Curriculum for 3 Year Degree Course

(with 1 major and 2 minors)

With Multiple Entry /Exit Options

Based on NEP-2020

Under

Choice Based Credit System

Including Course Aim and Outcomes

Geography

Based on Model Syllabus by

Odisha State Higher Education Council, Bhubaneswar

Government of Odisha

2024 – 2027

School of Geography
Gangadhar Meher University
Sambalpur-768004

Contents

Contents 3
NEP Based Undergraduate Structure 5
Courses (papers) being offered in undergraduate programme 5
Semester –I [CC; MDC; AEC; VAC] 7
Core Courses – Geography (4 credit each) 9
Major-I-P-I: Physical Geography 9
Major-I-P-II: Human Geography 11
Minor-I-P-I: Human Geography 13
Multi-disciplinary Courses – Geography (3 credit each) 15
MDC-I: Tribal Geography 15
Ability Enhancement Courses – University (4 credit each) 17
AEC-I: Odia / Hindi/ Sanskrit 17
Value Added Courses – University (3 credit each) 18
VAC-I: Environmental Studies & Disaster Management 18
Semester –II [CC; MDC; AEC; SEC] 21
Core Courses – Geography (4 credit each) 23
Major-I-P-III: Cartography and Geo-Spatial Techniques 23
Major-I-P-IV: Population Geography 25
Minor-II-P-I: Population Geography 27
Multi-disciplinary Courses – Geography (3 credit each) 29
MDC-II: Climatology 29
Ability Enhancement Courses – University (4 credit each) 31
AEC-II: English 31
Skill Enhancement Courses – University (3 credit each) 32
SEC-I [A]: Welfare and Development Programs: Monitoring and Evaluation 32
SEC-I [B]: Open Source GIS 34
Semester –III [CC; MDC; VAC] 37
Core Courses – Geography (4 credit each) 39
Major-I-P-V: Environmental Geography and Biogeography 39
Major-I-P-VI: Quantitative Techniques in Geography 41
Major-I-P-VII: Economic and Resource Geography 43
Minor-I-P-II: Economic and Resource Geography 45

Multi-disciplinary Courses – Geography (3 credit each) 47
MDC-III [A]: Oceanography 47
MDC-III [B]: Geo-informatics 49
Value Added Courses – University (3 credit each) 51
VAC-II: Understanding India 51
Semester –IV [CC; CE/FP/Intern] 53
Core Courses – Geography (4 credit each) 55
Major-I-P-VIII: Remote Sensing and GIS 55
Major-I-P-IX: Geomorphology 58
Major-I-P-X: Evolution of Geographical Thought 61
Minor-II-P-II: Remote Sensing and GIS 63
Community engagement and service/ Field Practice/ Projects/ Internship (CE/FP/Intern) (4 credit) 65
Semester –V [CC; SEC; VAC] 67
Core Courses – Geography (4 credit each) 69
Major-I-P-XI: Climatology and Oceanography 69
Major-I-P-XII: Regional Planning and Development 71
Major-I-P-XIII: Geography of Odisha 73
Minor-I-P-III: Geography of Odisha 75
Skill Enhancement Courses – University (3 credit each) 77
SEC-II: Digital Image Processing 77
Value Added Courses – University (3 credit each) 79
VAC-III: Understanding Odisha 79
Semester –VI [CC; SEC; VAC] 81
Core Courses – Geography (4 credit each) 83
Major-I-P-XIV: Geography of India 83
Major-I-P-XV: Urban Geography 85
Minor-II-P-III: Geography of India 87
Skill Enhancement Courses – University (3 credit each) 89
SEC-III: Environmental Impact Assessment 89
Value Added Courses – University (3 credit each) 91
VAC-IV: Climate Change and Disaster Risk Reduction 91

NEP Based Undergraduate Structure

Courses (papers) being offered in undergraduate programme

	3 Year Undergraduate Programmes with 1 major and 2 minor under NEP - 2020				
	Courses / Components	**No. of Papers**	**Credit per paper**	**Total Credits**	**Note**
1	Major (Core-I)	15	4	60	Primarily Preferred Discipline; t will depend on the choice of UG programme by student; Year wise distribution is explained in adjoining tables;
2	Minor Stream (Core-II and Core-III)	3+3	4	24	Secondarily Preferred Discipline/s; Maximum 2 disciplines could be opted, which will depend on the choice of UG programme by student; Year wise distribution is explained in adjoining tables;
3	Multidisciplinary Courses (MDC)	3	3	9	Any 3 to be chosen from list during 1st- 3rd sem; one per sem;
4	Ability Enhancement Courses (AEC)	2	4	8	Paper 1 - Odia/Sanskrit/Hindi/Urdu); Paper 2 - English
5	Skills Enhancement Courses (SEC)	3	3	9	One each to be chosen from list in 2nd, 5th and 6th Sem
6	Value Added Courses (VAC)	4	3	12	Three papers are compulsory: (i) Environmental Studies and Disaster Management (03 Credits) in 1st sem; (ii) Understanding India (03 Credits); (iii) Understanding Odisha (03 Credits); Rest 1 to be chosen from list during 3rd, 5th and 6th Sem
7	Community Engagement and service/ Field Practice/ Projects/ Internship / Apprenticeship/ Summer Project	1	4	4	To be carried out in 2nd year; Details in OSHEC Model Regulation for UG Prog under NEP-2020, point 10.10 (pag-6-7)
	Open Distance Learning (ODL)	Students can opt for any paper/s though ODL platform; 40% of the Course Credit in 1 Sem through SWAYAM/IGNOU etc. or any institution recognized by the regulatory authority like UGC;			
	TOTAL Credit to pass			**126**	**For UG with 1 major 2 minors**
8	Vocational courses (VOC)	1	4	4	Required to be eligible for Certificate/ Diploma; vocational subjects during the summer vacation with 60 hours of Theory/Laboratory/ Workshop at least within 15 days from Institutions as per OSHEC Model Regulation for UG Programme under NEP-2020, point 10.10 (pag-6-7)
9	NCC, NSS, Red Cross			16	Credits as per 2(h); Not counted in award though

Semester –I [CC; MDC; AEC; VAC]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-I	4
2.	Core	Major	Major-I-P-II	4
3.	Core	Minor	Minor-I-P-I	4
4.	Multi-disciplinary	Elective from any Multi-disciplinary	MDC-I	3
5.	Ability Enhancement	Compulsory	AEC-I	4
6.	Value Added	Compulsory	VAC-I	3
	Total			**22**

Core Courses – Geography (4 credit each)

Major-I-P-I: Physical Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this is to provide students with a comprehensive understanding of Earth's physical processes and systems pertaining to Earth, Atmosphere and Hydrosphere. The course will explore the interactions between these systems and how they shape the Earth's landscapes and environments.

Course outcomes:

1. Develop an understanding of the fundamental elements and processes that govern Earth's physical environment.
2. Analyze the spatial distribution of physical features and processes on Earth.
3. Explore the interactions between physical geography and human activities, including environmental change and sustainability and foster critical thinking skills in interpreting natural processes and their impact on global and local scales.
4. Use tools like maps, remote sensing, and Geographic Information Systems (GIS) to analyze physical geographic data, enabling them to apply physical geographic methods to collect, analyze, and interpret data from real-world environments

This course will foster analytical thinking, enhance problem-solving skills, and prepare students for research, policy-making, and professional careers in geography and related fields.

Course work:

Unit- I: Earth

1.1. Meaning, scope, and components of Physical Geography;
1.2. Earth movements - Rotation and Revolution; Earthquakes and volcanoes;
1.3. Interior of the Earth, convection currents;
1.4. Origin of continents and oceans;
1.5. Isostasy – Airy and Pratt; Continental Drift and Plate Tectonic Theories;
1.6. Geomorphic processes: Endogenic and Exogenic Forces; Faults and folds;
1.7. Cycle of erosion: Davis and Penck;
1.8. Weathering and Mass Wasting.

Unit-II: Atmosphere

2.1. Elements of weather and climate;
2.2. Structure and composition of atmosphere;
2.3. Insolation and heat budget; Vertical and horizontal distribution of temperature;
2.4. Atmospheric pressure and winds-Air mass, Frontogenesis;
2.5. Cyclones: Types, Origin and Mechanism;
2.6. Mechanism of Indian Monsoon.

Unit-III: Water

3.1. Hydrological Cycle;
3.2. Factors affecting run-off, infiltration and groundwater; Water Storage;

3.3. Ocean topography;
3.4. Temperature and salinity of ocean water;
3.5. Ocean current and deposits; Circulations.

Unit-IV: Practical

4.1. Relief depiction – Proficiency in representing relief features such as Mountain, Valley (U shaped and V shape), Waterfall, Plateau and Escarpment, Ocean topography;
4.2. Introduction to use of simple weather observation instruments: Thermometer (Wet and dry bulb temperature), Barometer, hygrometer, anemometer, wind vane, Rain Gauge, Stevenson Screen; Interpretation of weather maps;
4.3. Prepare world maps showing Tectonic Plate Boundaries, Volcanoes (significant) and Earthquakes (major) using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com). Write a brief report by visually correlating the resultant maps. Explain your finding in max 150 words. You can also prepare an overlay map for all layers.
4.4. Construction and interpretation unit hydrograph.
4.5. Practical Record and Viva.

Suggested Readings

Text Books:

1. Singh, S. (2020). Physical Geography. Prayag Pustak Bhawan, Allahabad.
2. Strahler, A. H., & Strahler, A. (2005). Introducing Physical Geography. John Wiley & Sons, New York.
3. Singh R. L. and Singh R. P. B., (1999). Elements of Practical Geography, Kalyani Publishers.

Reference Books:

1. Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). Applied Hydrology. Retrieved from https://ponce.sdsu.edu/Applied_Hydrology_Chow_1988.pdf
2. Critchfield, H. (1975). General Climatology. Prentice-Hall, New York.
3. Dayal, P. (2005). A Text Book of Geomorphology. Anmol Publications Pvt. Limited, Delhi.
4. Garrison, T. (1998). Oceanography. Wadsworth.com. USA 1998.
5. Getis, V., Getis, A., & Bjelland, M. D. (2020). Introduction to Geography. McGraw Hill India.
6. Holden, J. (2017). An Introduction to Physical Geography and the Environment. Pearson Education Ltd., Harlow, UK.
7. King, C. A. M. (1975). Oceanography for Geographers. E. Arnold, London.
8. Lohani, A. K. (n.d.). Practicing Hydrology-An Overview. Retrieved from http://nihroorkee.gov.in/sites/default/files/uploadfiles/Practicing-Hydrology.pdf
9. Monkhouse, F. J. (1960). Principles of Physical Geography. Hodder and Stoughton, London.
10. Pitty, A. (1960). Introduction to Geomorphology. Methuen, London.
11. Steers, J. A. (1964). The Unstable Earth: Some recent views in geography. Kalyani Publishers, New Delhi.
12. Strahler, A. N., & Strahler, A. H. (1992). Modern Physical Geography. John Wiley & Sons.
13. Thornbury, W. D. (1969). Principles of Geomorphology. Wiley Eastern.
14. Ward, A. D., Trimble, S. W., Burckhard, S. R., & Lyon, J. G. (2015). Environmental Hydrology. Boca Raton.
15. Wooldridge, S. W., & Morgan, R. S. (1959). The Physical Basis of Geography - An Outline of Geomorphology. Longman Green & Co., London, 1959.

Major-I-P-II: Human Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course is designed to provide students with an in-depth understanding of the spatial patterns and processes that shape human activities, cultures, and societies. The course explores how human populations interact with their environments, develop cultural landscapes, and organize space at various scales, from local to global in order to gain insights into the social, economic, political, and cultural forces that influence human geography.

Course outcomes:

1. Understand the fundamental concepts and theories that explain the spatial distribution of human activities and analyze the relationships between human populations and their environments, including the impact of geography on culture, politics, and economies.
2. Explore global and regional patterns of settlements, urbanization, migration, and globalization.
3. Examine the role of place, space, and scale in shaping human behavior and social organization.
4. Develop skills in using geographic tools, such as maps and Geographic Information Systems (GIS), to analyze human geographic data.

This course will equip students with the knowledge and analytical skills necessary to understand human-environment interactions, cultural and spatial diversity, and the processes shaping the global landscape, preparing them for careers in fields such as urban planning, social research, and international development.

Course work:

Unit-I: Fundamentals

1.1. Human Geography: Meaning, Nature, Scope, Evolution and Contemporary relevance;
1.2. Development of Human Geography- contributions of Germans, French and Americans;
1.3. Major Themes and concepts of Human Geography (Location, Place, Region, Landscape and Movement; Time-Space Integration and Compression; Spatial Diffusion, Spatial Distribution; Spatial Organization, Mental Map; Accessibility, Agglomeration;
1.4. Man and Environment Relationship: Concepts (Determinism, Possibilism and Neo-determinism); Modeling (Kirk's decision Model).

Unit-II: Socio-cultural aspects

2.1. World Population distribution and Growth; Population Problems;
2.2. World Distribution of religious, linguistic and ethnic groups;
2.3. Evolution of Culture and Cultural realms of the world; Cultural globalization; Global cultural diversities- diffusion of culture.
2.4. Regional diversity and disparity (Gender, Ethnicity and Income).

Unit-III: Settlement

3.1. Concept, Origin, Evolution, and Types of Settlements;
3.2. Rural Settlements – Types and Morphology;
3.3. Urban Settlements - Functional classification (Type) and Theories of Urban internal structure

(Morphology)

3.4. World Urbanization with special reference to developing countries.

Unit-IV: Practical

4.1. Identify prominent instances of human–nature interaction in your locality from the Google Earth and arrange them, with justification, in ascending order from a deterministic (control/influence) or possibilistic (freedom/development) perspective.

4.2. Construct a transect chart to illustrate the spatial variation of human–environment relationships from the given toposheet.

4.3. Draw a mental map of the campus to represent your spatial perceptions and human–environment interactions.

4.4. Identify the settlement pattern and types from toposheet or Google Earth.

4.5. Prepare a series of world map for population size, density and natural growth rate using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com) . Write a brief report of max 100 words for each of them.

4.6. Prepare world maps for cities and another for light pollution using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com). Write a brief report visually correlating the prepared maps for cities with light pollution. Explain your finding in max 150 words. You can also prepare an overlay map for all layers.

4.7. Practical Record and Viva.

Suggested Readings:

Text Books:

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

Reference Books:

1. Ahmed, A. (1999). *Social Geography*, Rawat Publication, New Delhi.
2. Daniel, P.A. and Hopkinson, M.F. (1989*). The Geography of Settlement*, Oliver & Boyd, London. Human Geography, Rupa Publication.
3. Fellmann, J. D., Getis, A., Getis,J. (2000). *Human Geography- Landscape of Human Activity*, McGraw Hill, NewYork.
4. Fouberg, E.A, Murphy, A.B. & de Blij, H. J. (2015). *Human Geography: Culture, Society and Space*. Wiley
5. Johnston, R; Gregory D, Pratt G. et al. (2008) *The Dictionary of Human Geography*, Blackwell Publication.
6. Jordan-Bychkov et al. (2006). *The Human Mosaic: A Thematic Introduction to Cultural Geography*. W. H. Freeman and Company, New York.
7. Knox, P. & Marston, S. (2013): *Human Geography: Places and Regions in Global Context*, 6th Edition, Pearson Education, New Delhi.
8. Leong. G.C. and Morgan, G.C. (1975). *Human and Economic Geography*, Oxford University Press, Hong Kong.
9. Rubenstein, James M. (2022) *Contemporary Human Geography* , Pearson, U.S.A

Minor-I-P-I: Human Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course is designed to provide students with an in-depth understanding of the spatial patterns and processes that shape human activities, cultures, and societies. The course explores how human populations interact with their environments, develop cultural landscapes, and organize space at various scales, from local to global in order to gain insights into the social, economic, political, and cultural forces that influence human geography.

Course outcomes:

1. Understand the fundamental concepts and theories that explain the spatial distribution of human activities and analyze the relationships between human populations and their environments, including the impact of geography on culture, politics, and economies.
2. Explore global and regional patterns of settlements, urbanization, migration, and globalization.
3. Examine the role of place, space, and scale in shaping human behavior and social organization.
4. Develop skills in using geographic tools, such as maps and Geographic Information Systems (GIS), to analyze human geographic data.

This course will equip students with the knowledge and analytical skills necessary to understand human-environment interactions, cultural and spatial diversity, and the processes shaping the global landscape, preparing them for careers in fields such as urban planning, social research, and international development.

Course work:

Unit-I: Fundamentals

1.1. Human Geography: Meaning, Nature, Scope, Evolution and Contemporary relevance;
1.2. Development of Human Geography- contributions of Germans, French and Americans;
1.3. Major Themes and concepts of Human Geography (Location, Place, Region, Landscape and Movement; Time-Space continuum; Spatial Diffusion, Spatial Distribution; Mental Map; Accessibility, Agglomeration;
1.4. Man and Environment Relationship: Concepts (Determinism, Possibilism and Neo-determinism); Modeling (Kirk's decision Model).

Unit-II: Socio-cultural aspects

2.1. World Population distribution and Growth; Population Problems;
2.2. World Distribution of racial, religious, linguistic and ethnic groups;
2.3. Evolution of Culture and Cultural realms of the world; Cultural globalization; Global cultural diversities- diffusion of culture.
2.4. Regional diversity and disparity (Gender, Ethnicity and Income).

Unit-III: Settlement

3.1. Concept, Origin, Evolution, and Types of Settlements;
3.2. Rural Settlements – Types and Morphology;
3.3. Urban Settlements - Functional classification (Type) and Theories of Urban internal structure

(Morphology)

3.4. World Urbanization with special reference to developing countries.

Unit-IV: Practical

4.1. Class seminar: Comparative evolution of Human Geography in Germans, French and Americans scholars. Write a report of maximum 500 words. Present your results in maximum 6 slides.

4.2. Write a 2-3 pages' report (max 500 words) describing any model depicting Man and Environment Relationship other than Kirk's.

4.3. Prepare a series of world map for population size, density and natural growth rate using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com) . Write a brief report of max 100 words for each of them.

4.4. Prepare world maps for cities and another for light pollution using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com). Write a brief report visually correlating the prepared maps for cities with light pollution. Explain your finding in max 150 words. You can also prepare an overlay map for all layers.

4.5. Practical Record and Viva.

Suggested Readings:

Text Books:

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

Reference Books:

1. Ahmed, A. (1999). *Social Geography*, Rawat Publication, New Delhi.
2. Daniel, P.A. and Hopkinson, M.F. (1989*). The Geography of Settlement*, Oliver & Boyd, London. Human Geography, Rupa Publication.
3. Fellmann, J. D., Getis, A., Getis,J. (2000). *Human Geography- Landscape of Human Activity*, McGraw Hill, NewYork.
4. Fouberg, E.A, Murphy, A.B. & de Blij, H. J. (2015). *Human Geography: Culture, Society and Space*. Wiley
5. Johnston, R; Gregory D, Pratt G. et al. (2008) *The Dictionary of Human Geography*, Blackwell Publication.
6. Jordan-Bychkov et al. (2006). *The Human Mosaic: A Thematic Introduction to Cultural Geography*. W. H. Freeman and Company, New York.
7. Knox, P. & Marston, S. (2013): *Human Geography: Places and Regions in Global Context*, 6th Edition, Pearson Education, New Delhi.
8. Leong. G.C. and Morgan, G.C. (1975). *Human and Economic Geography*, Oxford University Press, Hong Kong.
9. Rubenstein, James M. (2022) *Contemporary Human Geography* , Pearson, U.S.A

Multi-disciplinary Courses – Geography (3 credit each)

MDC-I: Tribal Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to provide students with an in-depth understanding of the spatial and cultural dynamics of tribal communities, their relationships with their environments, and the challenges they face in a rapidly changing world.

Course outcomes:

1. Understand the fundamental concepts and definitions of tribal geography, including the diversity of tribal cultures, languages, and social structures.
2. Assess spatial distribution of tribal populations and the factors influencing their settlement patterns and land use practices.
3. Examine the diverse tribal livelihoods, cultural practices, and the impacts of industrialization and mining on the economy, ecology, and society of selected tribes in Odisha.
4. Develop critical thinking and analytical skills through the study of case studies and field research related to tribal communities and their geographical contexts.

Course work:

Unit I: Fundamentals

1.1. General and Specific characteristics of tribe vis a vis non-tribe social structure;

1.2. Definition: Tribe, Scheduled Tribe, De-notified tribe, Primitive Tribe, Indigenous People, Criminal tribes in India, Particularly Vulnerable Tribal Group;

1.3. Geographical distribution of tribes in India: demographic and linguistic; Concept of common property resources.

Unit II: Tribal Economy

2.1. Tribal livelihoods (hunting & gathering, shifting cultivation, sedentary agriculture, pastoralism, fishing, forestry, agro-forestry, and the recent changes);

2.2. Occupation, religion, festival, dress, society and tradition of selected tribes (Bonda Poraja, Bhunjia, Dharua, Kharia, Lodha) of Odisha;

Unit III: Tribal implications

3.1. Economic, Ecological and Social implication of Industrialization and Mining activities in tribal areas.

3.2. Interactions between tribal communities and their environments, including traditional ecological knowledge and sustainable resource management.

Practical:

i. Explore the indigenous knowledge systems of a selected tribe, particularly in areas like medicine, agriculture, and environmental management. Compare these with modern practices.

ii. Conduct ethnographic research to document the festivals, traditional dress, and rituals of a selected tribe. Create a multimedia presentation or documentary to showcase your findings.

iii. Compare and contrast the social structures of a specific tribe with a neighboring nontribal community. Focus on aspects like family hierarchy, social roles, and community governance.

Suggested Reading:

Text books:

1. Mohanty,P.K “Encyclopedia of Scheduled Tribes in India”5 Vols.(2006),Eastern Book Corporation, Delhi.
2. Ahmad, A. 1999. Social Geography. Rawat Publication, Jaipur.

Reference books:

1. Beteille, Andre, 1977: “The Definition of Tribe” in Thapar Romesh (ed.), Tribe, Caste and Religion in India, The Macmillan Co. of India Ltd., Delhi.
2. Patnaik, N. 2005. Primitive tribes of Orissa and their development strategies. University of Michigan.
3. Ray, B.C. & Raya, B.C. 1989. Tribals of Orissa: The Changing Socio-economic Profile. University of Michigan.
4. Pati, B. 2019. Tribals and Dalits in Orissa: Towards a social History of Exclusion. Oxford University Press, New Delhi.
5. Ghatak, N. K. (2003), “The Scheduled Tribes of India in the New Millennium: Constitutional Aspect of Identification of Scheduled Tribe in India”, The Journal of the Anthropological Survey of India, vol. 52, no. 1, March, p.89
6. Xaxa, V, 1999: “Transformation of Tribes in India: Terms of Discourse”, Economic and Political Weekly, No. XXXIV, Volume. 24

Ability Enhancement Courses – University (4 credit each)

AEC-I: Odia / Hindi/ Sanskrit

[Mid-Term: 20 + End Term: 70 + 10 Continuous Evaluation in class = Total 100 Marks]

Please check GM University's central syllabus for this course.

Value Added Courses – University (3 credit each)

VAC-I: Environmental Studies & Disaster Management

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The course focuses on developing an understanding of the complex relationship between the environment and human activities, while also equipping students with knowledge and skills to manage environmental challenges and disasters effectively.

Course outcomes:

1. Understand the Multidisciplinary nature of environmental issues and the role of natural resources and biodiversity in order to identify different challenges associated with them.
2. Develop skills in assessing environmental risks and hazards, including both natural and anthropogenic disasters, and propose mitigation strategies.
3. Apply disaster preparedness planning, response mechanisms, and recovery strategies to reduce the impact of disasters on communities and ecosystems.
4. Analyze environmental policies, laws, and frameworks (both local and global) that guide environmental protection, conservation, and sustainable development.

Course work:

Unit I: Multidisciplinary nature of environmental studies

1.1. Definition, scope and importance; Need for public awareness;

1.2. Environmental Pollution: Definition, Cause and effects;

1.3. Control measures of: a) Air pollution, b) Water pollution, c) Soil pollution, d) Marine pollution, e) Noise pollution, and f) Radiation pollution.

1.4. Natural resources: Renewable and non-renewable resources; Associated problems: a) Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forest and tribal people; b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems; c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies; d) Food resources: World food problems, changes caused by agriculture and Overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies; e) Energy resources : Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

1.5. Biodiversity: Introduction-Definition; Biogeographically classification of India; India as a mega diversity nation; Hot spots of biodiversity, Threats to biodiversity; Endangered and endemic species of India; Conservation of biodiversity, In Situ and Ex-so conservation of biodiversity.

Unit II: Disaster Management

2.1. Disaster Management: Types of disasters (natural and Man-made) and their causes and effect)

2.2. Vulnerability Assessment and Risk analysis: Vulnerability to various disasters (Flood, Cyclone, Earthquake, Heat waves, Desertification and Lighting)
2.3. Institutional Framework: Institutional arrangements for disaster management (National Disaster Management Authority (NDMA), State Disaster Management Authority (SDMA), Disaster Management Act, 2005, District Disaster Management Authority (DDMA), National Disaster Response Force (NDRF) and Odisha Disaster Rapid Action Force (ODRAF);
2.4. Preparedness measures: Disaster Management cycle, Early Warning System, Pre-Disaster and Post-Disaster Preparedness, strengthening of SDMA and DDMA, Community Preparedness for flood cyclone, heat waves, fire safety, lightening and snake biting. Stakeholders participation, Corporate Social Responsibility (CSR)
2.5. Survival Skills: Survival skills adopted during and after disaster (Flood, Fire, Earthquake, Cyclone and Lightening), Disaster Management Act-2005, Compensation and Insurance.

Unit III: Social Issues and the Environment

3.1. Environmental Ethics: Issues and possible solutions;
3.2. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust - Case studies;
3.3. Environment Protection Act; Air (Preservation Control of Pollution) Act; Water (Preservation Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act;
3.4. Solid waste management Cause, effect and Control Measure of Urban and Industrial waste (Role of each individual in conservation of Natural resources and prevention of pollution)
3.5. Human Population and the Environment: Population Ecology: Individuals, species, population, community; Human population growth, population control method; Urbanization and its effect on society

Practical:

i. Visit to an area to document environmental assets: river/forest/flora/fauna, etc.
ii. Visit to a local polluted site- Urban/Rural/Industrial/Agricultural.
iii. Study of common plants, insects, birds and basic principles of identification.
iv. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings

1. Chiras, Daniel D., and Reganold, John P. (2014), Natural Resource Conservation: Management for a sustainable future. (10th Edition) Edinburgh Gate, England: Pearson Education Limited.
2. Chandna R. C. (2002). Environmental Geography. Kalyani, Ludhiana.
3. Singh S. (1997). Environmental Geography. Prayag Pustak Bhawan. Allahabad.
4. Singh, S. (2021). Disaster Management. Pravalika Publication.
5. Ravindranath, N.H., & Joshi, P.K. (2012). Climate change, disasters and vulnerabilities in India. Springer.
6. Cunningham W. P. and Cunningham M. A., (2004). Principles of Environmental Science: Inquiry and Applications, Tata McGraw Hill, New Delhi.
7. Goudie A. (2001). The Nature of the Environment. Blackwell, Oxford.
8. Huggett, R. John. (1998). Fundamentals of Biogeography. Routledge.
9. Miller, G. T., (2004). Environmental Science: Working with the Earth. Thomson Brooks Cole,

Singapore.
10. Asthana, N.C. and Asthana P. (2014). Disaster Management. Pointer Publishers
11. Bryant, E. (2004). Natural Hazards. Cambridge University Press, India
12. Huq, S., Rajan, S.C., & Pachauri, R.K. (2014). Climate change and disaster management in India. Springer.
13. Smith, Keith (2013). Environmental Hazards: Assessing risk and reducing disasters. Routledge, Taylor and Francis Group.
14. Singh R.B. (ed.) (2006). Natural Hazards and Disaster Management: Vulnerability and Mitigation. Rawat Publications, Jaipur.
15. Singh, J. (2007). Disaster Management: Future Challenges and Opportunities. IK International Pvt. Ltd, New Delhi.
16. Sinha, A. (2001). Disaster Management: Lessons drawn and Strategies for Future. New United Press, New Delhi.
17. Modh, S. (2010). Managing Natural Disaster: Hydrological, Marine and Geological Disasters. Macmillan, Delhi.

Semester –II [CC; MDC; AEC; SEC]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-III	4
2.	Core	Major	Major-I-P-IV	4
3.	Core	Minor	Minor-II-P-I	4
4.	Multi-disciplinary	Elective from any Multi-disciplinary	MDC-II	3
5.	Ability Enhancement	Compulsory	AEC-II	4
6.	Skill Enhancement	Compulsory	SEC-I	3
	Total			**22**

Core Courses – Geography (4 credit each)

Major-I-P-III: Cartography and Geo-Spatial Techniques

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course is designed to equip students with the knowledge and practical skills needed to effectively create, analyze, and interpret maps and spatial data. The course covers the principles and techniques of cartographic design, geospatial analysis, and the use of Geographic Information Systems (GIS), remote sensing, and other geospatial technologies.

Course outcomes:

1. Develop proficiency in cartographic principles, including map design, scale, projections, and symbology.
2. Understand the fundamentals of geospatial data collection, storage, and analysis.
3. Gain hands-on experience in using GIS software, remote sensing, and other geospatial technologies to analyze and interpret spatial data.
4. Learn how to create clear, accurate, and aesthetically pleasing maps that effectively communicate geographic information.

This course prepares students to work in a wide range of fields where spatial analysis and geographic visualization are essential, including urban planning, environmental science, transportation, and disaster management, as well as research and academia.

Course work:

Unit-I: Basics

1.1. Scientific basis of Cartography; Need of map making; Characteristics of maps; Types of maps;
1.2. Cartography as a science of human communication;
1.3. Scales (Plain, Comparative and Diagonal);
1.4. Basic Geodesy: Spherical Earth, Ellipsoidal Earth. Geoid Earth
1.5. Coordinate systems: Geographical (Latitude and Longitude) and Planar (X and Y); Graticules.

Unit-II: Classical Mapping Process

2.1. Map projection – concept, history and uses;
2.2. Transformation of Area, Shape, Distance and Direction;
2.3. Types of map projection: Conical (1 and 2 standard parallels), Cylindrical (Equal Area) and Polar/Zenithal (Equi-distant); Universe Transverse Mercator;
2.4. Specialized mapping: Basic Geological mapping- Interpretation of Bedding plane, Strike, Dip, structure & stratigraphy of Geological map.
2.5. Methods of determination of slope (Wentworth's method).

Unit-III: Modern mapping using Geographic Information System (GIS)

3.1. Geographical Information System: history and components;
3.2. Data Model in GIS -Conceptual (field/object) and logical (raster/vector);;

3.3. Data types (raster/vector/attribute);
3.4. Data sources – Remote Sensing based (e.g. Satellite images and Aerial photos); Attribute based (e.g. Survey)
3.5. Visual interpretation of Satellite images;
3.6. Global Positioning System (GPS) and Global Navigation Satellite System (GNSS).

Unit-IV: Practical

4.1. Finding Time of place with reference to GMT;
4.2. Construction of Scales: Statement Scale, Representative Fractions (RF) and Graphical Scale (Plain, Comparative and Diagonal Scales);
4.3. Construction of Map Projections: Conical (1 and 2 standard parallels), Cylindrical (Equal Area) and Polar/Zenithal (Equi-distant); Universe Transverse Mercator.
4.4. Manual drawing of maps: Isopleth and Choropleth maps;
4.5. Slope Analysis (Wentworth's method).
4.6. Identification and mapping of water bodies from satellite imageries of your city / district;
4.7. Digitization of map: drawing of some point, line and polygon features of your city / district;
4.8. Practical record and viva-voce

Suggested Readings:

Text Books:

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

Reference Books:

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

Major-I-P-IV: Population Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students with a thorough understanding of the spatial aspects of human populations, including distribution, density, growth, and movement patterns. The course explores demographic trends, population dynamics, and the relationships between population and place and provide insights into how population changes impact geographic regions at local, national, and global scales.

Course outcomes:

1. Analyze the spatial distribution and density of populations across different regions and understand the factors influencing these patterns.
2. Examine key demographic processes, such as fertility, mortality, and migration, and their geographic implications.
3. Explore the interaction between population growth and resource availability, urbanization, and development; and understand how population policies and global demographic trends affect human settlement, labor markets, and regional development.
4. Use demographic data and spatial analysis tools to assess population-related challenges and opportunities, such as aging populations, urbanization, and migration.

This course equips students with the skills to analyse population data, interpret demographic trends, and assess the impact of population changes on society and the environment, preparing them for careers in urban planning, public policy, demography, and geographic research.

Course work:

Unit- I: Fundamentals of Population

1.1. Definition, Nature and Scope of population geography;
1.2. Sources of population data with special reference to India (Census, National Family Health Survey and NSS);
1.3. Demographic Balancing Equation;
1.4. Population Distribution and Growth – Measures, Factors, and World Patterns;
1.5. Concept of Doubling Time, Concepts of Rate, Ratio and Proportion.

Unit- II: Conceptual Frameworks

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

Unit-III: Composition and concerns

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

reference to India.

Unit-IV: Practical

4.1. Estimation of Population Growth: Arithmetic and Geometric Projection calculation and graphical display for their comparison.

4.2. Population distribution maps of Odisha using symbols – Simple and Multiple Dots. Write a brief report of 75-100 words.

4.3. World Population distribution and density mapping using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com). Write a brief report of 75-100 words visually correlating the two. You can also prepare an overlay map for all layers.

4.4. Construction of Population Pyramid.

4.5. Practical Record and Viva-Voce.

Suggested Readings:

Text Books:

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

Reference Books:

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

Minor-II-P-I: Population Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students with a thorough understanding of the spatial aspects of human populations, including distribution, density, growth, and movement patterns. The course explores demographic trends, population dynamics, and the relationships between population and place and provide insights into how population changes impact geographic regions at local, national, and global scales.

Course outcomes:

1. Analyze the spatial distribution and density of populations across different regions and understand the factors influencing these patterns.
2. Examine key demographic processes, such as fertility, mortality, and migration, and their geographic implications.
3. Explore the interaction between population growth and resource availability, urbanization, and development; and understand how population policies and global demographic trends affect human settlement, labor markets, and regional development.
4. Use demographic data and spatial analysis tools to assess population-related challenges and opportunities, such as aging populations, urbanization, and migration.

This course equips students with the skills to analyse population data, interpret demographic trends, and assess the impact of population changes on society and the environment, preparing them for careers in urban planning, public policy, demography, and geographic research.

Course work:

Unit- I: Fundamentals of Population

1.1. Definition, Nature and Scope of population geography;
1.2. Sources of population data with special reference to India (Census, National Family Health Survey and NSS);
1.3. Demographic Balancing Equation;
1.4. Population Distribution and Growth – Measures, Factors, and World Patterns;
1.5. Concept of Doubling Time, Concepts of Rate, Ratio and Proportion.

Unit- II: Conceptual Frameworks

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

Unit-III: Composition and concerns

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

reference to India.

Unit-IV: Practical

4.1. Estimation of Population Growth: Arithmetic and Geometric Projection calculation and graphical display for their comparison.

4.2. Population distribution maps of Odisha using symbols – Simple and Multiple Dots. Write a brief report of 75-100 words.

4.3. World Population distribution and density mapping using ESRI's Mapmaker: Human Geography GeoInquiries™ (arcgis.com). Write a brief report of 75-100 words visually correlating the two. You can also prepare an overlay map for all layers.

4.4. Construction of Population Pyramid.

4.5. Practical Record and Viva-Voce.

Suggested Readings:

Text Books:

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

Reference Books:

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

Multi-disciplinary Courses – Geography (3 credit each)

MDC-II: Climatology

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students with a comprehensive understanding of climate systems, their dynamics, and the processes that drive climate variability and change.

Course outcomes:

1. Understand the fundamental principles of climatology, including the components of the climate system, climate classification, and the tools used for climate analysis.
2. Analyze the factors that affects climatic processes resulting into different climate patterns.
3. Explain the significance of climate and climate change.
4. Elaborate the heat budget and the mechanism of monsoon.

Course work:

Unit - I: Climate system and classification and Climate change

1.1. Components of the climate system,
1.2. Climate controlling factors,
1.3. Climate system response, response rates and interactions within the climate system.
1.4. Basis of classification; Koppen's classification; Thornthwaite's classification; Brief idea on
1.5. Types of Climate found in India. Climate forcing and feedbacks,

Unit - II: Heat budget of Earth and Interactions

2.1. Incoming solar radiation, receipt and storage of heat;
2.2. Heat transformation; Earth’s heat budget.
2.3. Interactions amongst various sources of earth’s heat;
2.4. Monsoon, its mechanism and its intensity influencing factors; Effects of monsoon.

Unit - III: Atmosphere & Hydrosphere

3.1. Stratification of atmosphere and atmospheric circulation;
3.2. Atmosphere-ocean interaction and its effect on climate;
3.3. Heat transfer in ocean;
3.4. Global oceanic conveyor belt and its control on earth’s climate;
3.5. Surface and deep circulation.

Practical

i. Study and Cartographic Representation of the Distribution of Major Climatic Regimes of India using Koppen and Thornthwaite Classification
ii. Global Wind Circulation: Representation and Analysis of Major Wind Belts, Pressure Zones, and Seasonal Shifts on a World Map
iii. Mapping and Classification of Major Ocean Currents with Analysis of Warm and Cold Currents and Their Role in Global Heat Circulation

Suggested Reading:

1. Rudiman, W.F., 2001. Earth's climate: past and future. Edition 2, Freeman Publisher.
2. Rohli, R.V. and Vega, A.J., 2007.Climatology. Jones and Barlatt.
3. Lutgens, F., Tarbuck, E., and Tasa, D., 2009. The Atmosphere: An Introduction to Meteorology. Pearson Publisher.

4. Aguado, E., and Burt, J., 2009. Understanding weather.

Ability Enhancement Courses – University (4 credit each)

AEC-II: English

[Mid-Term: 20 + End Term: 70 + 10 Continuous Evaluation in class = Total 100 Marks]

Please check GM University's central syllabus for this course.

Skill Enhancement Courses – University (3 credit each)

SEC-I [A]: Welfare and Development Programs: Monitoring and Evaluation

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of a course on Welfare and Development Programs: Monitoring and Evaluation is to equip participants with the technical knowledge and practical skills to systematically measure, track, and assess the performance and impact of development and welfare initiatives, ensuring accountability and improved program outcomes

Course outcomes:

1. Demonstrate an understanding of the concepts, approach and method of M&E Concepts
2. Describe and explain various types of M&E
3. Design basic monitoring indicators and design approach and method of evaluation

Course work:

Unit I: Fundamentals

1.1. Concepts of theory of change and logical framework, definition of program monitoring and evaluation, difference between monitoring and evaluation,

1.2. concept and purpose of monitoring of development program, types of monitoring, tools and techniques of monitoring,

1.3. Uses of monitoring in implementation of developmental programme

Unit II: Evaluation

2.1. Concept and purpose of evaluation in development program,

2.2. types of evaluation, evaluation approaches and methods (quantitative, qualitative and mixed),

2.3. Evaluation design (experimental and quasi-experimental) and criteria,

Unit III: Sampling and analysis

3.1. sampling methodology for evaluation,

3.2. data analysis for evaluation,

3.3. use of evaluation in implementation of developmental programme

Practical:

i. Development of indicators and framework of monitoring of a Government sponsored development program

ii. Preparation of approach and methodology of impact evaluation of a government sponsored development program (select any Government program after 2-3 years of its inception)

Suggested Reading:

Text books:

1. UNDP Evaluation Office. (2002). Handbook on Monitoring and Evaluation for Results.
2. Phillips, J. J. (1997). Handbook of training evaluation and measurement methods (3rd ed.). Houston, TX: Gulf.

Reference books:

1. *Campbell, D. T., & Stanley, J. (1963). Experimental and quasi- experimental designs for research. Chicago: Rand-McNally.*
2. *Chen, H.-T. (2005). Practical program evaluation: Assessing and improving planning, implementation, and effectiveness. Thousand Oaks, CA: SAGE.*
3. *Cook, T. D., & Campbell, D. T. (1979). Quasi- experimentation: Design and analysis issues for fi eld settings. Boston: Houghton Mifflin.*
4. *Creswell, J. W., & Creswell, J. D. (2017). Research design: qualitative, quantitative, and mixed methods approaches. Sage publications*
5. *Fitzpatrick, J. L., Sanders, J. R., & Worthen, B. R. (2004). Program evaluation: Alternative approaches and practical guidelines. Upper Saddle River, NJ: Pearson/Allyn & Bacon.*
6. *Funnell, S. C. and P. J. Rogers (2011). Purposeful Program Theory: Effective Use of Theories of Change and Logic Models, John Wiley & Sons*
7. *ILO (2022). Basic Principles of Monitoring and Evaluation.*
8. *Kultar Singh (2007): Quantitative Social Research Methods, Sage Publication*
9. *Rossi, P., Lipsey, M. W., & Freeman, H. E. (2004). Evaluation: A systematic approach (7th ed.). Thousand Oaks, CA: SAGE.*
10. *Segone, M. (2009). Country-led monitoring and evaluation systems. Geneva, Switzerland: UNICEF Regional Office.*
11. *Stuffl ebeam, D. L., & Shinkfi eld, A. J. (2007). Evaluation theory, models, and applications. San Francisco: Jossey-Bass.*
12. *UN-Women. (2014). Guide for the evaluation of programmes and projects with a gender, human rights and intercultural perspective.*

SEC-I [B]: Open Source GIS

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to provide students with a comprehensive understanding of the principles, tools, and applications of open-source Geographic Information Systems (GIS). It focuses on utilizing open-source software for geospatial data analysis, visualization, and management, emphasizing the benefits of accessibility, collaboration, and cost-effectiveness in geospatial projects.

Course outcomes:

4. Understand the fundamental concepts and principles of GIS and the significance of open-source software in the geospatial field.
5. Gain proficiency in popular open-source GIS tools, such as QGIS, GRASS GIS, and GeoServer, for data analysis and visualization.
6. Understand and Apply open source GIS techniques to resolve real-world problems.
7. Develop the ability to integrate open source and cloud-based GIS data into decision-making processes for spatial planning and management.

Course work:

Unit I: Fundamentals

1.4. Introduction to Open and FOSS GIS, Open data standards and SDI, Introduction to Source;
1.5. Internet GIS & Mapping, Mobile GIS and its application;
1.6. Open-source software for Desktop GIS and WEB mapping – Proprietary vs Open source – OGC Standards.

Unit II: Web-based GIS

2.4. Web GIS: Definition, Concepts, History, Principles and Significance;
2.5. Transferred Geo data, Interactive Web Maps, Internet Map Services, Web GIS Architectures, Web GIS development, Requirement Analysis, Conceptual design, Web GIS system Integration, Open-Source GIS;
2.6. Web Based Geo Portal, India Geoportal; State Geoportal and District Geoportal.

Unit III: Advance applications

3.4. Vehicle Tracking Systems, Mobile Mapping, Location Based Services, Intelligent transportation systems;
3.5. Cloud storage, Google earth engine and
3.6. Application of open cloud base platform in GIS.

Practical:

iii. Introduction to the need for Open-Source GIS and open-source plug-ins
iv. Collaboration, Workflow Management, and Version Control in Open-Source GIS
v. QGIS – basic and advanced, tools and libraries
vi. Uses of Web and Mobile GIS
vii. Accessible Open-Source mapping
viii. Open-Source GIS applications to Physical Geography and other applied sciences
ix. Natural hazard mapping in Open-Source GIS
x. Practical Record and Viva

Suggested Reading:

Text books:

3. Fu, P. and Sun, J. 2011. Web GIS: Principles and Applications, Redlands: Esri Press.
4. Muehlenhaus, I. 2013. Web Cartography: Map Design for Interactive and Mobile Devices. CRC Press.

Reference books:

13. Du Vander, A 2010. Map Scripting 101: An Example-Driven Guide to Building Interactive Maps with Bing, Yahoo!, and Google Maps. Available as an eBook (free) through UCONN Libraries.
14. Bandara, R. M. P. N. S., Jayasinghe, A. B., & Chemin, Y. (2014). Application of Mobile GIS for Mobility Mapping. International Conference of Communication (ICC), 91–100.
15. Peng, Z.R. and Tsou, M.H. 2003. Internet GIS: distributed geographic information services for the Internet and wireless networks. New York: John Wiley and Sons, Inc.
16. Peterson, M. 2014. Mapping in the Cloud. The Guilford Press.
17. Pérez-Cutillas, P., Pérez-Navarro, A., Conesa-García, C., Zema, D. A., & AmadoÁlvarez, J. P. (2023, January 1). What is going on within google earth engine? A systematic review and meta-analysis. Remote Sensing Applications: Society and Environment. Elsevier B.V.

Semester –III [CC; MDC; VAC]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-V	4
2.	Core	Major	Major-I-P-VI	4
3.	Core	Major	Major-I-P-VII	4
4.	Core	Minor	Minor-I-P-II	4
5.	Multi-disciplinary	Elective from any Multi-disciplinary	MDC-III	3
6.	Value Added	Compulsory	VAC-II	3
	Total			**22**

Core Courses – Geography (4 credit each)

Major-I-P-V: Environmental Geography and Biogeography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to provide students with an understanding of the spatial relationships between the environment, ecosystems, and human activities; by examining the distribution of life forms (biogeography) and how physical environments interacts with humans and shapes ecosystems in order to gain insights into the dynamics of ecosystems and the challenges of environmental management and sustainability.

Course outcomes:

1. Explore the concept of environmental ecosystem, their types, structure, functions, and spatial distribution of ecosystems leading to the understanding of the factors that influence these patterns, which will provide better understanding of biomes and Man-Environment relationship.
2. Analyze how physical processes such as soils shape the biogeographical regions and ecosystems across the Earth.
3. Understand the role of biogeography in addressing global environmental challenges, such as climate change, habitat loss, and species extinction.
4. Apply geospatial techniques and field methods to assess and manage ecosystems, biodiversity, and environmental sustainability.

This course prepares students to address complex environmental issues, engage in conservation efforts, and pursue careers in environmental management, ecology, conservation biology, and geographical research.

Course work:

Unit-I: Environment & Ecosystem

1.1. Environment: Concept, Types and Characteristics and Principles;

1.2. *Environmental Controls and Concept of tolerance; limiting factors (Light, temperature, wind, rainfall)*

1.3. Ecosystem: Concept, Types, Structure and Functions (Food Chain and Food Web, Trophic Level, Ecological Pyramid);

1.4. Energy flow in Ecosystem; Bio-geo-chemical Cycles (Nitrogen, Carbon, Oxygen);

1.5. Concept and Types of Biomes: (Equatorial, Subtropical, Temperate and Polar).

1.6. National Programmes and Policies: International Treaties, International Programmes and Polices (Brundtland Commission, Kyoto Protocol, Agenda 21, Sustainable Development Goals, Paris Agreement)

Unit-II: Biogeography & Biodiversity

2.1. Introduction to Biogeography: Nature, Scope, Development;

2.2. Ecological Succession: Succession, Change and Equilibrium;

2.3. Key processes in Biogeography: Evolution, Speciation, Extinction, Dispersal;

2.4. World Distribution patterns of Biota: Biogeographical Regions;
2.5. Distribution of World's Biodiversity hotspots: Critical and Endangered, Threatened, relatively stable/intact.

Unit-III: Soil

3.1. Physical Properties of soil (soil texture, soil structure, soil colour, porosity and permeability), chemical properties and biological properties.
3.2. *Soil horizons; profile Soil forming Processes and Factors.*
3.3. Soils Classification: (a) Soil Classification by Maturity (Entisols, Inceptisols, Alfisols, Spodosols, Ultisols, Oxisols), (b) Soil Classification by Climate (Mollisols, Ardisols, Gelisols), (c) Soils Characterized by Parent Material (Vertisols, Andisols).

Unit-IV: Practical

4.1. Write a Project Report (max 2000 words) on any environmental problem of global/national/local significance. Include a map showing the location of the problem.
4.2. Write a report / seminar paper (max 2000 words) on biodiversity hotspots of India with special reference to the distribution, biotic characteristics, major threats, and possible solutions. Include a map showing the hotspots prepared by you.
4.3. Prepare a map catalogue (max 5 pages) showing maps for Biomes and Soils in World. Write a brief explanation (max 100 words) for each. Interpret their relationship at the end.
4.4. Project Records and Viva-Voce.

Suggested Readings:

Text Books:

1. Chandna R. C. (2002). Environmental Geography. Kalyani, Ludhiana.
2. Singh S. (1997). Environmental Geography. Prayag Pustak Bhawan. Allahabad.

Reference Books:

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

Major-I-P-VI: Quantitative Techniques in Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to equip students with the knowledge and skills to apply statistical and mathematical methods to geographic problems. By integrating quantitative techniques, students will be able to analyze spatial data, interpret patterns and relationships, and make informed decisions based on data-driven insights.

Course outcomes:

1. Develop competence in using geographical data and statistical tools to analyze geographic problems.
2. Understand and apply basic and advanced quantitative techniques in spatial analysis and integrate quantitative approaches in addressing physical and human geography problems.
3. Interpret and communicate the results of quantitative geographic research effectively.
4. Utilize software tools like statistical packages to perform quantitative analyses.

This course will foster analytical thinking, enhance problem-solving skills, and prepare students for research, policy-making, and professional careers in geography and related fields.

Course work:

Unit-I: Data (reference to physical and human geography)

1.1. Data: Sources, Collection, Tabulation and Processing; Scales of Measurements, Frequency Distribution, Data Matrix.

1.2. Sampling Methods: Definition, Size; Types of Sampling (Simple Random, Systematic, Stratified and Purposive); Probability and non-probability sampling;

1.3. Data in Geography – Spatial and non-spatial (attribute), time-series data.

Unit-II: Fundamental statistics used in Geography

2.1. Descriptive Statistics: Central Tendencies – Mean, Median, Mode;

2.2. Measures of Partitions - Quartile, Decile, Percentile;

2.3. Measures of Dispersion- Range, Quartile Deviation, Mean Deviation, Standard Deviation and Coefficient of Variation, Variance;

2.4. Measures of Relationship: Correlation - Spearman's and Karl Pearson's coefficient of correlation; Regression - Simple and Logistic; Test of significance.

2.5. Theoretical Distribution: Concept of Probability Distribution (Theoretical only), Normal Distribution – Characteristics, Area under Normal Curve.

Unit-III: Advance statistics in Geography

3.1. Inequality: Lorenz curve and Gini coefficient;

3.2. Differences: ANOVA (Analysis of variance)

3.3. Patterns and relations in more than two variables: Multivariate factor analysis; Discriminate function analysis.

Unit-IV: Practical

4.1. Drawing of bar, histogram, frequency polygon, frequency curve and ogive using geographic data (one example from each physical and human geography).

4.2. Time series analysis: univariate vs multivariate; stationary vs non-stationary; Trend, seasonality, cyclicality, and irregular components

4.3. Calculation & drawing of graphs showing mean, median, mode using geographic data (one example from each physical and human geography).

4.4. Calculation of mean deviation, standard deviation and coefficient of variation using geographic data (one example from each physical and human geography).

4.5. Calculation of Pearson's coefficient of correlation, Spearman's rank correlation and Linear Regression Model using geographic data (one example from each physical and human geography).

4.6. Draw Lorenz curve and calculate Gini coefficient using geographic data.

4.7. Practical Record and Viva-Voce.

Suggestive readings:

Text Books:

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

Reference Books:

1. Alvi, Z. (1995). Statistical Geography: Methods and Applications. Rawat Publications, Jaipur.
2. Deshpande, B.R. (2007). Statistical Methods for Geography. Pragati Publications, Pune.
3. Ebdon D. (1977). Statistics in Geography: A Practical Approach. Oxford, UK. Blackwell.
4. Gupta, S.C., and Kapoor, V.K. (2018). Fundamentals of Mathematical Statistics. Sultan
5. Chand & Sons, New Delhi.
6. Katti, C.B. (2008). Basic Statistics for Geographers. Rawat Publications, Jaipur.
7. Pal, S. K. (1998). Statistics for Geoscientists. Tata McGraw Hill, New Delhi. Rogerson P.A. (2014). Statistical Methods for Geography: A Student's Guide. Sage, New Delhi.
8. Sarker, P.C. (2013). Fundamental Statistics for Geographers. Rawat Publications, Jaipur.
9. Singh D. (2018). Elementary Statistical Methods. R K Books, New Delhi.
10. Triola, M.F. (2019). Elementary Statistics. Pearson,
11. Walford N. (2011). Practical Statistics for Geographers and Earth Scientists. Wiley- Blackwell, West Sussex, United Kingdom.

Major-I-P-VII: Economic and Resource Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to examine the concepts, processes and spatial patterns of economic activities and the management of natural resources by focusing on the relationships between geography, economic development, and resource distribution, gaining insights into the challenges of economic development and resource management.

Course outcomes:

1. Understand the concepts, frameworks, and factors influencing the spatial organization of economic activities.
2. Analyze the geographic distribution and utilization of natural resources, such as minerals, energy, and water, and their role in economic development.
3. Explore the links between resource availability, environmental sustainability, and economic growth.
4. Apply geographic tools and spatial analysis to evaluate economic patterns and resource management strategies.

This course prepares students to address complex issues related to economic activities and development as well as resource management and sustainability, equipping them for careers in economic planning, resource management, environmental policy, and geographic research.

Course work:

Unit I: Basics

1.1. Meaning, nature and scope of economic geography;
1.2. Resource - Concept and Classification;
1.3. Economic activities: historical evolution, classification; Type – Primary economic activities (Agriculture and mining), Secondary economic activities (Cotton Textile, Iron and Steel and Petrochemical), Tertiary economic activities (Transportation and Trade).
1.4. Factors affecting location of economic activities (with special reference to agriculture, manufacturing and Services);
1.5. Resource related theories & Model – Functional Theory of Resources; Models in Resource Management – Zimmerman's models for resource;;

Unit–II: Fundamental components – Economic Geography

2.1. Von Thunen Theory of location of agricultural activity;
2.2. Weber Industrial location Theory;
2.3. Classification of world agricultural system of Whittlesey;
2.4. Major Industrial Regions of the world;
2.5. Special Economic Zones and Technology Parks.

Unit-III: Fundamental components – Resource Geography

3.1. Natural Resources in World: Distribution, Utilization, Problems and Management of – Land, Water, Forest and Energy (Coal, petroleum and non-conventional), Mineral resources (Iron, Bauxite);
3.2. Population- Resource Relationship Regions;

3.3. Resource depletion, conservation and Sustainable use of resources.

Unit-IV: Practical

4.1. Explore the population data from Census of India to delineate the number of people involved in different economic activities (Hint: Occupational Structure). Prepare a tertiary / ternary diagram for population involved in the 3 economic activities for any 10 districts in India/Odisha.

4.2. Prepare a map-series for World and India showing following resources: Forest, Coal, Petroleum, Iron and Bauxite.

4.3. Draw flow diagram for Traffic / Trade at global / national / state level.

4.4. Practical record and viva –voce.

Suggested Readings:

Text Books:

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

Reference Books:

1. Durand L. (1961). Economic Geography. Crowell
2. 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.
3. *Gautam, Alaka (2016). Advanced Economic Geography. Sarada Pushtak Bhawan, Allahabad.*
4. Gautam, Alaka (2018). Geography of Resources: exploitation, conservation and management. Sarada Pustak Bhawan, Allhabad
5. Guha, J.L. and Chattaraj, P.R. (1989). A New Approach to Economic Geography: A Study of Resources. World Press Ltd., Kolkata 7. Hall, C.M. and Page.
6. Harikesh N. Misra. (2014). Managing Natural Resources- Focus on Land and Water. Prentice Hall India Leaming Private Limited.
7. Hussain, M. (2017). Resource Geography. Anmol Publications, New Delhi.
8. Klee G. (1991). Conservation of Natural Resources. Prentice Hall, Englewood
9. Leong. G.C. and Morgan, G.C. (1975). Human and Economic Geography. Oxford University Press, Hong Kong
10. Mahmood Aslam (2008). Statistical Methods in Geographical Studies. Rajesh Pub. New Delhi.
11. Mishra R. P (1969). Fundamentals of Cartography. Concept Publication Company, New Delhi.
12. Rees J. (1990). Natural Resources: Allocation, Economics and Policy. Routledge. London.
13. Saxena, H.M. (2018). Economic Geography. Rawat Publication, New Delhi.
14. Siddhartha K. (2017). Economic Geography. Kitab Mahal Publishers, New Delhi.
15. Singh, R.L. and Singh R.P.B. (1999. Elements of Practical Geography. Kalyani Publishers, New Delhi.
16. Sundaram. M, and M. Mrityunjay. (2004). Natural Resources Management and livelihood Security Survival Strategies and Sustainable Policies. Bhoovigyan Vikas Foundation.
17. Zimmermann, E.W. (1933). World Resources and Industries - A Functional Appraisal of the Availability of Agriculrural and Industrial Materials. New York.

Minor-I-P-II: Economic and Resource Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to examine the concepts, processes and spatial patterns of economic activities and the management of natural resources by focusing on the relationships between geography, economic development, and resource distribution, gaining insights into the challenges of economic development and resource management.

Course outcomes:

5. Understand the concepts, frameworks, and factors influencing the spatial organization of economic activities.
6. Analyze the geographic distribution and utilization of natural resources, such as minerals, energy, and water, and their role in economic development.
7. Explore the links between resource availability, environmental sustainability, and economic growth.
8. Apply geographic tools and spatial analysis to evaluate economic patterns and resource management strategies.

This course prepares students to address complex issues related to economic activities and development as well as resource management and sustainability, equipping them for careers in economic planning, resource management, environmental policy, and geographic research.

Course work:

Unit I: Basics

1.6. Meaning, nature and scope of economic geography;
1.7. Resource - Concept and Classification;
1.8. Economic activities: historical evolution, classification; Type – Primary economic activities (Agriculture and mining), Secondary economic activities (Cotton Textile, Iron and Steel and Petrochemical), Tertiary economic activities (Transportation and Trade).
1.9. Factors affecting location of economic activities (with special reference to agriculture, manufacturing and Services);
1.10. Resource related theories & Model – Functional Theory of Resources; Models in Resource Management – Zimmerman's models for resource;;

Unit–II: Fundamental components – Economic Geography

2.6. Von Thunen Theory of location of agricultural activity;
2.7. Weber Industrial location Theory;
2.8. Classification of world agricultural system of Whittlesey;
2.9. Major Industrial Regions of the world;
2.10. Special Economic Zones and Technology Parks.

Unit-III: Fundamental components – Resource Geography

3.4. Natural Resources in World: Distribution, Utilization, Problems and Management of – Land, Water, Forest and Energy (Coal, petroleum and non-conventional), Mineral resources (Iron, Bauxite);
3.5. Population- Resource Relationship Regions;

3.6. Resource depletion, conservation and Sustainable use of resources.

Unit-IV: Practical

4.5. Explore the population data from Census of India to delineate the number of people involved in different economic activities (Hint: Occupational Structure). Prepare a tertiary / ternary diagram for population involved in the 3 economic activities for any 10 districts in India/Odisha.

4.6. Prepare a map-series for World and India showing following resources: Forest, Coal, Petroleum, Iron and Bauxite.

4.7. Draw flow diagram for Traffic / Trade at global / national / state level.

4.8. Practical record and viva –voce.

Suggested Readings:

Text Books:

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

Reference Books:

18. Durand L. (1961). Economic Geography. Crowell
19. 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.
20. *Gautam, Alaka (2016). Advanced Economic Geography. Sarada Pushtak Bhawan, Allahabad.*
21. Gautam, Alaka (2018). Geography of Resources: exploitation, conservation and management. Sarada Pustak Bhawan, Allhabad
22. Guha, J.L. and Chattaraj, P.R. (1989). A New Approach to Economic Geography: A Study of Resources. World Press Ltd., Kolkata 7. Hall, C.M. and Page.
23. Harikesh N. Misra. (2014). Managing Natural Resources- Focus on Land and Water. Prentice Hall India Leaming Private Limited.
24. Hussain, M. (2017). Resource Geography. Anmol Publications, New Delhi.
25. Klee G. (1991). Conservation of Natural Resources. Prentice Hall, Englewood
26. Leong. G.C. and Morgan, G.C. (1975). Human and Economic Geography. Oxford University Press, Hong Kong
27. Mahmood Aslam (2008). Statistical Methods in Geographical Studies. Rajesh Pub. New Delhi.
28. Mishra R. P (1969). Fundamentals of Cartography. Concept Publication Company, New Delhi.
29. Rees J. (1990). Natural Resources: Allocation, Economics and Policy. Routledge. London.
30. Saxena, H.M. (2018). Economic Geography. Rawat Publication, New Delhi.
31. Siddhartha K. (2017). Economic Geography. Kitab Mahal Publishers, New Delhi.
32. Singh, R.L. and Singh R.P.B. (1999. Elements of Practical Geography. Kalyani Publishers, New Delhi.
33. Sundaram. M, and M. Mrityunjay. (2004). Natural Resources Management and livelihood Security Survival Strategies and Sustainable Policies. Bhoovigyan Vikas Foundation.
34. Zimmermann, E.W. (1933). World Resources and Industries - A Functional Appraisal of the Availability of Agriculrural and lndustrial Materials. New York

.

Multi-disciplinary Courses – Geography (3 credit each)

MDC-III [A]: Oceanography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students with a comprehensive understanding of the physical, chemical, biological, and geological processes that govern the Earth's oceans in order to gain insights into the importance of oceanography for addressing environmental challenges and promoting sustainable management of marine resources.

Course outcomes:

1. Understand the fundamental principles of oceanography, including ocean circulation, tides, waves, and the physical and chemical properties of seawater.
2. Explore the geological features of the ocean floor, including plate tectonics, seafloor spreading, and sedimentation processes.
3. Examine the role of oceans in regulating climate and weather patterns, and their response to climate change and anthropogenic influences.
4. Develop practical skills in data collection, analysis, and interpretation related to oceanographic phenomena through laboratory and fieldwork experiences.

Course work:

Unit - I: Introduction to Oceanography

1.1. Ocean Floor Topography – Continental Shelf, Continental Slope, Continental Margin, Continental Rise, Submarine Canyons, Mid Oceanic Ridges, Trenches, Abyssal Plains.

1.2. Wave theories, Tides- type of tides, tidal currents, rip currents.

Unit - II: Properties of Seawater

2.1. Salinity and chlorinity;

2.2. Temperature; thermal properties of sea water;

2.3. Density and stability, conductivity, viscosity, heat budget, colligative and other properties of sea water.

Unit - III: Ocean Currents and Circulation

3.1. Definition, direct and indirect forces acting on sea water, surface currents,

3.2. Coriolis effect, geostrophic currents, upwelling, sinking, circulation,

3.3. El-Nino, La-Nina,

3.4. significance of major ocean currents of the world, measurement of currents.

3.5. Thermo-haline circulation.

Suggested practical:

i. Observed the oceanographic divisions using Google Earth. Creating bathymetric profiles

ii. GEBCO Undersea features and landforms

iii. Major currents and Ocean circulation patterns of world oceans.

Suggested Reading:

Text books:

- Trujilo, A. and Thurman, H. (2012) Essentials of Oceanography, 12th Edition, Pearson

Reference books:

- Gross, M. G. (1977). Oceanography: A view of the earth.
- Invitation to Oceanography (2009) Paul R. Pinet Jones & Barlett Learning Climatology

MDC-III [B]: Geo-informatics

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to equip students with the knowledge and skills necessary to utilize geospatial technologies and data for analysis, modeling, and decision-making in various applications, emphasizing the importance of geoinformatics in addressing complex geographic challenges across diverse fields such as urban planning, environmental management, public health, and disaster response.

Course outcomes:

1. Understand the fundamental concepts, components and principles of geoinformatics.
2. Understand the fundamentals of map making.
3. Develop proficiency in using GIS software for mapping, visualization, and analysis of spatial data.
4. Explore spatial technologies and their applications.

Course work:

Unit - I: Remote sensing

Electromagnetic spectrum, Black body radiation, Spectral signature; Resolutions: Spatial, Spectral, Temporal and Radiometric; Remote Sensing Platforms and Sensors; Image Enhancement and Image Interpretation.

Unit - II: Coordinates and Projections

Geographic coordinates, Concept of datum and geoid. GPS & GNSS, Map Projections, Map Grid systems, Map Grid Transformations and Distortions.

Unit - III: GIS

Principle and Components of GIS, Spatial Data Models, Data collection methods, Data structures and storage, Spatial data operation and analysis (Interpolation, Buffer, Overlay). GIS applications in Terrain and Network Analysis.

Practical:

i. Image properties – Spatial, Radiometric and Spectral
ii. Image Operations – Compositing, Mosaicking and Enhancement
iii. Coordinate Transformation
iv. GIS Data input and overlay analysis

Suggested Reading:

Text books:

— Reddy, A. (2014). Textbook of. Remote Sensing and. Geographical Information Systems.

Reference books:

— Curra, P.J. (1986). Principles of Remote Sensing. John Wiley & Sons, New York.
— Gupta R.P. Remote Sensing Geology, Springer
— Demers, M.N. (2012). Fundamentals of GIS, 4th Edition, Wiley Blackwell
— Burrough, P.A. (2016). Principles of GIS. 3rd Edition, OUP.

Value Added Courses – University (3 credit each)

VAC-II: Understanding India

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks] (45 hours)

Course aim:

This course aims to provide a broader understanding of India to familiarize the students with the history, culture, geography, polity and economy of India in order to enable them to gain basic understanding of India to prepare for various competitive examinations both at national and state level.

Course Outcome:

1. To familiarize the learner with geographic features of India.
2. To enable the students to understand how India is plural and multi-diversified society. To make the students aware how diversity has been a source of strength for nationalism in India both Pre and Post-Independence period.
3. To know about the Indian polity and its distinctive features.
4. To familiarize students of hurdles to development and to analyze the mechanism of economic transformation in India.

Course work:

Unit - I: Geography of India [11 hours]

1.1. Physiographic divisions of India, Drainage, Climate of India
1.2. Characteristics of Indian Agriculture, Major Crops: production and distribution of rice and wheat, cotton, sugarcane
1.3. Major Industries and minerals: iron ore, coal, petroleum, natural gas
1.4. Demographic structure: Distribution and growth, census in India

Unit - II: Unity in Diversity [12 hours]

2.1. Ethnic, linguistic, geographic, religious and cultural diversity and unity of India.
2.2. The Idea of India: Jambudipa Bharat Varsha, Uttar Patha, Dakhina Patha, Hindustan and India and 'Bharat'
2.3. Evolution of Syncretic Indian culture during 1000 CE to 1800 CE : Religion (Suffi/Bhakti) Art and Architecture, Music and literature
2.4. Socio- economic, Political and Cultural impact of British Rule: An outline of India's freedom struggle (1857-1947)

Unit- III: Indian polity and its political identity [11 hours]

3.1. Salient features of Indian constitution (Republic, Federal, Parliamentary, Democracy, Secular, Separation of power, Centre-State Relationship, Panchayat- Raj
3.2. Fundamentals Rights and duties, Directive Principles of State Policy and Affirmative Action
3.3. India's Foreign Policy, International Trade Policy and Global Standing

Unit- IV: Indian economy [11 hours]

4.1. Concept of development: Core Values of development, Sustainable development and Social development;
4.2. Poverty: Poverty line, concepts of absolute and relative poverty, MDPI and Poverty alleviation-measures;

4.3. Social Sector Initiatives: Quality education, human capital development, health care, rural development
4.4. Economic growth since independence in Agricultural, Industrial and Service Sectors and Sectorial contribution to GDP in India
4.5. Regional Imbalance: An analytical approach (Convergence/Divergence approach)
4.6. Fiscal Federalism: System of Devolution of Funds
4.7. Economic challenges of 21st century

Suggested Reading

Text Books

1. Unity in Diversity, R.K. Mookorjee
2. Freedom struggle of India, Barun De, Bipan Chandra and Amle Tripathy, NBT, Govt.
3. of India
4. An Advanced History of India, Roychoudhury Dutt and Majumdar
5. Indian Economy, Mishra and Puri, Himalaya Publication
6. India Year Book, Govt. of India, Publication Division
7. Indian Economy- Dutta and Sundaam
8. An Introduction to Constitution of India- D.D. Basu
9. Indian Economy by Uma Kapila
10. Indian Polity, M. Laxmikanth, Tata Mc graw Hill

Sample Question

1. Who used the term “Bharat Varsha” in an inscription for the first time in India’s history? [1 mark]
2. State the course of R. Ganga by identifying at least 4 states of India through which it passes. [2 marks]
3. Enumerate explain the major challenges faced in the 21st century by India [5 marks]
4. Write a critical essay on Center State Relationship in India.[8 marks]

Please note:

- A single text book covering all aspects is not readily available. It shall be developed by OSHEC/DDCE Utkal University/OSOU/ OTBP & P and similar other organization.
- VTP lectures shall be prepared.

Semester –IV [CC; CE/FP/Intern]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-VIII	4
2.	Core	Major	Major-I-P-IX	4
3.	Core	Major	Major-I-P-X	4
4.	Core	Minor	Minor-II-P-II	4
5.	CE/FP/Intern	Compulsory	CES/FW	4
	Total			**20**

Core Courses – Geography (4 credit each)

Major-I-P-VIII: Remote Sensing and GIS

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this is to provide students with the theoretical knowledge and practical skills needed to acquire, analyze, and interpret spatial data using remote sensing technologies and Geographic Information Systems (GIS), enabling students to effectively utilize these tools to solve complex spatial problems in areas such as environmental monitoring, urban planning, resource management, and disaster response.

Course outcomes:

1. Understand the basic components and fundamental principles of remote sensing, including data acquisition, image processing, and interpretation.
2. Gain practical skills in using GIS software for spatial data analysis, map creation, and geospatial visualization and analyze and interpret satellite images, aerial photographs, and other geospatial data for various applications.
3. Apply remote sensing and GIS techniques to real-world problems, such as land use change, environmental assessment, and disaster management.
4. Develop the ability to integrate remote sensing and GIS data into decision-making processes for spatial planning and resource management.

This course trains students to work in fields such as environmental science, urban planning, agriculture, natural resource management, and geospatial research, preparing them for careers that require advanced spatial analysis and mapping skills.

Course work:

Unit-I: Basic Elements

1.1. Remote Sensing: Introduction, History, Basics principles, Types of Remote Sensing and Remotely sensed data;
1.2. Sources and characteristics of spatial data: Maps vs RS images;
1.3. Concept of Remote Sensing, Meaning and significance of EMR Spectrum;
1.4. Interaction of the atmosphere, Earth surface with EM radiation, Scattering, Spectral Signature Curve;
1.5. Elements of a RS image: Pixel, Digital Number (DN), Band, Resolution of Remote sensing data;
1.6. Remote Sensing Observation Platforms and its type, Polar orbiting and Geostationary Satellites;
1.7. Visual Interpretation of Aerial Photograph and Satellite imagery.

Unit-II: Representation of Spatial Data - Vector

2.1. Data Models in GIS – Vector and Raster;
2.2. Vector Data Model, Types and Components of Vector data,

2.3. Attribute data Management, Query of Spatial and non-spatial Data, Processing and
2.4. Analysis of Vector Data, Geoprocessing, Overlay Analysis.

Unit-III: Representation of Spatial Data - Raster

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

Unit-IV: Practical

4.1. Visual Image Interpretation;
4.2. Vectorisation: digitization, attribute data query, SQL;
4.3. Geoprocessing: Buffering, Union, intersection, merge, dissolve;
4.4. Subsetting and mosaicking Images, Indices, Image enhancement Rectification,
4.5. Image classification- supervised and unsupervised, accuracy assessment.
4.6. Report and Viva-Voce

Suggested Readings:

Text Books:

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

Reference Books:

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

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

Major-I-P-IX: Geomorphology

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide a comprehensive understanding of the processes that shape Earth's surface and the resulting landforms by examining both the physical mechanisms driving landscape evolution and the interactions between these processes and human activities; and explore the spatial distribution of landforms, the factors influencing their development, and the role of geomorphology in addressing environmental and hazard-related challenges.

Course outcomes:

1. Understand the fundamental processes responsible for shaping Earth's landform and analyse the evolution and spatial distribution of landscapes across various environments by investigating the role of climate, tectonics, and human activities in landform development and modification;
2. Assess and mitigate geomorphic hazards and to identify potential geomorphic hazards and its association with anthropogenic activities;
3. Apply geomorphological principles to real-world issues such as natural hazard management, environmental conservation, and land use planning;
4. Develop skills in geomorphological mapping, fieldwork, and spatial data analysis using Geographic Information Systems (GIS).

This course prepares students to engage with topics related to landform analysis, landscape evolution, and natural hazards, providing a foundation for careers in environmental consulting, land management, geology, and geographic research.

Course work:

Unit-I

1.1. Geomorphology: Nature, Scope, Significance and application; Principles of Geomorphology;
1.2. Rock: characteristics, types
1.3. Modern techniques in geomorphology and their application- Profile, Hypsometry, Altimetry and Clinographic Drainage Basin;
1.4. Network Characteristics, Morphology, Phases of drainage network development; Major Landforms (Fluvial, Aeolian, Glacial, Karst and Coastal).

Unit-II

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

Unit-III

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

Unit IV: Practical

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

Suggested Readings:

Text Books:

1. Hussain, M. (2014). Physical Geography. Anmol Publication. New Delhi.
2. Strahler, A. N., & Stahler, A. M. (2016). Modern Physical Geography. Wiley India, New Delhi.
3. Thornbury, W. D. (1969). Principles of Geomorphology. Wiley Eastern.
4. Reference Books:
5. Alcántara, I., & Goudie, A. S. (Eds.). (2010). Geomorphological hazards and disaster prevention. Cambridge University Press.
6. Bird, E. C. (2008). Coastal geomorphology: an introduction. John Wiley & Sons.
7. Bryant, R. H. (2016). Physical Geography. Rupa Publication. New Delhi.
8. Chorley, R. J. (1972). Spatial Analysis in Geomorphology. Methuen, London.
9. Garner, H. F. (1974). The Origin of Landscape – A Synthesis of Geomorphology. Oxford University Press, London.
10. Hooke, J. M. (2020). Changing landscapes: Five decades of applied geomorphology. Geomorphology, 366, 106793. https://livrepository.liverpool.ac.uk/3055638/1/Applied%20Geomorph%20%20Hooke%20_final.pdf
11. Mitchell, C. W. (1973). Terrain Evaluation. Longman, London.
12. Pandit, R., et.al (2020). A framework to evaluate land degradation and restoration responses for improved planning and decision-making. Ecosystems and People, 16(1), 1-18. https://www.tandfonline.com/doi/pdf/10.1080/26395916.2019.1697756
13. Robinson, P. J., & Henderson, S. (1999). Contemporary Climatology. Henlow.
14. Singh, S. (1998). Geomorphology. Prayag Publications, Allahabad.
15. Singh, S. (2016). Physical Geography. Pravalika Publications, Allahabad.

16. Stoddart, D. R. (Ed.). (1996). Process and Form in Geomorphology. Routledge, New York.
17. Summerfield, M. (2013). Global Geomorphology. Routledge, New York.
18. Wooldridge, S. W., & Morgan, R. S. (1959). The Physical Basis of Geography - An Outline of Geomorphology. Longman, London.

Major-I-P-X: Evolution of Geographical Thought

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The main objective of this course is to understand the progress of sciences, especially geography, during the ancient classical period. It maps different historical and contemporary geographical contributions, and investigates them n greater depth selected overarching geographical concepts, debates and issues.

Course outcomes:

1. Provide the basic conceptual understanding of temporal succession of geographical views from ancient times to the present time and understand and interpret the evolution of the philosophy, methods and approaches of Geography in the present context;
2. Compare different approaches and methods to study geographical phenomena and analyze the paradigm shift in Geographical philosophy, methods and approaches;
3. Explore the transitions between different periods of geographic thought, including classical, medieval, modern, and postmodern perspectives.
4. Develop critical thinking and analytical skills in assessing the implications of various geographical theories and their application to current geographic challenges.

This course prepares students to engage with the complexities of geographic inquiry, fostering a deeper appreciation for the historical context of the discipline and its ongoing evolution. It encourages students to critically evaluate geographic concepts and theories, providing a strong foundation for further study and research in geography and related fields.

Course work:

Unit – I: Ancient and medieval

1.1. Geography: Definition, Nature, Scope & Relevance

1.2. Development of geographical knowledge during ancient period: Contributions of Greek, Roman, and Indian scholars.

1.3. Development of geographical knowledge during medieval period: Contributions of Arab scholars.

1.4. Impact of European Renaissance and Age of Exploration

Unit – II: Modern

2.1. Modern period: Contributions of Alexander Von Humboldt, Carl Ritter;

2.2. Contributions of Ratzel, Vidal De La Blache, Mackinder.

2.3. Carl O Sauer

2.4. David Harvey

Unit - III: Dichotomy and Recent Trends

3.1. Dichotomy and dualism in Geography– Environmental Determinism and Possibilism, Systematic and Regional Geography, Ideographic and Nomothetic, Physical and Human Geography.

3.2. Recent Trends in Geography– Quantitative Revolution, Behaviouralism Radicalism, Humanistic approach.
3.3. Recent changes in methods and approaches of geography
3.4. Progress in Indian Geography

Unit - IV: Practical

4.1.. Create a chronological timeline showing key contributions of Greek, Roman, and Arab geographers. Compare how different civilizations understood space, environment, and the Earth.
4.2. Trace the main exploration routes of Alexander von Humboldt. Annotate your map to show:
- The countries and major regions visited
- Key geographic observations made during the journey.
- Use symbols or colors to differentiate between phases of the journey or types of observations.

4.3. Show Mackinder's Heartland Theory on a world map; annotate its geopolitical significance.
4.4. Show the progression of paradigms (Determinism → Possibilism → Quantitative → Behavioural → Radical → Humanistic)
4.5. Pick one real-world example and interpret it from a behavioural perspective.
4.6. Report and Viva-Voce.

Suggested Readings:

Text Books:

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

Reference Books:

1. Adhikari, S. (1992). Fundamentals of Geographical Thoughts. Chaitanya Publishing House, Allahabad, India.
2. Rana, L. (2014). Geographical Thought: Classical to Contemporary. Concept Publishing Company, New Delhi.
3. Hartshone, R. (1959). Perspectives of Nature of Geography. Rand MacNally and Co.
4. Holt-Jensen A. (2011). Geography: History and Its Concepts: A Students Guide, SAGE.
5. Husain, Majid (2015). Evolution of Geographical Thought. Rawat Publications, Jaipur.
6. Peet, R. (1998). Modern Geographical Thought. Blackwell Pub, UK.

Minor-II-P-II: Remote Sensing and GIS

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this is to provide students with the theoretical knowledge and practical skills needed to acquire, analyze, and interpret spatial data using remote sensing technologies and Geographic Information Systems (GIS), enabling students to effectively utilize these tools to solve complex spatial problems in areas such as environmental monitoring, urban planning, resource management, and disaster response.

Course outcomes:

1. Understand the basic components and fundamental principles of remote sensing, including data acquisition, image processing, and interpretation.
2. Gain practical skills in using GIS software for spatial data analysis, map creation, and geospatial visualization and analyze and interpret satellite images, aerial photographs, and other geospatial data for various applications.
3. Apply remote sensing and GIS techniques to real-world problems, such as land use change, environmental assessment, and disaster management.
4. Develop the ability to integrate remote sensing and GIS data into decision-making processes for spatial planning and resource management.

This course trains students to work in fields such as environmental science, urban planning, agriculture, natural resource management, and geospatial research, preparing them for careers that require advanced spatial analysis and mapping skills.

Course work:

Unit-I: Basic Elements

1.1. Remote Sensing: Introduction, History, Basics principles, Types of Remote Sensing and Remotely sensed data;
1.2. Sources and characteristics of spatial data: Maps vs RS images;
1.3. Concept of Remote Sensing, Meaning and significance of EMR Spectrum;
1.4. Interaction of the atmosphere, Earth surface with EM radiation, Scattering, Spectral Signature Curve;
1.5. Elements of a RS image: Pixel, Digital Number (DN), Band, Resolution of Remote sensing data;
1.6. Remote Sensing Observation Platforms and its type, Polar orbiting and Geostationary Satellites;
1.7. Visual Interpretation of Aerial Photograph and Satellite imagery.

Unit-II: Representation of Spatial Data - Vector

2.1. Data Models in GIS – Vector and Raster;
2.2. Vector Data Model, Types and Components of Vector data,
2.3. Attribute data Management, Query of Spatial and non-spatial Data, Processing and
2.4. Analysis of Vector Data, Geoprocessing, Overlay Analysis.

Unit-III: Representation of Spatial Data - Raster

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

Unit-IV: Practical

4.1. Visual Image Interpretation;
4.2. Vectorisation: digitization, attribute data query, SQL;
4.3. Geoprocessing: Buffering, Union, intersection, merge, dissolve;
4.4. Subsetting and mosaicking Images, Indices, Image enhancement Rectification,
4.5. Image classification- supervised and unsupervised, accuracy assessment.
4.6. Report and Viva-Voce

Suggested Readings:

Text Books:

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

Reference Books:

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

Community engagement and service/ Field Practice/ Projects/ Internship (CE/FP/Intern) (4 credit)

[Total 100 Marks]

- **This course is mandatory and contains 4 credit.**
- **Please do not confuse it with - Vocational courses (VOC)** [Summer Internship], which is also of 4 credit. VOC is only needed when you want to leave after completing 1 year (certificate course) or two years (Diploma). These 4 credits of VOC are additional than mandatory credits.

- Regarding the topic of this document, Curriculam and Credit Framework for Undergraduate Programmes by UGC in December 2022 (page 12 and onward) states following:
  1. "A one-credit of Seminar or Internship or Studio activities or Field practice/projects or Community engagement and service means two-hour engagements per week. Accordingly, in a semester of 15 weeks' duration, one credit in these courses is equivalent to 30 hours of engagement." [page 12]
  2. A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice. [page 12]
  3. **Internship:** A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning. [Page 13]
     Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities), Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability. [Page 23-24]
  4. **Field practice/projects:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. [Page 13]
     The field-based learning/minor project will attempt to provide opportunities for students to understand the different socio-economic contexts. It will aim at giving students exposure to development-related issues in rural and urban settings. It will provide opportunities for students to observe situations in rural and urban contexts, and to observe and study actual field situations regarding issues related to

socioeconomic development. Students will be given opportunities to gain a first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the development process. They would have the opportunity to gain an understanding of the complex socio-economic problems in the community, and innovative practices required to generate solutions to the identified problems. This may be a summer term project or part of a major or minor course depending on the subject of study. [Page 23-24]

5. **Community engagement and service:** Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems. [Page 13]

   The curricular component of 'community engagement and service' seeks to expose students to the socio-economic issues in society so that the theoretical learnings can be supplemented by actual life experiences to generate solutions to real-life problems. This can be part of summer term activity or part of a major or minor course depending upon the major discipline. [Page 23-24]. Following outcome is intended from this course [Page 19]:

   5.1. The graduates should be able to demonstrate the capability to participate in community-engaged services/ activities for promoting the well-being of society.

   5.2. The graduates should be able to demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions (Empathy).

Summer Internship /Apprenticeship (2 – 4 credits):

A key aspect of the new UG programme is induction into actual work situations. All students will also undergo internships / Apprenticeships in a firm, industry, or organization or Training in labs with faculty and researchers in their own or other. HEIs/research institutions during the summer term. Students will be provided with opportunities for internships with local industry, business organizations, health and allied areas, local governments (such as panchayats, municipalities), Parliament or elected representatives, media organizations, artists, crafts persons, and a wide variety of organizations so that students may actively engage with the practical side of their learning and, as a by-product, further improve their employability. Students who wish to exit after the first two semesters will undergo a 4-credit work-based learning/internship during the summer term in order to get a UG Certificate. [Page 23-24]

Semester –V [CC; SEC; VAC]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-XI	4
2.	Core	Major	Major-I-P-XII	4
3.	Core	Major	Major-I-P-XIII	4
4.	Core	Minor	Minor-I-P-III	4
5.	Skill Enhancement	Compulsory	SEC-II	3
6.	Value Added	Compulsory	VAC-III	3
	Total			**22**

Core Courses – Geography (4 credit each)

Major-I-P-XI: Climatology and Oceanography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The course provides a comprehensive understanding of the processes that govern the Earth's climate and ocean systems. It explores the interactions between atmospheric and oceanic phenomena, including climate patterns, ocean currents, and their impacts, to gain insights into the significance of climatology and oceanography in addressing global environmental challenges.

Course outcomes:

1. Acquaint with the overview of the fundamental concepts of Earth's climate and weather system.
2. Understand the basic thermodynamic concepts for the atmosphere related to atmospheric stability and cloud formation, and to be able to explain weather phenomena
3. To demonstrate a systematic, extensive, and coherent knowledge and understanding of the ocean and atmospheric system, its manifestations, variability and change, and their applications and implications for society
4. Equipped with relevant skills in the field of ocean and atmospheric sciences, along with a critical thinking of the established theories, latest developments, and ability to use modern state-of-the-art techniques for observations and analyses

Course work:

Unit-I:

Composition and structure of the atmosphere, Weather and Climate; Weather: Stability and instability, barotropic and baroclinic conditions; Inversion of temperature: types, causes and consequences; Condensation: Process and forms; Heat Budget of the Earth; Mechanism of precipitation: Bergeron-Findeisen theory, collision and coalescence; Forms of precipitation; Types of Clouds

Unit-II

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

Unit-III

Major relief features of the ocean floor (Pacific, Atlantic and Indian Ocean): Characteristics and origin according to plate tectonics; Physical and chemical properties of ocean water; Ocean temperature and salinity: distribution and determinants; Ocean currents circulation (Pacific, Atlantic and Indian Ocean); Wave and Tide; Distribution and determinants; Coral reefs: Formation, classification, theories and threats; Marine resources: Classification and sustainable utilization; Sea level change: Types and causes.

Unit-IV: Practical

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

Suggested Readings:

Text Books:

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

Reference Books:

1. Barry, R.G. & Chorley R.J. (2009). Atmosphere Weather and Climate. Routledge.
2. Garrison, T. (1998). Oceanography. Wordsworth Cp, Bedmont
3. K. Siddhartha (2001) Atmosphere, Weather and Climate. Kisalaya publication, New Delhi
4. Lal, D.S. 2012. Climatology. Sharda Pustak Bhawan.
5. Lutgens, F.K., Tarbuck, E.J. 1998. The Atmosphere: An Introduction to Meteorology, 9th Ed, Prentice Hall Inc.
6. Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata.
7. Oliver, J.E., Hidore J.J. 2002. Climatology: An Atmospheric Science, Pearson Education India.
8. Raghunath, H.M. 2006. Hydrology: Principles, Analysis, Design, 3rd ed, New Age International Publishers.
9. Ahrens, C.D. 2012. Essentials of Meteorology: An Invitation to the Atmosphere. 9th Ed, Cengage Learning.
10. Sen, P.K. 1989. Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters, University of Burdwan.
11. Singh, S. (2003). Physical Geography (English and Hindi Editions) Prayag Pustak Bhawan, Allahabad.

Major-I-P-XII: Regional Planning and Development

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide the knowledge and skills necessary to understand the principles, practices, and challenges of planning and developing regions, emphasizing the importance of sustainable planning and community engagement in order to gain insights into effective strategies for addressing regional disparities and promoting sustainable growth.

Course outcomes:

1. Understand the concepts and theoretical foundations of regional planning and development;
2. Explore key concepts and models associated with regional planning and assess regional disparity and factors affecting regional development outcomes;
3. Analyze the role of different stakeholders such as government in the planning and development process;
4. Develop practical skills in planning techniques, including GIS applications, data analysis, and community engagement strategies.

This course fosters critical thinking and problem-solving skills, enabling students to address complex challenges in regional planning and contribute to the sustainable development of communities and regions. It prepares students for careers in urban and regional planning, economic development, environmental management, and policy-making.

Course work:

Unit-I

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

Unit-II

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

Unit-III

3.1. Development: concept, indicators (e.g. HDI, IHDI)
3.2. Regional Disparity and Imbalances in India, Strategies for balanced regional development in India through Policies and Programmes in FYPs, concept and characteristics of city master plan, NCR Planning,
3.3. Decentralized planning in India: District Plan and Multi Level Planning in India, Formulation and function of NITI Aayog, Development planning skills, Welfare program of different sectors,
3.4. Special Component plan: Tribal Sub Plan and Weaker Section plan Allocation and Principles

and Methods of participatory planning**.**

Unit-IV: Practical

4.1. Regional Disparity based on socio-economic indicators at C.D Block/ Tehsil / District/ State by range equalization/ Z-Score method. Showcase the outcome through choropleth maps.

4.2. Nearest neighborhood analysis;

4.3. Map the socio-economic development at global or regional level based on socio-economic data and/or related indices;

4.4. Transport network analysis: Connectivity and Accessibility (Alpha, Beta and Gamma)

4.5. Practical record and viva-voce.

Suggested Readings:

Text Books:

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

Reference Books:

1. Bhat L.S. (1972). Regional Planning In India, Statistical Publishing Society.
2. Claval, P.l. (1998). An Introduction to Regional Geography, Blackwell Publishers, Oxford and Massachusetts
3. Friedmann J. and Alonso W. (1975). Regional Policy - Readings in Theory and Applications, MIT Press, Massachusetts.
4. Glasson, J. (1974). An introduction to regional planning: Concepts, theory and practice.
5. Kulshetra, S.K (2012): Urban and Regional Planning in India: A handbook for Professional Practitioners. Sage Publication, New Delhi.
6. Misra, R.P, Sundaram K.V, PrakashRao, VLS (1974). Regional Development Planning in India. Vikas Publication, New Delhi.
7. Peet R., (1999). Theories of Development. The Guilford Press, New York.
8. UNDP (2001-04). Human Development Report. Oxford University Press.
9. World Bank (2001-05). World Development Report. Oxford University Press, New Delhi.

Major-I-P-XIII: Geography of Odisha

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course intends to provide students with a comprehensive understanding of the physical, cultural, economic, and environmental characteristics of Odisha, India through an in-depth exploration of its diverse landscapes, ecosystems, and socio-economic dynamics to understand the unique geographical features that shape the region and its development challenges.

Course outcomes:

1. Understand the physical geography of Odisha and analyse the demographic and cultural aspects of Odisha.
2. Explore the population and associated matters of Odisha.
3. Assess the challenge for Odisha, including urbanization, and natural disasters, and their implications for sustainable development.
4. Understand the economy of the state, focusing on key sectors such as agriculture, industry, tourism, and natural resource management; and associated challenges.

This course prepares students for careers in regional planning, environmental management, tourism development of Odisha. It also provides knowledge and skills necessary to understand and address the unique geographical challenges and opportunities in Odisha.

Course work:

Unit-I: Physical Characteristics

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

Unit-II: Population and Urbanization

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

Unit-III: Culture

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

Unit-IV: Economy and challenges

4.1. Major Farming Types; Industrial Belts of Odisha;
4.2. Cottage and Handicraft Industries of Odisha;

4.3. Fisheries: Fresh and Marine; Aspirational districts and other major welfare schemes;
4.4. Natural Disaster and Odisha (Cyclone, Flood): Risk and Vulnerability;
4.5. Paradigm Shifts in Disaster Management: Success Stories of Odisha.

Suggested readings:

Text Books:

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

Reference Books:

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

Minor-I-P-III: Geography of Odisha

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course intends to provide students with a comprehensive understanding of the physical, cultural, economic, and environmental characteristics of Odisha, India through an in-depth exploration of its diverse landscapes, ecosystems, and socio-economic dynamics to understand the unique geographical features that shape the region and its development challenges.

Course outcomes:

1. Understand the physical geography of Odisha and analyse the demographic and cultural aspects of Odisha.
2. Explore the population and associated matters of Odisha.
3. Assess the challenge for Odisha, including urbanization, and natural disasters, and their implications for sustainable development.
4. Understand the economy of the state, focusing on key sectors such as agriculture, industry, tourism, and natural resource management; and associated challenges.

This course prepares students for careers in regional planning, environmental management, tourism development of Odisha. It also provides knowledge and skills necessary to understand and address the unique geographical challenges and opportunities in Odisha.

Course work:

Unit-I: Physical Characteristics

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

Unit-II: Population and Urbanization

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

Unit-III: Culture

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

Unit-IV: Economy and challenges

4.1. Major Farming Types; Industrial Belts of Odisha;
4.2. Cottage and Handicraft Industries of Odisha;

4.3. Fisheries: Fresh and Marine; Aspirational districts and other major welfare schemes;
4.4. Natural Disaster and Odisha (Cyclone, Flood): Risk and Vulnerability;
4.5. Paradigm Shifts in Disaster Management: Success Stories of Odisha.

Suggested readings:

Text Books:

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

Reference Books:

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

Skill Enhancement Courses – University (3 credit each)

SEC-II: Digital Image Processing

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to provide students with the foundational knowledge and practical skills necessary to process, analyze, and interpret digital images, particularly in the context of geospatial data and remote sensing applications covering various techniques for enhancing, manipulating, and classifying digital images to extract meaningful information for their applications.

Course outcomes:

1. Understand the basic principles of Digital Image Processing (DIP).
2. Gain proficiency in image acquisition, enhancement, transformation, and classification for DIP based assessments.
3. Use popular image processing tools and techniques for data analysis through DIP to resolve real-world problems.
4. Develop the ability to integrate DIP into decision-making processes for spatial planning and management.

Course work:

Unit I: Fundamentals

1.1. Introduction to digital image processing- concept of digital image, steps in DIP, Source of Data,

1.2. Data Formats, Hardware and Software Consideration for Digital Image Processing, Data loading, Image Restoration, Image Reduction and Magnification.

Unit II: Image Pre-processing

2.1. Fundamental of image rectification, definition, principle and procedure;

2.2. Sources of Error in image data;

2.3. Image Rectification, and Registration;

2.4. Resampling Techniques, Radiometric & geometric correction;

2.5. Image calibration methods (DN to radiance, radiance to reflectance).

Unit III: Image enhancement techniques

3.1. Image enhancement techniques - an overview; Contrast Manipulation: Gray Level Thresholding, Level Slicing;

3.2. Contrast Stretching – Linear and Non-linear, histogram equalization and density slicing, Spatial Texture Manipulation: Spatial filtering – Linear, High Boost, Directional and Gradient Filters;

3.3. Edge Enhancement and Fourier Analysis;

3.4. Multi-image Manipulation: Band Rationing and Differencing, Principal and Canonical Components, Vegetation Components, Image Fusion, Enhancement by using colors -

advantages, types of color enhancements;

3.5. Image transformation -Intensity Hue Saturation (HIS) and PCA.

3.6. Image classification types - supervised and unsupervised, advantage and limitations; Classification accuracy assessment.

Practical:

i. Atmospheric Correction,
ii. Image enhancement and filtering of multispectral optical data,
iii. Image classification (Unsupervised, Supervised), and
iv. Accuracy assessment.
v. Practical Record and Viva.

Suggested Reading:

Text books:

- Jensen J.R. (2005) Digital Image Processing: A Remote Sensing Perspective, 3rd ed., Prentice Hall.
- Jensen J.R. (2007) Remote Sensing of the Environment: An Earth Resource Perspective, 2nd ed., Prentice Hall.
- Joseph, George, (2003), Fundamental of Remote Sensing, University Press (India) Pvt. Ltd, Orient Longman Pte. Ltd., Hyderabad, India
- Lillesand, T.M. and Kieffer, R.W., 2003. Remote Sensing and Image Interpretation, 5th Edition., Wiley, New York.
- Panda, B. C., 2008. Remote Sensing: Principles and Applications, Viva Books Private Limited, India.

Reference books:

- Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.
- Campbell, James B., Introductory Remote Sensing: Principles and Concepts, Routledge.
- Castleman, K.R. (1979) Digital Image Processing. Prentice Hall Inc, New Jersey.
- Cracknelll, A.P., and L.W.B.Hayes, Introduction to remote sensing, Taylor and Francis, Washington, DC,1991
- Curran, P.J. (1980) Mulltispectral remote sensing of vegetation amount, Progress in Physical Geography, 4:315
- Curran, P.J. (1988) Principles of Remote Sensing, ELBS Edn. Longman Group UK Ltd.

Value Added Courses – University (3 credit each)

VAC-III: Understanding Odisha

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks] (45 hours)

Course aim:

To familiarize the students with Odisha, its history, linguistic heritage, religion, culture, literature, geographic features, tribes and their culture, dance and music and contemporary features; enable them to develop an informed perspective about their land, people, their past and present and the challenge they face; and, prepare them to face competitive examinations for jobs under Govt. of Odisha.

Course Outcome:

1. To familiarize with the physiography, drainage, climate and forests in Odisha.
2. To enable the students to familiarize themselves with the chronology of Political History, formation of Odisha in modern days and freedom movement.
3. Understand Essence of Odisha's Culture, Art, Architecture, Dance, Music, Religion, and Literature.
4. To develop an understanding of tribal culture, and appreciate their ways of life and be cognizant of contemporary Odisha

Course work:

Unit - I: Odisha's physical and human geography [9 hours]

1.1. Physiography, Drainage systems, Climate, natural vegetation
1.2. Major Industries and Minerals in Odisha: Iron Ore, Coal, Bauxite and Chromite
1.3. Steel and Aluminum industries
1.4. Growth and distribution of population

Unit - II: An outline of political history of Odisha [9 hours]

2.1. Ashoka and Kharavela
2.2. An outline of Dynastic History of Odisha: Bhaumkaras, Somavamsies, Gangas and Gagapatis
2.3. Odisha under Mughals and Marathas
2.4. Movement for Separate Province of Odisha and freedom struggles Odisha

Unit- III: an introduction to Odisha's culture and heritage [9 hours]

3.1. Temple Architecture in Odisha
3.2. History of Odia Literature from ancient period to independence including Bhakti Literature, Development of Odia Script
3.3. Dance and Music: Odissi, Gotipua, Chhau, and Folk;
3.4. Religion in Odisha: Shaivism, Vaishnavism and Neo-Vaishnavism(Chaitanya), Shakti cult, Jagannath Culture, Islam and Christianity in Odisha;
3.5. Odisha Cuisine;
3.6. Major Festival of Odisha

Unit- IV: Tribes in Odisha [09 hours]

4.1. Essentials of 62 Tribes of Odisha: Major Tribes and PVTs, festivals, beliefs, art and craft.

Unit- V: Contemporary Odisha [09 hours]

4.1. Districts of Odisha – An Outline
4.2. Education – Primary, Secondary, Higher education including Technical.

4.3. Tourism in Odisha including Eco-tourism

4.4. Industry, Agriculture, Public Health, Service Sector (including IT).

Suggested Reading

Text Books

1. Odisha Reference Year book (Latest Edition) by B.K. Publication Pvt. Ltd

Reference books

1. History of Odisha by Prof. Atul Chandra Pradhan
2. History of Odia Literature by Mayadhar Mansingh
3. Odisha Review and Utkal Prasanga (Current Issues)

Sample Question

1. Dhemsa is the dance form_____ Tribe.[1 mark]
2. Name the three types of temple architecture of Odisha.[2 marks]
3. Trace the growth of IT industry in Contemporary Odisha.[5 mark]
4. Write an essay on Jagannath Culture.[8 mark]

Semester –VI [CC; SEC; VAC]

For 3 year 1 major 2 minor UG programme				
S.N	**Course**	**Paper Type**	**Paper Code**	**Credit**
1.	Core	Major	Major-I-P-XIV	4
2.	Core	Major	Major-I-P-XV	4
3.	Core	Minor	Minor-II-P-III	4
4.	Skill Enhancement	Compulsory	SEC-III	3
5.	Value Added	Compulsory	VAC-IV	3
	Total			**18**

Core Courses – Geography (4 credit each)

Major-I-P-XIV: Geography of India

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students an overall understanding of India covering its all kind of geographies and resources along with the problems critical to India.

Course outcomes:

1. Understand the locations, physiography, climatic conditions, and distribution of soils in India.
2. Acquaint themselves with thorough understanding of the Indian Agriculture and regional disparities in agricultural development.
3. Familiar with the Industries, industrial policy and transport networks of India.
4. Understand the regional development and planning and political Aspects of India.

Course work:

Unit-I:

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

Unit-II

2.1. Agricultural regionalization-Agro climatic zones; Regional disparities in agricultural development, Govt. Schemes related to Agriculture; Green revolution, white, blue revolution and its socio economic cum ecological implications.
2.2. Joint Forest Management, Social forestry, Biosphere reserves and National Parks.
2.3. Conventional and non-conventional sources of energy, Energy Crisis and Conservation.

Unit-III

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

Unit-IV

4.1. Experience of regional planning in India: Five-year plans;
4.2. Integrated rural development programmes; Panchayati Raj and decentralized planning; Command area development;
4.3. Watershed management; planning backward area, desert, drought-prone, hill tribal area

development, Multi-level planning,

4.4. Geographical basis of Indian federalism, State reorganization, Emergence of new states, Regional consciousness and inter-state issues, International boundary of India and related issues.

Suggested readings:

Text Books:

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

Reference Books:

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

Major-I-P-XV: Urban Geography

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course is designed to explain students how cities are formed; how do they function; how and why they change and what the major patterns of historical, economic area, and social connectivity of cities within themselves as well as with their surrounding areas.

Course outcomes:

1. Get an idea about development of urban Geography and its relevance.
2. Understand the concepts and critically recent concepts in urban geography
3. Comprehend the emerging patterns of urban settlements and related issues
4. To ensure the practical knowledge on urban geography

Course work:

Unit-I:

1.1. Concept of Urban, Urbanization and Urbanism;
1.2. Nature and scope of urban geography;
1.3. Urban geography: a sub discipline (evolution);
1.4. Different ways of Categorizing, evaluating, and developing urban centers: Census (Census towns and statutory towns); Size & Type-Based (million plus cities, metropolitan city, megalopolitan city, and cosmopolitan city); Qualitative (World class city, Global city, Inclusive city, Sustainable city); Conceptual & Planning Terms (Compact city, virtual city, network city, and of smart city).

Unit-II:

2.1. Origin and evolution of urban settlements;
2.2. Hierarchy of urban settlements; concept of urban region;
2.3. Central Business District, Umland, Rural-urban fringe
2.4. Slums – concept & Types, slums in India
2.5. Concept of ghettoization and gentrification;
2.6. Urban public places;
2.7. Peri-urban: concept, challenges and opportunities;
2.8. Urban planning, policy and governance.

Unit-III:

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

Unit-IV: Practical

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

the Odisha map.

Suggested Readings:

Text Books:

1. Alan Latham, Derek McCormack, Kim McNamara, Donald McNeil. 2009. Key concepts in urban geography. Sage.
2. Michael Pacione. 2009. Urban Geography: a global perspective. Routledge.
3. R. Ramachandran. 1997. Urbanization and urban systems in India. OUP India.
4. Surender Singh and Jitender Saroha. 2021. Urban geography. Pearson Education.
5. Tim Hall. 2006. Urban geography. Routledge.

Reference Books:

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

Minor-II-P-III: Geography of India

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course aims to provide students an overall understanding of India covering its all kind of geographies and resources along with the problems critical to India.

Course outcomes:

1. Understand the locations, physiography, climatic conditions, and distribution of soils in India.
2. Acquaint themselves with thorough understanding of the Indian Agriculture and regional disparities in agricultural development.
3. Familiar with the Industries, industrial policy and transport networks of India.
4. Understand the regional development and planning and political Aspects of India.

Course work:

Unit-I:

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

Unit-II

2.1. Agricultural regionalization-Agro climatic zones; Regional disparities in agricultural development, Govt. Schemes related to Agriculture; Green revolution, white, blue revolution and its socio economic cum ecological implications.
2.2. Joint Forest Management, Social forestry, Biosphere reserves and National Parks.
2.3. Conventional and non-conventional sources of energy, Energy Crisis and Conservation.

Unit-III

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

Unit-IV

4.5. Experience of regional planning in India: Five-year plans;
4.6. Integrated rural development programmes; Panchayati Raj and decentralized planning; Command area development;
4.7. Watershed management; planning backward area, desert, drought-prone, hill tribal area development, Multi-level planning,
4.8. Geographical basis of Indian federalism, State reorganization, Emergence of new states,

Regional consciousness and inter-state issues, International boundary of India and related issues.

Suggested readings:

Text Books:

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

Reference Books:

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

Skill Enhancement Courses – University (3 credit each)

SEC-III: Environmental Impact Assessment

[Mid-Term: 20 (10 Theory + 10 Practical) + End Term: 70 (50 Theory + 20 Practical) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

The aim of this course is to provide students with the foundational knowledge and practical skills necessary to process, analyze, and interpret digital images, particularly in the context of geospatial data and remote sensing applications covering various techniques for enhancing, manipulating, and classifying digital images to extract meaningful information for their applications.

Course outcomes:

1. Provide an in-depth understanding of the principles, concepts, and purpose of Environmental Impact Assessment as a decision-making tool.
2. Introduce students to the stages of the EIA process, including screening, scoping, baseline studies, impact prediction, and mitigation measures.
3. Equip students with tools and methodologies for conducting EIA studies, such as GIS mapping, modeling, and data analysis.
4. Develop the ability to critically assess effective mitigation measures and environmental management plans to minimize adverse impacts.

Course work:

Unit I: EIA Fundamentals

1.1. EIA: Introduction, Overview and Principles of EIA;
1.2. Concepts and approaches of EIA;
1.3. Current issues in EIA;
1.4. Methods and procedures of EIA;

Unit II: EIA Process

2.1. EIA (Need, Project Cycle and the EIA Process); Screening and Scoping;
2.2. EIA: Baseline data, Evaluation, Assessment of Impacts (Physical, Biological, Social)
2.3. Mitigation and Impact Management;
2.4. Risk Assessment, Vulnerability, and Decision Making;
2.5. Valuation of environmental impacts; Cumulative Impact Assessment;
2.6. Public participation, presentation and review.

Unit III: Policy and Governance

3.1. Governance of EIA systems, Legal and Policy Issues
3.2. EIA practices in developed and developing countries (one example each).
3.3. Environmental Impact Assessment Regulations and Policies in India,
3.4. Role of National Green Tribunal (NGT) in EIA.

Practical:

i. Case Study / Practical for Environmental Impact Assessment

ii. Case Study / Practical for Social Impact Assessment;
iii. Case Study / Practical for Mining Impact Assessment.
iv. Case Study / Practical for Water-Submergence Impact assessment.

Suggested Reading:

Text books:

- J. Glasson, R. Therivel and A. Chadwick, 1994. Introduction to Environmental Impact Assessment: Principles and Procedures, Process, Practice and Prospects, Research Press, Delhi.
- Judith, Petts (eds.) 1999. Handbook of Environmental Impact Assessment, Blackwell Science Publication

Reference books:

- Betty Bowers Marriott, 1997. Environmental Impact Assessment, Mc Graw Hill Professional Bookstore.
- Goel, R.S. 2000. Environmental Impacts Assessment of water Resources Projects - concerns, Policy Issues Perceptions and Scientific Analysis, Oxford Publishing Co. Pvt. Ltd.
- Goel R.S., and R.N. Srivastava, 1999. Hydropower and River Valley Development Environment Management, Case Studies and Policy Issues, Oxford & IBH Publishing Co. Pvt., New Delhi.
- Goudie, A. 2000. The Human Impact on the Natural Environment, Blackwell, Publishers, Oxford.
- Prasad, K. and Goel, R. S. 2000. Environmental Management in Hydro Electric Projects

Value Added Courses – University (3 credit each)

VAC-IV: Climate Change and Disaster Risk Reduction

[Mid-Term: 20 (Theory) + End Term: 70 (Theory) + 10 Continuous Evaluation in class = Total 100 Marks]

Course aim:

This course focuses on comprehensive understanding of the Climate Change and as well as Disaster Management Cycle along with their associated challenges, policies and laws in India. It also covers community-based disaster management practices and understand disaster risk and vulnerability.

Course outcomes:

1. Able to examine the impacts of climate change globally and particularly in Odisha;
2. Understand the relationship between the greenhouse effect, climate change, and various types of disasters;
3. Able to demonstrate awareness of policies and Laws;
4. Able to analyze social dimensions of climate change and disasters.

Course work:

Unit I: Climate Change and Disaster

1.1. Concept, nature, and severity of climate change. Causes of climate change. SDGs- 13: Climate Action.
1.2. Impact of climate change: globally in general and Odisha in particular. Greenhouse effect, climate change and disaster.
1.3. Disaster: Definition, Types of disaster (natural and manmade disaster), mining disaster, tropical cyclone, flood, lightning, forest fire, earthquake, and Tsunami.
1.4. Disaster phase, Response phase, Recovery phase, Risk reduction phase, Preparedness phase;
1.5. Process of Disaster Management: mitigation, preparedness, response, and recovery;
1.6. Sendai Framework for DRR: 2015- 2030

Unit II: Disaster Management Laws, Policy, and Institution

2.1. Acts: National Disaster Management Act (2005), National Policy on Disaster Management (2009), National Disaster Management Agency (NDMA);
2.2. Agencies: State Disaster management Agency (SDMA), National Disaster Response Force (NDRF), National Institute of Disaster Management (NIDM), India Disaster Resource Network (IDRN).
2.3. The role of INGOs and NGOs.

Unit III: Disaster Risk Reduction (DRR) Fundamentals

3.1. Community based disaster management practices (case studies).
3.2. Understanding disaster risk and vulnerability.
3.3. Disaster Warning and Evacuation: Factors influencing evacuation.
3.4. Social dimensions of climate change and disasters.
3.5. Gender responsive approaches in DRR.

Suggested Readings

1. Anandha Kumar K.J and Ajinder Walia (2013) India Disaster Report, NIDM: New Delhi.
2. Community Based Disaster Preparedness (2013) Course Book, Assam State Disaster Management Authority & Doctors For You
3. Gupta. Anil K et, al (Ed) (2014). Training Module Mainstreaming Climate Change Adaptation and Disaster Risk Reduction into District Level Development Plans, NIDM: New Delhi.
4. Gadnayak, B B and Routray, J K (2010), A path to disaster resilient communities, Lambert Publishing Academy, Germany. https://www.lappublishing.com/catalog/details/store/hu/book/978-3-8433-6666-3/a-path-to-disaster-resilientcommunities?search=Bibhuti%20Bhusan%20Gadanayak
5. National Policy on Disaster Management (2009), NDMA, Government of India, New Delhi.
6. National Disaster Management Act (2005), NDMA, Government of India, New Delhi.
7. State Disaster Management Policy (2005), Government of Orissa Revenue Department, Odisha https://www.osdma.org/plan-and-policy/state-disaster-management-plan/#gsc.tab=0
8. Odisha State Action Plan on Climate Change (2018-23), Forest & Environment Department Government of Odisha 3
9. Building Disaster Risk Reduction in Asia: A Way Forward ADPC Looks Ahead To 2015
10. Disaster Risk Reduction Information Kit for Media, Scaling-up Community-Based Disaster Risk Reduction in Lao PDR
11. Satendra and Kaushik. D (2013) Forest Fire Disaster Management NIDM: New Delhi.
12. Disaster Risk Reduction in the United Nations (2009) Roles, mandates and areas of work of key United Nations entities, UNISDR.
13. Vogelbacher (2013) Flood Disaster Risk Management NIDM: New Delhi.
14. Kaushik. A.D. (2012) Flood Risk Mitigation and Management: A Training of Trainers Module, NIDM: New Delhi.
15. Noncommunicable diseases & Communicable diseases https://www.who.int/our-work/communicable-and-noncommunicable-diseases-and-mentalhealth
16. Kaushik. A.D. (2012) Flood Risk Mitigation and Management: A Training of Trainers Module, NIDM: New Delhi.