.

The following learning outcomes will be achieved:

1. Understand the physical profile of the country, relating the profiles to basic concepts and theories,
2. The agro-industrial and natural resources ecosystem structure of the country
3. Perceptions and approach of society and state towards resource use
4. Identify certain critical problems on outcome of development programme,
5. Understand and use of certain spatial tools and techniques, use of data to measure development outcomes.
6. Public policy analysis

Course Content:

Unit	Contents	No. of lectures
1	Physical: physiography, soil, climate, drainage, vegetation	10
2	Population: growth and distribution	4
3	Economic Resources: mineral and power resource distribution and utilization (coal, iron ore, petroleum, natural gas; non-conventional energy – wind, solar, bio-energy, nuclear); Major crops paddy, wheat, maize, tea, horticulture – production and distributions; Industries and Industrial development with study of specific industries (large – iron and steel; medium- paper, textile; small and micro -handloom and handicraft, food processing) developments in information technology sector, Human resources – level and measurement of human development in the states of India	14
4	Social: religion, language, tribes, race, ethnicity; diversities	6
5	Regionalisation of India: Socio-cultural (Sopher), Economic (Sengupta), Agro-climatic regions (planning commission)	6
6	Regional disparities in economic development – agriculture and industrial sectors	5

Reading List:

- Ahmed, A. (1999): *Social Geography*, Rawat Publications. Jaipur
- Deshpande, C.S. (1992): *India: A Regional Interpretation*, ICSSR, New Delhi

- Hussain, M. (2014): *Geography of India*, Tata Mcgrow-Hill Education, New Delhi
- Khullar, D.R. (2011): *India: A comprehensive geography*, Kalyani Publishers, New Delhi
- Mandal, R.B. (Ed) (1990): *Patterns of Regional Geography- A International Perspective*. Vol3- Indian Perspective.
- Pathak, C.R. (2003): *Spatial structure and Process of Development in India*. Regional Science Association, Kalkata.
- Sharma, T.C. (2003): *India- Economic and Commercial Geography*, Vikas Publications, New Delhi
- Singh, J. and Dhillon, S.S. (2004): *Agricultural*, Tata Mcgrow-Hill Education, New Delhi
- Singh, Jagdish (2003): *India-A Comprehensive of Systematic Geography*, Gyanodaya Prakashan, Gorakhpur
- Singh, R.L. (1993): *India: A regional Geography*, UBS publishers Distributors, New Delhi
- Tirtha, R. (2002): *Geography of India*, Rawat Publications, Jaipur
- Tiwari, R.C. (2007): *Geography of India*. Prayak Pustak Bhawan, Allahabad

Semester III

Course IV: Climatology: 4 Credits (Lecture 3; Practical 1) (Level -200)

This paper introduces the students to the basic concepts associated with earth's atmosphere; elements of weather and factors influencing climates and disturbances in the world. The students will understand the functioning of the atmospheric system and analyze how the natural operating factors influencing the variations.

The specific learning outcome of this course are –

1. Understanding the basic concept of climate and weather, their phenomenon and parameter
2. Relate the phenomena of weather and climate in different spatial contexts.
3. Identify, and relate certain critical phenomena occurred and discussed in contemporary times revealing the applied dimensions.

Unit	Contents	No. of lectures
1	Atmosphere: Structure and composition of Atmosphere	4
2	Heat and Temperature: Insolation, heat budget, vertical and horizontal distribution of temperature	4
3	Pressure and Winds: Atmospheric Pressure, Measurement of air pressure and wind, Distribution of pressure, Factors affecting pressure, Pressure belts; Atmospheric Circulation, Factors controlling winds, Types of Winds, Planetary wind system, Instruments for wind direction, speed and strengths, Jet Streams.	10
4	Humidity and Precipitation: Measurement of Atmospheric moisture, Types of Humidity, Factors affecting rate of Evaporation and distribution, Evapotranspiration, Forms of condensation, Types of clouds, stability and instability of air.	10
5	Air Masses and Fronts: Classification of Air Masses, Modifications. Fronts and their types. Cyclones and Anticyclones: Types of Cyclones, Temperate and Tropical Cyclones;	10
6	World Climatic Regions: Classification of Climate of the World, Koeppen's Climatic Classification.	4
7	Climate change and extreme climatic events	3
8	<u>Practical:</u> Graphs/ diagrams representing climatic data. 1. Weather map interpretation, 2. Rainfall dispersion graphs, 3. Climographs (Taylor), 4. Hythergraph 5. Star/ Wind rose diagram 6. Preparation and interpretation of maps showing the trend of onset and withdrawal/retreat of Monsoon in India/Northeast India	15

Reading List:

- Barry R. G. and Carleton A. M., 2001: *Synoptic and Dynamic Climatology*, Routledge, UK.
- Barry R. G. and Corley R. J., 1998: *Atmosphere, Weather and Climate*, Routledge, New York.
- Batten L. J., 1979: *Fundamentals of Meteorology*, Prentice-Hall Inc. Englewood Cliffs, New Jersey.
- Boucher K., 1975: *Global Climates*, Halstead Press, New York.
- Critchfield H. J., 1987: *General Climatology*, Prentice-Hall of India, New Delhi.
- Griffith, J.F., 1966: *Applied Climatology*, Oxford university Press
- Lal, D.S., 2002: *Climatology*, Chaitanya Publishing House, Allahabad
- Lutgens F. K., Tarbuck E. J. and Tasa D., 2009: *The Atmosphere: An Introduction to Meteorology*, Prentice-Hall, Englewood Cliffs, New Jersey.
- Oliver J. E. and Hidore J. J., 2002: *Climatology: An Atmospheric Science*, Pearson Education, New Delhi.
- Singh, S. 2007: *Climatology*, Sharada Pustak Bhawan, Allahabad.
- Thompson D. R. and Perry A. (eds.), 1997: *Applied Climatology: Principles and Practice*, Routledge, USA, and Canada.
- Trewartha G. T. and Horne L. H., 1980: *An Introduction to Climate*, McGraw-Hill.

Semester IV

Course V: Soil, Biogeography and Oceanography 4 Credits (L -3; T -1) (Level 200)

This course introduces the basic concepts and features of associated with oceanography, soil, and biogeography. Students shall get acquainted with the physical features and environment of oceans, the movements and changes and outcomes observed in the forms of facilitation of economic activities as well as the calamities. Understanding on the biomes, people's living in different ecological settings and traditional ecological knowledge would offer an outlook to look at the world to ensure sustainability.

The specific learning outcomes are

1. Understand the basic concept and theories of oceanography, biogeography and soil studies, landscape, and spatial dimension of all components at global level,
2. Learn the ecosystems evolved around the ocean and soil,
3. Ability to relate human perceptions including development of traditional knowledge base in all forms of ecological settings.
4. Identification of emerging problems if any in spatial context and need of policy interventions.

Unit	Content	No. Of lectures
1	Definition and scope of oceanography, coral reefs and islands: conditions of growth, types of coral reefs	08
2	Ocean salinity, temperature, ocean deposits, bottom configuration of Indian, Atlantic and Pacific oceans; Tides, Waves, Ocean currents, Ocean- Atmosphere interactions - El Nino, La Nina; Marine resources and concerns for sustainability	11
3	Definition and scope of biogeography, biomes, ecology, and ecosystem – components, structure, types, ecotone, food chain and food web, energy flow, bio-geo chemical cycles, biodiversity hotspot and conservation	18
4	Factors and processes of soil formation, properties of soil, classification of soil, soil profile, soil catena, soil erosion and degradation; measures to check soil degradation	08

Reading List:

- Anikouchine W. A. and Sternberg R. W., 1973: *The World Oceans: An Introduction to Oceanography*, Prentice-Hall.
- Garrison T., 1998: *Oceanography*, Wordsworth Company, Belmont.
- Gerald S., 1963: *General Oceanography: An Introduction*, John Willey & Sons, New York.
- Kershaw S., 2000: *Oceanography: An Earth Science Perspective*, Stanley Thornes, U. K.
- King C. A. M., 1962: *Oceanography for Geographers*, Edward Arnold.

- Pinet P. R., 2008: *Invitation to Oceanography* (Fifth Edition), Jones and Barlett Publishers, USA, UK, and Canada.
- Sharma R. C. and Vatal M., 1980: *Oceanography for Geographers*, Chaitanya Publishing House, Allahabad.
- Sverdrup K. A. and Armbrust, E. V., 2008: *An Introduction to the World Ocean*, McGraw Hill, Boston.
- Thurman H. V., 1996: *Essentials of Oceanography*, Prentice-Hall, New Jersey
- Bradshaw, M. J., 1979: *Earth and Living Planet*, ELBS, London.
- Bunting, B. T., 1967: *The Geography of Soil*, Hutchinson, London.
- Foth, H. D. and Turk, L. M. 1972: *Fundamentals of Soil Science*, John Wiley, New York.
- Govindarajan, S. V. and Gopala Rao, H. G., 1978: *Studies on Soils of India*, Vikas, New Delhi.
- Goudie, Andrew, 1981: *The Human Impact*, Basil Blackwell, Oxford.
- Huggett, R. J., 1988: *Fundamentals of Biogeography*. Routledge, London.
- Huggett, R. J., 1995: *Geoecology: An Evolutionary Approach*, Routledge, London.
- Hussain, M. (ed), 1994: *Biogeography (Part I&II)*, Anmol Publications Pvt. Ltd., New Delhi.
- Newbiggin: *Plant and Animal Geography*.
- Pears, N., 1985: *Basic Biogeography*. 2nd Edition, Longman, London.
- Robinson, H., 1982: *Biogeography*, E.L.B.S., Mc Donald & Evans, London.
- Russell, E.W., 1973: *Soil Condition and Plant Growth*, Longman, London.
- Mc. Bride, M. B., 1999: *Environmental Chemistry of Soils*, Oxford University Press, New York
- Odum, E. P., 1971: *Fundamentals of Ecology*, W.B. Saunders, Philadelphia.
- Singh, S. 1991: *Environmental Geography*, Prayag Publications, Allahabad.
- Smith, R. L., 1977: *Ecology of Man- An Ecosystem Approach*.
- Spellberg, I. F. & Sawyer, J. W. D., 1999: *An Introduction to Applied Biogeography*, Cambridge University Press.
- World Resources, 2001: *People and Ecosystems*; World Resources Institute, Washington.

Semester IV

Course VI: Quantitative Methods in Geography: 4 Credits (Lecture -3; Practical -1) (Level 200)

This course discusses significance of quantification, and quantitative/statistical methods in Geography. This course introduces the students to data sets and sources of data and various modes of analysis to explain geographical phenomena.

After the completion of the course, the students will be

1. Learn the basic concepts of statistics
2. Acquire ability to understand the nature of data used in geographical study and research
3. Apply appropriate technique to collect socio-economic data from the field.
4. Develop skill to process data for comprehension and meaningful outcomes, represent and interpret the results.

Unit	Content	No. of lectures
1	Significance and need of quantification in geography; sources of geographic data, types of data – primary and secondary, discrete and continuous, spatial and non-spatial, scales of measurement, geographical data matrix	5
2	Descriptive statistics: measures of central tendency- mean, median, mode and their relationship	5
3	Positional measures- deciles, quartiles and percentiles of data; measures of dispersion – absolute and relative measures of dispersion, range, quartile deviation, mean deviation, standard deviation, coefficient of variation	12
4	Sampling- types and methods of sampling; sampling errors, confidence intervals, sample size estimation	10
5	Probability distribution- normal distribution, measures of skewness and kurtosis, z-score – meaning and use	5
6	Correlation analysis- types and methods of correlation, Spearman's rank correlation, Karl Pearson's product moment correlation, Kendall's method	8
7	Practical- Preparation of data matrix table, calculation of mean, median and mode of geographic data, locating positions of mean, median and mode graphically, standard deviation and coefficient of variation, preparation of variability maps (Assam/Northeast India) of rainfall and agricultural production; showing confidence intervals graphically; correlation analysis - Spearman, Pearson method	15

Reading List:

- Alvi, Z. 1995: *Statistical Geography*, Rawat Publications, Jaipur and New Delhi
- Berry B.J.L and Marble D. F. (eds): *Spatial Analysis- A reader in Geography* Prentice Hall, Englewood Cliffs, N. J.
- Ebdon D. 1977: *Statistics in Geography: A practical Approach* (2nd edition 1991) Wiley
- FitzGerald, B. P. et al 1974: *Science in Geography Series*, Oxford University Press, London
- Gregory, S. 2014: *Statistical Methods and the Geographer*, Routledge
- Hammond R. and McCullagh P. S., 1978: *Quantitative Techniques in Geography*, Oxford University Press
- King L.J. 1969: *Statistical Analysis in Geography*, Prentice Hall

- Mahmood A., 1977: *Statistical Methods in Geographical Studies*, Concept
- Pal, S. K. 1998: *Statistics for Geoscientist*, Tata McGraw Hill, New Delhi
- Rogerson, P 2006: *Statistical Methods for Geography* (2nd Edition), Sage Publications, London, New Delhi

Semester IV

Course VII: Cartographic Techniques: Maps and Diagrams: 4 Credits (Lecture -3; Practical -1) (Level 200)

The main objective of the course is to give the students an understanding of the various types of geographic data and different forms of data representation including maps, diagrams, and graphs. The course introduces the students to various components of maps and topographic sheets to analyse various aspects of the space. The course has a practical component where the adequate emphasis has been given on the applied aspects of the subject of emerging techniques of map-making. Keeping in mind the research-driven nature of the subject based on empirical data, this course introduces the spatial tools and techniques of interpreting topographic, weather, population, and economic data.

The following learning outcomes will be achieved

1. Exposing the students to the concepts, scope, and nature of cartographic information.
2. Familiarize students with diagrammatic data representation, enabling them to understand the meaning of information on relief, climatic, economic and population attributes and represent them.
3. Facilitate the students to learn map reading skills, students will develop cartography skills and learn skills of map-making.
4. Develop aptitude for acquiring the basic skills of processing and interpreting geographic data.

Unit	Contents	Class
1	Definition, nature, scope and development of cartography, impact of changing technology	5
2	Map elements, Map scale: classification of map scale, conversion of scale	5
3	Map: significance and classifications of map, map design and layout principle, map generalization. Thematic map – classification, challenges in thematic mapping; types of representation - chorochromatic, choropleth, isopleth, dot map, flow map, dissymmetric map, Quantitative thematic maps with proportional symbols	15
3	Diagrammatic Data Presentation – Dot, Line, Bar, Circle and Spheres to represent relief, climatic, population and economic data	15
4	Introduction to elements of topographical and weather maps	5
7	Practical Construction of scale: linear, comparative and vernier scale, computation of area using graphical method Mapping point features- qualitative and quantitative; line features-qualitative and quantitative Preparation of isopleths map using physical or environmental data, choropleth map using population, socio-economic data Quantitative thematic maps- simple dot map, proportional circle	15

Reading List

- Gupta K.K. and Tyagi, V. C., 1992: *Working with Map, Survey of India*, DST, New Delhi.
- Loxton J., 1980: *Practical Map Production*, John Wiley.
- Mishra R.P. and Ramesh, A., 1989: *Fundamentals of Cartography*, Concept, New Delhi.
- Monkhouse F. J. and Wilkinson H. R., 1973: *Maps and Diagrams*, Methuen, London.
- Rhind D. W. and Taylor D. R. F., (eds.), 1989: *Cartography: Past, Present and Future*, Elsevier, International Cartographic Association.
- Robinson A. H., 2009: *Elements of Cartography*, John Wiley and Sons, New York.
- Singh R. L. and Singh R. P. B., 1999: *Elements of Practical Geography*, Kalyani Publishers.
- Singh G. 2004: *Map Work and Practical Geography*, Vikas Publishing House Pvt. Ltd., Delhi,
- Tyner J. A., 2010: *Principles of Map Design*, The Guilford Press.

Semester V

Course VIII: Geographic Thought (4 Credits L+T+P=3+1+0) – Level 300

This course introduces the students on the development of geographical thought from the ancient period to the contemporary period. It also seeks to give a general view on the chronology of geographical development to the present times. This course gives an idea of the different schools of geography that have evolved in time and space; the debates and discussions to place geography as a discipline and approaches of study on certain critical concerns such environmental determinism, possibilism, ecology relevant even at contemporary times.

The specific learning outcomes of the course are-

1. Understand the approaches and paradigms, past and present to study geography across the time and different landscapes
2. Identify critical issues of development and analysis
3. Appreciate the various philosophical changes that have led to the development of the discipline up to the Second World War

Unit	Content	No. of lectures
1	Evolution of geographical thought; nature and scope of geography; geography as an interdisciplinary and integrated discipline; subject matter of geography	8
2	Chronological development of geography during ancient and medieval periods -Greeks, Romans, Indian, Chinese and Arabs; age of explorations	8
3	Modern geography: Contributions of Germans, French, American and British geographers; environmental determinism, possibilism, empiricism, morphology of landscape, human ecology, chorology and areal differentiation, neo-determinism, probabilism	8
4	Dualism in geography- systematic vs. regional, physical vs. human, idiographic vs. nomothetic; impact of evolutionary biology in geographical thought	8
5	The beginning of contemporary phase in geography: the Schaefer-Hartshorne debate; quantitative revolution-merits, demerits, and its impact	8
6	System approach in geography	3

Reading list:

- Abler, R., Adams, J. and Gould, P.P., 1971: Spatial Organization: The Geographers' View of the World, Prentice Hall, Englewood Cliff
- Adhikari, S., 1992: Geographical Thought, Chailnaya, Allahabad
- Chorley, R.J. & Hagget, P. (eds.) 1967: Models in Geography, Methuen, London
- Dikshit, R.D., 1997: Geographical Thoughts: A Contextual History of Ideas, Prentice Hall of India, New Delhi.
- Hussain, M., 1989: Evolution of Geographic Thought, Rawat Publications, Jaipur
- Hartshorne, R., 1939: The Nature of Geography, Rand McCulley, Chicago

- Hartshorne, R., 1959: Perspective on the Nature of Geography, Indian edition, Scientific Publishers, Jodhpur
- Harvey, D., 1969: Explanation in Geography, St. Martin Press, New York
- Johnston, R.J. (ed): The Dictionary of Human Geography, Oxford, Basil, Blackwell
- Rana,R., 2008: Geographic Thought: A Systematic Record of Evolution, Concept Publishing House, New Delhi

Semester V

Course IX: Regional Planning and Development

Total Credits: 4 (L+T+P, 2+1+1) Level- 300

The course places the arguments on the need for regional planning towards achieving balanced development outcomes in a country. The students shall get introduced to the established theories of development/underdevelopment and to place critical view on the approaches of the state towards achieving the desired goals through some case studies in context of India. In addition, students will get acquainted with the policies adopted by government of India across the major sectors of the economy and approaches for inclusive development.

The students shall learn the approaches of regionalization, empirically, based on secondary data of the state surveillance systems in India; and do the analysis in statistical software using established methods. In addition, certain statistical measures used in contemporary times shall be taught to measure inequality in level of development and address specific study problems having policy relevance.

The specific learning outcome of this course will be –

1. Understand the development theories propagated since the last century and critically assess their relevance in contemporary contexts.
2. Learn the approaches to study development intervention through certain cases.
3. Use of development data sets
4. Application of quantitative methods to have measures on different facets of development.

Unit	Content	No. of lectures
1	The concept of region, regionalism, regionalization, and regional development	4
2	Need and purpose of regional planning: synoptic, functional and adhoc or specific	4
3	Classical/Traditional theories - Central Place Theory of Christaller, Growth Pole Theory of Perroux and Boudeville, Theory of Prebisch, Cumulative Causation Theory of Gunnar Myrdal and Multi-level Growth Foci concept of R. P. Mishra: relevance and applications	8
4	Case studies of regional planning exercises: National Capital Region, Northeast India, River basin planning- case studies from India: Key issues and relevance	6
5	Policies for development in contemporary India; Review on approaches and outcomes. Agriculture, Industrial, Public Employment policies, Policy initiatives for sustainable development; Financing development initiatives; Models for inclusive development	10
	Practical: a) Measurement of inequality in development- Gini's Coefficient and Lorenz Curve, Atkinson's Inequality measures, Hoover Index, Theil Index and General Entropy Measures; Ratios a) Construction of indicators and measures for development; Gravity potential, break point analysis, Factor Analysis and mapping	

Reading list:

- Alden J. and R. Morgan, 1974: *Regional Planning: A Comprehensive View*, Leonard Hills Books, UK
- Bhat, L S, 1976: *Micro-Level Planning: A Case Study of Karnal Area, Haryana*, Concept Publishing Co., New Delhi.
- Chand, M. and Puri, V. K. 1993: *Regional Planning in India*, Allied Publishers Limited, B/M Asraf, Ali Road, New Delhi-110002.
- Chandna, R. C., 2000: *Regional Planning: A Comprehensive Text*, Kalyani Publishers, New Delhi.
- Dickinson, R. E: *City, Region and Regionalism*,
- Hilborst, J G. M. (1971) : *Regional Planning: A System Approach*, Notterdam University Press.
- Mishra R P, 1992: *Regional Planning: Concept, Techniques, Policies and Case Studies*, Concept Publications, New Delhi.
- Bellù, L. G., and Liberati, P. (2006), 'Policy Impacts on Inequality: Welfare Based Measures of Inequality – The Atkinson Index', Food and Agriculture Organization of the United Nations.
- V Nath (1988) *Regional Planning for Large Metropolitan Cities: A Study of NCR*, Economic and Political Weekly, January 30
- CJ Barrow (1998), *River Basin Planning and Development, A Critical Review*, World Development, January
- S K Saha (1979) *River Basin Planning in the Damodar Valley of India*, Geographical Review, Vol 69, No 3
- Bellù, L. G., and Liberati, P. (2006), 'Describing Income Inequality: Theil Index and Entropy Class Indexes', Food and Agriculture Organization of the United Nations.
- Cobham, A., Schlogl, L., and Sumner, A. (2015), 'Inequality and the Tails: The Palma Proposition and Ratio Revisited', Department of Economic and Social Affairs Working Paper No. 143 (ST/ESA/2015/DWP/143). '
- *Handbook of Income Distribution Volume 2*' First Edition (2015), edited by Anthony Atkinson and François Bourguignon, North-Holland (Elsevier).
- United Nations Development Programme, '2014 Human Development Trends by Indicator', available at <http://hdr.undp.org/en/data>.
- World Bank, World Development Indicators. Accessed 13 October 2015.
- NABARD (2022) *Agricultural Challenges and Policies for 21st Century*
- NITI Aayog (2023) *Policy Paper on Indian Mode of Inclusive Development*,

Semester V

Course: X: Cartographic Techniques: Surveying and Map Projections (4 Credits L+T+P= 3+0+1) – Level 300

The objective of the course is to develop an understanding of the shape of the Earth and its cartographic use, coordinate systems and directions. The course is designed to enable the students to choose map projection according to the purpose of map-making. The objective of the course is also to offer practical knowledge to the students on handling survey instruments like Plane table, Prismatic compass, Theodolite and Dumpy level.

On completion of the course, the students shall be able to,

1. Develop an understanding of the concepts regarding scale, coordinate system and map projections to suit map purposes,
2. Carryout traversing, levelling and triangulation surveying including general field marking for preparing topographical maps,
3. Create professional and aesthetically pleasing maps through thoughtful application of Cartographic conventions.

Unit	Contents	No. of lectures
1	Earth: shape, concept of geoid and ellipsoid, cartographic use of sphere, ellipsoid and geoid, Concept of Datum; orthometric, geoid and ellipsoidal heights	10
2	Properties of graticules, reference system- geocentric and geodetic co-ordinates, direction of coordinate & their function- concept of magnetic, true and grid north.	10
3	Map projection-concept and classification, properties of different map projections (zenithal, conical, cylindrical), choice of map projection, Concept and use of Lamberts, Mercators, Mollweides, and UTM projections	10
4	Surveying: definition, principles and types of surveying, concepts of bearings and angles, equipments and methods of surveying –Plane table, Prismatic compass, Theodolite and Dumpy level	15
5	Practical Construction, properties, uses and limitations of i. Polar zenithal gnomonic projection, ii. Polar zenithal equal area projection, iii. Cylindrical equal area projection, iv. Conical one standard parallel projection, v. Bonne's projection Field Surveying: i. Plane table survey using radiation method, ii. Closed traverse survey by prismatic compass iii. Contour mapping by dumpy level iv. Measuring height of accessible object using Theodolite	15

Reading List:

- Anson R. and Ormelling F. J., 1994: *International Cartographic Association: Basic Cartographic* Pregmen Press.
- Gupta K.K. and Tyagi, V. C., 1992: *Working with Map, Survey of India*, DST, New Delhi.
- Kanetkar T. P. and Kulkarni S. V., 2011: *Surveying & Levelling Vol - I*, Vidyarthi Griha Prakashan

- Loxton J., 1980: *Practical Map Production*, John Wiley.
- Punamia B.C., Jain A.K., Jain A.k., 2005: *Surveying, Volume I*, Laxmi Publication (P) Ltd.
- Rhind D. W. and Taylor D. R. F., (eds.), 1989: *Cartography: Past, Present and Future*, Elsevier, International Cartographic Association.
- Robinson A. H., 2009: *Elements of Cartography*, John Wiley and Sons, New York.
- Sarkar, A., 2008: *Practical Geography: A Systematic Approach*, Orient Longman Pvt. Ltd., Kolkata.
- Singh R. L. and Singh R. P. B., 1999: *Elements of Practical Geography*, Kalyani Publishers.
- Steers J. A., 1965: *An Introduction to the Study of Map Projections*, London.
- Talukdar, S., 2010: *Introduction to Map Projections*, Eastern Book House, Guwahati

Semester V

Course XI: Political Geography (4 Credits L+T+P = 4+0+0) – Level 300

This course will help the students to build up theoretical and conceptual foundation on political geography. The students will learn the developments in the field of political geography in the contemporary period and approaches of study; understand the territorial bases of the state and role of various geographic factors in shaping political history to outcomes at present. Through the course students will be able to identify the critical geo-political problems including politics of displacement and spatial issues of state and specifically about Southeast Asia.

Specific Learning outcome of the course

1. Understand theoretical and conceptual foundation of political geography
2. Identify and understand certain critical geo-political and development problems
3. Learn case study-based analysis and relevant public policies

Unit	Content	No. of lectures
1	Political geography- meaning, nature and scope; History and Development of Political-geographical thought; approaches to the study of political geography	12
2	Critical Geopolitics; Geopolitics in Germany (1945), Cold War Geopolitics, Geopolitics in the contemporary world; Relation of political geography to Geopolitics, Geoeconomics and Political Science	10
3	State, nation and nation-state; Nationalism, Sovereignty, Governance, Democracy, Introduction to Electoral Geography	8
4	State as a Territory; nature and functions of frontier and boundary; classification of international boundaries; Concepts of Buffer State, Core, Periphery and Capital	8
5	World strategic views - theories of Lebensraum, Heartland and Rimland, Colonialism/Imperialism, Socialism, Neoliberalism, Globalization	10
6	Political Geography of India; Constitutional development, structure of Indian Federalism; Geopolitical problems of India with special reference to Northeast India - changing political map, secessionist movements, insurgency, border dispute and identity politics	12

Reading list:

- Agnew J., Mitchell K., and Toal G. (eds.), 2003. *A Companion to Political Geography*, Blackwell Publishing Ltd.
- Chopra, G., 2006. *Political Geography*. New Delhi: Commonwealth Publishers.
- Cox, Kevin, Jennifer Robinson, and Murray Low. (eds.), 2007: *The SAGE handbook of political geography*. SAGE Publications Ltd
- Dikshit, R. D., 1982. *Political Geography: The Spatiality of Politics*. New Delhi: Tata Mc Graw Hill.
- Gallaher C., Dahlman C.T., Gilmartin M. and Mountz A., 2009: *Key Concepts in Political Geography*, SAGE Publications Ltd
- Mohanty, G. S., 2005. *Political Geography*. Delhi: ISHA Books.
- Pounds, N. J., 1972. *Political Geography*. New York: Mc Graw Hill.
- Sukhwai, B. L., 1985. *Modern Political Geography of India*. New Delhi: Sterling Publishers.
- Painter J. and Jeffrey A., 2009. *Political Geography*, Sage Publications.

Semester VI

Course: Social and Cultural Geography (4 Credits L+T+P = 3+1+0) – Level 300

The objective of the course is to introduce the students to the concepts and various facets of the society and culture.

Learning outcomes:

1. Gain insight into the scope, approaches of study in social geography.
2. Understand the concepts of caste, tribe, ethnicity, culture, race, social changes and social problems faced by different societies, etc.
3. Understand and visualize how the society functions.

Unit	Content	Lectures
I	Origin, nature and scope of social geography, approaches in social geography. Concept of space and place, types and characteristics of space	12
II	Social categories: Concepts of caste, tribe, class, ethnicity; Social structure and social process, factors and impacts of social change, social problems and issues in India	12
III	Definition and concepts of culture, components of culture, cultural assimilation and diffusion, world cultural regions	10
IV	Race and racism, basis of racial classification, spatial diffusion and distribution of races, folk culture and regions with regional focus – Northeast India	12

Reading List

- Ahmed, A., 1999: Social Geography, Rawat Publications, Jaipur and New Delhi
- Ahmed, A., (ed), Social Structure and Regional Development, A Social Geography Perspective, Rawat Publications, Jaipur
- Eyles J: 'Social Geography' in Johnston, R.J., et al, *The Dictionary of Human Geography*
- Jones, E and Eyles, J: An introduction to Social Geography, Oxford University Press, London
- Sen, J.: A textbook of Social and Cultural Geography Kalyani Publishers, New Delhi
- Taher, M.: An introduction to Social Geography, Northeast India Geographical Society, Gauhati University, Guwahati
- Pahl, R.: 'Trends in Social Geography', Chorley and Haggett (ed.) *Frontiers in Geographical Teaching*.
- Sharma, H.N.: Social Geography: Perspective on its definition and development', *Journal of Geography*, Vol.3. Gauhati University, Guwahati
- Knowles, R. & Wareing, J.: *Economic and Social Geography*, Rupa and Co., Kolkata
- Pahl, R.: 'Sociological models in Geography', in *Models in Geography*, Chorley and Haggett (ed.)

Semester VI

Course XII: Environmental Geography (4 credits L+T= 4+1) Level 300

This course will make students aware of environmental problems, laws, policies and regulations available for environmental protection. This paper will develop an ethical consideration to environment and its components and will give insights on environmental impact assessment and disaster management. The course also outlines the roles of environmental education and imparts different international treaties and convention with respect to sustainable development.

Learning outcome:

- 1 Understand the concept and problems related to environmental concerns in contemporary times.
- 2 Analyse human perceptions and behaviour and human environment relationship.
- 3 Understand the environmental laws and policies, convention and treaties and environmental ethics and education.
- 4 Evaluate the application of Organizational responses to disaster.

Unit	Contents	No of Lectures = 48
1	Meaning and scope of environmental geography: ecology and ecosystem, concepts and types of ecosystem, human ecological relationship and adaptation.	6
2	Environmental issues: global warming and climate change, acid rain, desertification, air, water, noise, land pollution, water crisis-water deficit and surplus situations, environmental degradation. environmental conflicts	8
3	Hazards and disaster: types of hazards and disaster, geographic distribution of natural hazards, risk and vulnerability, risk identification and assessment, disaster management and policies.	8
4	International environmental convention and treaties: Stockholm conference 1972, Nairobi declaration 1982, Montreal protocol, Vienna Convention 1985, Rio Conference 1992, Kyoto Protocol 1997, Basel Convention 1989, Convention on biological diversity. Paris 2016	6
5	Environmental ethics, concepts and philosophy of biocentrism and centrism, environmental equity and justice, environmental education, traditional ecological knowledge	6
6	Environment and Development Issues; Sustainable development and its goals,	4
7	Environmental policy, laws and movements in India. National Environmental Policy 2006, green funding and taxes, green benches, objectives and roles of central and state pollution control board, bio-medical waste management rules 2016, solid waste management;	10

Recommended readings:

- * Bishov, V. (2001) Hazards and responses, (2nd edition) Collins, London.
- * Charles, H. E. (2011) Environmental impact assessment, CRC press, New York.
- * Chandna, R. C. (2003) Environmental Geography, Kalyani Publishers, New Delhi.
- * Cutter and Susan, L. (1999) Environmental Risk and hazards, Prentic Hall, New Delhi.
- * Fellenberg, G. (1999) Chemistry of pollution, John Wiley and Sons, New Delhi.
- * Frampton, C.; Hardwick and McNaught (1999) Causes, Consequences and management of disasters, Hodder and Stoughton, London.
- * Gupta, H. K. (2003) Disaster Management, University Press India Pvt. Ltd.
- * Keith, S. (2002) Environmental hazards; assessing risk and reducing, Routledge, London.
- * Mishra, R. P. (1995) Environmental ethics, Concept Publishing Company, New Delhi.
- * Pine, J. (2015) Hazard analysis, reducing the impact of disaster, 2nd edition, CRC Press, Boca Raton, London, New York.
- * Sharma, P. D. (2003) Ecology and environmental Sciences, Rostogi publications, Meerut, India.
- * Singh, G. (2005) Environmental laws in India, MacMillan, New Delhi.
- * Singh, S. (2014) Environmental Geography, Prabalika Publications, Allahabad.
- * Singh, S. and Saroha, J. (2019). Geography of India, 2nd edition, G. K. Publications Pvt. Ltd.
- * Srivastava, D. C. (2005) Readings in Environmental Ethics; Multidisciplinary perspectives, Rawat Publications, Jaipur.
- * Tomar, A. (2011) Environmental Education, Kalpaj Publication, New Delhi.
- * Trivedi, R. K. and Goel, P. K. (2010). An introduction to Air Pollution, DVS Publication, New Delhi.
- * Wright D. A, and P. Welbourn (2002). Environment Toxicology, Cambridge University Press, London.

Semester VI

Course XIV: Remote Sensing and Geographical Information System Credit: 3+0 +1 (L+T+P) Level 300

Learning Outcomes:

The Remote Sensing (RS) and Geographical Information System (GIS) course provides a comprehensive understanding of GIS and RS principles, concepts, and theories.

1. Students will develop practical skills in using GIS and RS software tools, enabling them to collect, process, analyze, and interpret spatial data.
2. The course emphasizes effective data management practices, including acquisition, quality control, integration, and sharing of geospatial data.
3. Students gain proficiency in spatial analysis and modeling techniques, allowing them to extract meaningful information and solve complex geospatial problems.
4. The course fosters critical thinking, problem-solving, decision making and communication skills, enabling students to apply geospatial knowledge in diverse domains and collaborate effectively on geospatial projects.

Course Content:

1. Remote Sensing: definition, historical development, platforms and types
2. Principles of Electromagnetic Radiation (EMR), Spectral Signature, Interaction of EMR with atmosphere and earth surface; application of Remote sensing (Disaster Risk Reduction, & Natural Resources)
3. DEM/ DSM: Data sources, characteristics and application, ASTER and SRTM DEM (nature and its characteristics; digital image processing: concepts and techniques)
4. Geographical Information System (GIS) - definition, components, data types and structure, earth models and referencing systems; application of GIS (research, management, planning, and decision support system).
5. Concept of database management system (DBMS) and relational database management system (RDBMS).
6. Unmanned Aircraft System (UAS): principles, mission plan, rules and regulations (Drone rules, 2021, Part I-VIII (India))

Practical

1. Landuse/ Landcover classification and area calculation (supervised & unsupervised) and Normalized Difference Vegetation Index (NDVI)
2. DEM creation using GPS points (auto import from handheld GPS/mobile phone/ DGPS) and text to points (manual import)
3. Geo-referencing, Digitization (point, line & polygon), map layout of campus from google earth/scanned photo

Book Reference:

- Burrough P. A. and McDonnell R. A., 2000: Principles of Geographical Information Systems-Spatial Information Systems and Geostatistics, Oxford University Press.
- Campbell, J. B. (2015). Introduction to remote sensing. CRC Press.

- Chang, K. T. (2018). Introduction to geographic information systems. McGraw Hill Education.
- Clarke K. C., 2001: Getting Started with Geographic Information Systems, Prentice Hall.
- DeMers M. N., 2000: Fundamentals of Geographic Information Systems, John Wiley & Sons.
- French, G. T. 1996: Understanding the GPS: An Introduction to the Global Positioning System,
- Geo Rernational Association of Hydrological Sciences. (2019). GIS and remote sensing in hydrology. Grafiati.
- Foody, G. M. (2015). Remote sensing of vegetation: Principles, techniques, and applications. Routledge.
- Jensen, J. R. (2013). Remote sensing of the environment: An earth resource perspective. Pearson Education.
- Jensen, J. R., & Cowen, D. J. (1999). GIS and remote sensing integration for environmental applications. International Journal of Geographical Information Systems, 10(7), 877–890.
- Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). Remote sensing and image interpretation. Wiley.
- Mather, P. M. (2016). Computer processing of remotely sensed images: An introduction. John Wiley & Sons.
- Weng, Q. (2015). Remote sensing and GIS integration: Theories, methods, and applications. McGraw Hill Education.

Semester VI

Course XV: Geography of resources and economic activities (4 Credits L+T+P = 3+1+0) Level 300

This course introduces the concept of natural resources, and discusses distribution, utilization, and management of natural resources towards sustainable use. Presence of natural resources though largely determine location of economic activities and there are established theories of location; the emergence of new economic activities particularly in secondary, tertiary, quaternary and quinary need to be looked at from new perspectives in this globalized environment.

Learning outcomes of this paper are

1. Understand specific concepts and examine pressing issues related to use and conservation of natural resources.
2. Understand the spatial perspectives of resource distribution.
3. Understand different types of economic activities and their utilities.
4. Appreciate the factors responsible for the location and distribution of activities.
5. Examine the significance and relevance of theories in relation to the location of different economic activities.

Unit	Content	No. of lectures
1	Natural resources: concept and classification; Energy resources: Conventional and non-conventional	4
2	Distribution, utilization, conservation of natural resources: methods and techniques (special emphasis on water and forest resources), sustainable resource development and management	10
3	Concept and classification of economic activity; Factors affecting location of Economic activity with special reference to Agriculture (Von Thunen theory), Industry (Weber's theory), Agriculture and Industrial activities with a focus on technological innovations and development in the context of liberalisation and globalisation.	10
4	Primary economic activities: agriculture and its types, forestry, fishing, and mining.	8
6	Secondary activities: industries and their types, Concept of manufacturing region, Special Economic Zones, Exclusive Economic Zones, and Technology Parks.	8
7	Tertiary activities (Transport, Trade and Services), quaternary, and quinary activities, Information and Communication Technology: Impact on Indian Economy	8

Reading list:

- Cutter S. N., Renwich H.L. and Renwich W. (1991): *Exploitation, conservation, preservation: a geographical perspective on natural resources use*, John Wiley and Sons, New York.
- Gadgil M. and Guha, R. (2005): *the use and abuse of nature: Incorporating this Fissured Land: An ecological History of India and ecology and equity*, Oxford University press, USA
- Klee, G. (1991): *Conservation of natural resources*. Prentice Hall, England
- Mitchell, B. (1997): *Resources and Environmental Management*. Longman Harlow, England

- Owen S. and Owen P.L. (1991): *Environment, Resources and Conservation*, Cambridge University Press, New York.
- Alexander J.W. (1963): *Economic geography*, Prentice-Hall Inc., Englewood cliffs, New Jersey.
- Hodder, B. W. and Lee Roger (1974): *Economic Geography*, Taylor and Francis.
- Willington, D.E. (2008): *Economic Geography*, Husband Press
- Wheeler J.O. (1998): *Economic Geography*, Wiley
- Prithwish, Roy (2014): *Economic Geography - A study of Resources*, New Central Book Agency, Kolkata. 11.
- Saxena, H.M., (2013): *Economic Geography*, Rawat Publications, Jaipur

Multi-Disciplinary Electives
Four Year undergraduate programme in Geography

Semester I

Geography MDE I – (Level 100)

Course Title: Environmental concerns of contemporary times and institutional measures for mitigation (3 Credits L+T/P = 3+0)

This course introduces the students to certain environmental concerns of contemporary times, namely, global warming, climate change and desertification. Along with the concerns people across the developing and developed countries as well, are prone to several forms of tectonic, atmospheric, and geomorphic hazards. Mitigation measures are pivotal, and in this context, it is important to understand how the state and non-state institutions under the domain of environmental laws respond at local and global contexts, understand the association between environment and development towards ensuring sustainability of the earth.

After the completion of the course, the student will be able to

1. Understand concepts and critical problems related environmental concerns debated and discussed in contemporary times
2. Understand landscape with vulnerabilities.
3. Learn approaches and techniques for environmental impact assessment.
4. Understand laws and policies related to environmental regulations.

Unit	Content	No. of lectures
1	Environmental concerns - global warming, climate change, ozone depletion, acid rain, desertification	6
2	Hazards- definition and types, geographic distribution of natural hazards; hazard perception; hazard analysis; disaster- definition and types; disastrous effects of natural hazards; concept of risk and vulnerability – dimensions and analysis	8
3	Environmental laws- international and national	4
4	Response to disasters- community, voluntary organisation, and state organizations - national and international	5
5	Disaster management – Principles and stages of disaster management	4
6	Impact of and response to disasters - Case studies of tectonic, atmospheric and geomorphic hazards in developed and developing countries.	10
7	Environment and development, Concept of sustainable development, environment impact assessment	8

Reading List:

- Bishop V. 2001: *Hazards and Responses*, (2nd edition) Collins, London
- Chandna R. C. 2003: *Environmental Geography*, Kalyani Publishers, New Delhi
- Frampton C., Hardwick and McNaught, 1999: *Causes, Consequences and Management of Disasters*, Hodder and Stoughton, London
- Frank W. L. 1986: *The Violent Earth*, Croom Helm, London
- Goel, S. L. 2001: *Encyclopaedia of Disaster Management* Vol. 1, 2 and 3, Deep and Deep Publications, New Delhi

- Kapur, A., 2010: *Vulnerable India: A Geographical Study of Disasters*, Sage Publication, New Delhi
- Keith S., 2002: *Environmental Hazards: Assessing Risk and Reducing Disaster*, Routledge, London
- Keller E. A. and Blodgett R. H., 2006: *Natural Hazards: Earth's Processes as Hazards, Disasters and Catastrophe*, Prentice Hall, New Jersey
- Pine John C. 2015: *Hazard Analysis, Reducing the Impact of Disasters* (2nd edition), CRC Press, Boca Raton, London, New York
- Saxena H. M. 1999: *Environmental Geography*, Rawat Publications, Jaipur and New Delhi
- Singh R. B. (ed) 2006: *Natural Hazards and Disaster Management: Vulnerability and Mitigation*, Rawat Publications, New Delhi
- Singh S 2014: *Environmental Geography*, Pravalika Publications, Allahabad

Multi-disciplinary Electives II

Course: Hill and Mountain Agriculture in Northeast India: Traditions, Continuity and Changes

Credits 3 (Lectures 2- Tutorial/ Field exposure – 1)

Total lectures -30

Unit	Contents	No of lectures
1	Introductory to Landscape ecology; physical landscape of NE India and crop suitability	3
2	Hill agriculture practices of NE India – Jhum, Terrace, Wet-paddy; crops of northeast India, area and production	4
3.	Community practices around hill agriculture, reflection on Traditional Ecological Knowledge; traditional use and conservation approach on rainwater, soil conservations; traditional institutions on agriculture	8
4	Debates on sustainability of hill agriculture systems; challenges and continuity	4
5	Paradigm shift; new adoptions in farming practices and plantations – the state and the market	4
6.	Institutions for development of hill and mountain agriculture in India; review of policies, programme and budget/resources for sustainability	5
7.	Festivals around traditional agriculture practices – development of agro-eco tourism	2

SUGGESTED READING

1. Anonymous. Tillage and Interculture Management/ Farm Implements. In Inventory of Indigenous Technicla Knowledge in Agriculture Document 1; Document 2; Document 3; Publ: ICAR New Delhi.
2. Bhatt, B. P.; Jat, M.L.; Arunachalam, A., Pattanayak, A. and Prakash, N. (2019). Roadmap for Agricultural Development in North-Eastern Hill(NEH) Region, India. Policy Brief, Published by Indian Council of Agricultural Research, New Delhi.
3. Choudhary, S.L.; Sharma, G.S. and Nene, Y.L. (2000) Ancient and Medieval History of Indian Agriculture and its relevance to Sustainable Agriculture in the 21st Century. Proceedings of the summer school held from 28th May to 17th June 1999, Rajasthan College of Agriculture, Udaipur, India.
4. Chandel, S. R. S. A Handbook of Agricultural Statistics. Publ: Impect Publishers.
5. Dakshinkar, N. P. and Singh, M. (2022). Draught Animal Power and its relevance to Indian Agriculture, In Bhumi Suposhan, Akshay Krishi Parivar, pp. 80-87.
6. Kalita, D. C. (2012). Sustainability and economic development in Hill Agriculture, New Delhi Biotech Books.
7. Prakash, N. (2010). Sustainable Hill Agriculture, New Delhi Today and Tomorrow Printers and Publishers.
8. Peshwe D. R.; Singh, R. K.; Deshmukh, K.A. and Chopra, S. (2018). Advances and Research in Agriculture Tools. Publ:MME Publishig House, Nagpur.

9. Rangaswamy, R. (2020). A textbook of Agricultural Statistics. Publ: New Age International Pvt. Ltd.
10. Rao, G. N. (2018). Statistics for Agricultural Sciences. Publ: B.S. Publications.
11. Ryszkowski, L. (2002). Landscape Ecology in Agroecosystems Management, Boca Raton CRC Press.
12. Singh Jhina, P. (1962). Agriculture in the Hill Regions of the North India. New Delhi Directorate of Extension.
13. Singh R.; Naik, D. and Feroze, S. M. (2014). Agri-Buisness potentials in India: Experience from Hill States. EBH Publishers India 136, M.L. Nehru Road, Pan Bazaar, Guwahati- 781001.
14. Singh, R., Yumnam, A.; Roy, A. and Choudhury, A. (2018). Agriculture development: Technical and policy options. Biotech Books 4762-63/23 Ansari Road, Darya Ganj, New Delhi, 110002.
15. Singh, P. K. (2000). Watershed Management: Design and Practices. E-media Publications, Udaipur.
16. Singh, R.V. (2000). Watershed Planning and Management. Yash Publishing House, Bikaner.
17. Sadhale, N. (2007). Water harvesting and conservation in ancient agricultural text. *In*. Nene YL. Ed. Glimpses of the Agricultural Heritage of India. Asian Agri-History Foundation. Pp. 414-424.
18. Singh, H. and Kavia Z.D. (2007). Traditional Rainwater Harvesting Methods of Indian Thar Desert. *In*. Nene YL. Ed. Glimpses of the Agricultural Heritage of India. Asian Agri-History Foundation. Pp. 432-440.

Multidisciplinary Electives III

Course: Rural Development (3 Credits L+T/P = 2+1)

This course is designed to make the students informed and understand the centrality of rural economic base and approaches for development. The course focuses on Gandhian approach of rural development, introduces the students the Panchayati raj systems on its functions, functionaries and fund, the agriculture and allied activities, and con cooperatives. The area based and target group approaches are also discussed adopted in India for rural development are also discussed. On the other hand, understanding on rural areas make complete with study provisioning of basic services of health care and education system, and the institutional provisioning of credits.

The learning outcome of the course are-

- 1 Understand the rural landscape and critical problems associated with development of rural areas of India
2. Understand policies and programs for development of rural areas
3. Learn approaches for rural development and adopting newer process for services in elementary education and primary health care.
3. Get introduced to a data base on development indicators in rural areas

Units	Content	No. Of lectures
1	Defining Development: Rural Sectors of the Economy; Agriculture and Allied Sectors, Seasonality and Need for Expanding Non-Farm Activities, Gandhian Approach of Rural Development.	8
2	Rural governance: Panchayati Raj System, co-operatives	6
3	Approaches for Rural Development in India: Programmes for rural development; Micro credits	8
4	Provision of Services – Physical and Socio-Economic Access to Elementary Education and Primary Health	10

Reading list

- Gilg A. W., 1985: *An Introduction to Rural Geography*, Edwin Arnold, London.
- Krishnamurthy, J. 2000: *Rural Development - Problems and Prospects*, Rawat Pubs., Jaipur
- Lee D. A. and Chaudhri D. P. (eds.), 1983: *Rural Development and State*, Methuen, London.
- Misra R. P. and Sundaram, K. V. (eds.), 1979: *Rural Area Development: Perspectives and Approaches*, Sterling, New Delhi.
- Misra, R. P. (ed.), 1985: *Rural Development: Capitalist and Socialist Paths*, Vol. 1, Concept, New Delhi.
- Palione M., 1984: *Rural Geography*, Harper and Row, London.
- Ramachandran H. and Guimaraes J.P.C., 1991: *Integrated Rural Development in Asia – Learning from Recent Experience*, Concept Publishing, New Delhi.
- Robb P. (ed.), 1983: *Rural South Asia: Linkages, Change and Development*, Curzon Press.

- UNAPDI 1986: *Local Level Planning and Rural Development: Alternative Strategies*. (United Nations Asian & Pacific Development Institute, Bangkok), Concept Publs. Co., New Delhi.
- Wanmali S., 1992: *Rural Infrastructure Settlement Systems and Development of the Regional Economy in South India*, International Food Policy Research Institute, Washington, D.C.
- Ministry of Panchayati Raj, A Roadmap for Panchayati Raj – 2011-17, Government of India.

Multidisciplinary Electives -IV
Course: Sustainable Development (Credit 2=2+1+0)

This course introduces the students on the defining role of the concept and approaches of sustainable development in contemporary world taking into account of all-inclusive outcome indicators of development. The development indicators and wellbeing aspects are also considered from rights-based perspective. The course along with emphasizing and adoption of the sustainable approaches in all economic sectors, considers significance of policies adopted at global level, finance, and governance towards achieving the goals.

Specific learning outcome of the course are

1. The students will acquire ability to understand significance of the concept and its defining role.
2. Will be able to distinguish the patterns of regional development of the world and the need for sustainable development plan suitable to different ecosystems.
3. Understand the policies and programme of the Governments in ameliorating the levels of poverty and inequality in contemporary world.
4. Enhancement of critical thinking, and students will be able to identify critical issues related to environment, development, climate change, policy making and implementation.
5. Shall get acquainted with a huge data base on development aspects.

Units	Contents	No. of lecture
1	Sustainable Development: Definition, concept, components and historical development.	3
2	Sustainable Regional development: Need and examples from different ecosystem.	3
3	Inclusive Development Education, Health; Climate Change: the role of higher education on sustainable development; The human right to health; Poverty and disease; The challenges of Universals death coverage; policies and Global cooperation for climate change.	12
4	Sustainable development policies and programmes: the proposal for SDGs at Rio+20; Illustrative SDGs, Goal based development; Financing for Sustainable Development.	8
5	Principles of Good governance; National Environment Policy, CDM, biodiversity and sustainable development.	4

Reading List

- Agyeman, Julian, Robert D. Bullard and Bob Evans (Eds.) (2003) Just Sustainabilities: Development in an Unequal World. London: Earthscan. (Introduction and conclusion.).
- Ayers, Jessica and David Dodman (2010) “Climate change adaptation and development I: the state of the debate”. Progress in Development Studies 10 (2): 161-168.
- Baker, Susan (2006) Sustainable Development. Milton Park, Abingdon, Oxon; New York, NY: Routledge. (Chapter 2, “The concept of sustainable development”).

- Brosius, Peter (1997) “Endangered Forest, endangered people: Environmentalist representations of indigenous knowledge”, *Human Ecology* 25: 47-69.
- Lohman, Larry (2003) “Re-imagining the population debate”. *Corner House Briefing* 28.
- Martínez-Alier, Joan et al (2010) “Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm” *Ecological Economics* 69: 1741-1747.
- Merchant, Carolyn (Ed.) (1994) *Ecology*. Atlantic Highlands, N.J: Humanities Press. (Introduction, pp 1-25.)
- Osorio, Leonardo et al (2005) “Debates on sustainable development: towards a holistic view of reality”. *Environment, Development and Sustainability* 7: 501-518.
- Robbins, Paul (2004) *Political Ecology: A Critical Introduction*. Blackwell Publishing.
- Singh, R.B. (Eds.) (2001) *Urban Sustainability in the Context of Global Change*, Science Pub., Inc., Enfield (NH), USA and Oxford & IBH Pub., New Delhi.
- United Nations (2022) *Financing for Sustainable Development, Report of the Inter-Agency Task Force on Financing for Development*
- UNEP, *An Introduction to Clean Development Mechanism*

Skill Enhancement Course

Semester I

Global Navigation Satellite System (GNSS) and its application

Credits: 3= 1+1+1 (Theory, Practical and Field Exposure)

The aim of this course is to introduce the principles of the Global Navigation Satellite Systems (GNSS), Satellite Positioning, GNSS Signal Structures and to demonstrate its applications to various aspects of location-based services and geospatial sciences.

After the completion of the course, the students will be able to

1. Understand fundamental theory and applications of radio navigation with the multi-GNSS.
2. Develop understanding of satellite orbit theory, GNSS signal structure, point positioning with pseudorange, real-time kinematic positioning with carrier phase, dilution of precision and atmospheric effect on GNSS signals.
3. Application of GNSS, field survey and mapping

Unit	Content	No. Of lectures
1	<ol style="list-style-type: none">1. Introduction to Global Navigation Satellite System (GNSS)2. Segments of GNSS3. Working principle4. Coverage of GNSS:<ol style="list-style-type: none">I. Global coverage systema. GPS (USA)<ol style="list-style-type: none">II. Local/ Regional coverage system (RNSS)a. IRNSS (India)<ol style="list-style-type: none">III. Satellite Based Augmentation System (SBAS)a. GAGAN (India)5. Application of GNSS (any one)	15
2	<ol style="list-style-type: none">1. Introduction to the GPS instrument2. Field Survey<ol style="list-style-type: none">i. Pointii. Lineiii. Area3. Introduction to GPS software (Mapsource& DNR Garmin)4. Data generation and transfer5. Map layout (Point, line, and area)	15

Reading List:

- Curtis, H., 2000: *The GPS Accuracy Improvement Initiative*, GPS World, June, 2000.
- Gopi, S., 2005: *Global Positioning System Principles and Applications*, Tata McGraw Hill, New Delhi.

Skill Enhancement Course II

Course: Understanding and Measuring the Dimensions of Human Development

Credits: 3= 1+1+1 (Theory, Practical and Field Exposure)

The UNDP justifies the importance of having Human Development Index for countries of the world, states of a country, and districts of a state. The measure reflects a country's overall achievement in social and economic dimensions; reflected by certain inclusive outcomes indicators of life expectancy, level of education attainment and standard of living. In addition to the HDI, the UNDP has gone for several other indices to incorporate levels of income inequality, gender inequality and multiple deprivations of certain basics necessities at household level.

This course will help the students

1. Understand the concepts and measures of HDI, IHDI, GDI, GII and MDPI
2. Ability to collect and extract data and frame the relevant indicators and indices
3. Analyse and Evaluate the realities as reflected by the data.

Unit		Lectures	Tutorial and hands on exercise
I	Dimensions of Human Development to UNDP framework; Rationality, Data, Methodology and Measurement	2	6
II	Inequality adjusted human development index; measuring the development outcomes if there is no inequality.	2	4
III	Gender Development Index; understanding the gender gaps in human development.	1	4
IV	Gender Inequality Index; understanding gender based disadvantages; and the measure	1	4
V	Multi-dimensional Poverty Index; importance of having MDPI and the measure	2	6

Reading List

- Human Development Reports and Technical Notes: UNDP -Recent years
- Sabina Alkire, James Foster et al (2015) Multidimensional Poverty Measurement and Analysis, OUP.

Value Added Course – Domain of Understanding India

Semester I

Course: Indigenous Ecological Knowledge Systems: Native wisdom for a better future

Credit: 2 (Lecture 1+ 1+ Practical 0)

Course Objective: To gain exposure to Indigenous Knowledge that is acquired through direct contact and experiences with nature and accumulated through generations. It incorporates beliefs and practices of a community and gives identity to it.

CO1: Identify Indigenous Knowledge in their neighbourhood, region, state and country, locate the various values and practices associated with it and those for whom this knowledge is valuable.

CO2: Understand significance of Indigenous Ecological Knowledge in Modern Scientific Endeavour

Unit	Content	No of Classes
1	Concept, component and significance of Indigenous Knowledge	3
2	Indigenous Knowledge of Ecosystems	1
3	Indigenous knowledge towards nature conservation and resource management – forest, soil, water, wildlife etc.	4
4	Indigenous knowledge in natural hazard management	2
5	Ethics, values and cultural identity of the communities	2
6	Indigenous knowledge and modern scientific knowledge	3

Reading List

1. Bhagawati, K, Shukla, K K, Sen A, Bhagawati R (2016): Science and Indigenous Traditional Knowledge: Approaches of Galo/Adi Tribes, CreateSpace Independent Pub
2. Gosai K, Arunachalam A, Dutta, B K, GV P Kumar (2009): Indigenous knowledge of soil fertility management in the humid tropics of Arunachal Pradesh, Indian Journal of Traditional Knowledge, vol 10(3)
3. Inglish, Julian T, ed (1993): Traditional Ecological Knowledge: Concepts and Cases, International Development Research Centre
4. Lemi, T (2019): The Role of Traditional Ecological Knowledge (TEK) for Climate Change Adaptation, International Journal of Environmental Sciences and Natural Resources, vol 18, ISSN 2572-1119
5. Majumder, Satarupa D (2019): Indigenous Knowledge Systems towards a Holistic Inclusive Conservation, Manohar Publishers, Delhi
6. Mishra, S. Behera S K. and Bhui S ed (2022): Indigenous Knowledge System, Traditions and Transformations, Mittal Publications
7. Nautiyal S and Goswami, M (2022): Role of traditional ecological knowledge on field margin vegetation in sustainable development: A study in rural-urban interface of Bengaluru, Trees, Forests and People, <https://doi.org/10.1016/j.tip.2022.100207>
8. Rai, S C (2007): Traditional Ecological Knowledge and Community-based Natural Resource Management in Northeast India, Journal of Mountain Science, vol 4 No 3

Value Added Course – Domain Environment
Course: Introduction to Ecology and Environment
(2 Credits L+T+P= 1+1+0)

Objectives: The course gives a general overview of the interplay between environment, culture, and society and how it changes across time and space. Students will learn about various historical, social and geographical perspectives on human-nature relationships in this course.

Course Outcomes: After completion of the course, a student shall be able to,

1. to integrate different scientific perspectives into a holistic understanding of the relationship between humans and the environment,
2. to analyze the differences between natural, socio-cultural and political aspects of the environment, and
3. to demonstrate an understanding of the human dimensions of environmental and resource management.

Unit	Contents	No. of Lectures
1	Theorizing Human-Nature relationship: Environmental Determinism, Possibilism, Environmentalism	3
2	Understanding Human Ecology: Biological and Socio-Cultural Dimensions of Human Ecology, Introduction to Cultural Ecology	4
3	Ecosystem Services, drivers of change in ecosystem services; Ecosystems and Human Wellbeing	3
4	Political Theory of Nature: Production of Nature, Political Ecology – Conservation and Control, Sustainability	5

Readings:

- Braun, B. (2008). Theorizing the nature-society divide. *The SAGE Handbook of Political Geography*. Los Angeles, CA: SAGE, 189-204.
- Gadgil, M., & Guha, R. (1993). *This fissured land: an ecological history of India*. Univ of California Press.
- Guha, R., & Alier, J. M. (2013). *Varieties of environmentalism: essays North and South*. Routledge.
- Guha, R. (ed.) (2018). *Social ecology*. Delhi: Oxford University Press
- Millennium ecosystem assessment, M. E. A. (2005). *Ecosystems and human well-being* (Vol. 5, p. 563). Washington, DC: Island press.
- Richerson, P. J., Mulder, M. B., & Vila, B. (1996). *What is Human Ecology? Principles of human ecology*. Simon & Schuster Custom Pub.
- Robbins, P. (2004). *Cultural ecology. A companion to cultural geography*, 180-193.
- Robbins, P. (2019). *Political ecology: A critical introduction*. John Wiley & Sons.
- Sahlins, M. D. (1963). *Culture and environment: The study of cultural ecology*. Voice of America, US Information Agency.
- Steiner, F., & Steiner, F. (2016). *Fundamental Principles of Human Ecology. Human Ecology: How Nature and Culture Shape Our World*, 19-37.