ADAMAS UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

DEPARTMENT OF GEOGRAPHY

Program Name:

B.Sc. (Major) GEOGRAPHY

Program Code: GEO3404

Total Credit: 100

Course Structure 2024-25

(Course Structure and Syllabus modified as per the Board of Studies meeting held on 29th June 2024)

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

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

ADAMAS UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

Department of Geography

B.Sc. (Geography) Programme

(2024-25)

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

VISION OF THE UNIVERSITY

To be an internationally recognized university through excellence in inter-disciplinary education, research and innovation, preparing socially responsible well-grounded individuals contributing to nation building.

MISSION STATEMENTS OF THE UNIVERSITY

M.S 01: Improve employability through futuristic curriculum and progressive pedagogy with cutting-edge technology

M.S 02: Foster outcomes-based education system for continuous improvement in education, research and all allied activities

M.S 03: Instill the notion of lifelong learning through culture of research and innovation

M.S 04: Collaborate with industries, research centers and professional bodies to stay relevant and up-to-date

M.S 05: Inculcate ethical principles and develop understanding of environmental and social realities

CHANCELLOR / VICE CHANCELLOR

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

VISION OF THE SCHOOL

To be recognized globally as a provider of education in Basic and Applied Sciences, fundamental and interdisciplinary research.

MISSION STATEMENTS OF THE SCHOOL

M.S 01: Develop solutions for the challenges in sciences through value-based science education.

M.S 02: Conduct research leading to innovation in sciences.

M.S 03: Nurture students into scientifically competent professionals in the usage of modern tools.

M.S 04: Foster in students, a spirit of inquiry and collaboration to make them ready for careers in teaching, research and corporate world.

DEAN (SoBAS)

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

VISION OF THE DEPARTMENT

To achieve excellence for imparting quality higher education and skills in Geography that can serve to the society adopting the changing versatility of job and research opportunities

MISSION STATEMENTS OF THE DEPARTMENT

M.S 01: Create highly qualified and employable geographers by imparting quality education and research aptitude

M.S 02: Enhance the skills of geoinformatics and data analysis along with encourage for entrepreneurship, innovativeness, self-learning in an interdisciplinary domain

M.S 03: To foster professional ethics and responsibilities for the organization, society and environment

M.S 04: To promote collaborations with industries, research institutes and experts for transmitting up-to-date knowledge, training, research skills and connection with the world

HOD, Geography DEAN (SoBAS)

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

Name of the Programme: B.Sc.(Geography)

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 01: Develop analytical skills to solve complex socio-environmental problems using the knowledge of geographical science.

PEO 02: Enhance professional capabilities by harnessing the new and advanced technology.

PEO 03: Possess an effective communication skills and become a true team worker with higher sense of ethics and value.

PEO 04: Openness to explore new ideas through research and lifelong learning.

HOD, GeographyDEAN (SoBAS)

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

Name of the Programme: B.Sc. (Geography)

GRADUATE ATTRIBUTE / PROGRAMME OUTCOME (PO)

GA 01 / PO 01: Physical Geography Knowledge: Understand how different landforms and physical environment are formed by different physical processes.

GA 02 / PO 02: Social-Cultural Geography Knowledge: Know the socio-cultural aspects and their spatial variation and pattern.

GA 03 / PO 03:Contextualized Understanding: Understand the relationships between society and the environment, and feedback mechanism of their relation.

GA 04 / PO 04: Data Analysis: Collection, analysis, visualization and interpretation of spatial and non-spatial data for solving real world problems.

GA 05 / PO 05:Modern Tool Usage: Ability to prepare, interpret and analyze maps for a variety of purposes through geo-computation, cartography, remote sensing and GIS techniques.

GA 06 / PO 06:Research Skills: Enhanced research skills for research design, data collection, analysis, referencing and report writing.

GA 07 / PO 07:Societal Implication: Analysis and scrutinize the nature and socio-economic based reports in quantitative and qualitative way.

GA 08 / PO 08: Environment and Sustainability: Knowledge of protecting and conserving the environmental resources for sustainable development.

GA 09 / PO 09:Communication and Leadership: Develop quality for lectures and research presentation, good communication, leadership, work in group, and other extracurricular activities.

GA 10 / PO 10:Ethics: Demonstrate applications of ethical values in the academic discourses and professional practices.

HOD, GeographyDEAN (SoBAS)

ADAMAS UNIVERSITY, KOLKATA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY

Name of the Programme: B.Sc.(Geography)

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO 01: Understand the diversity ofnatural and social processes focusing man-environment relationships.

PSO 02: Ability to apply Earth Observation Data (ESD) for monitoring natural resource dynamics using geoinformatics.

PSO 03: Capable to generate reports by analyzing different types of maps and data.

PSO 04: Demonstrate skills in decision support system using Geographical Information System and data sciences.

HOD, GeographyDEAN (SoBAS)

ADAMAS UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

DEPARTMENT OF GEOGRAPHY

Programme Name:

B.Sc. GEOGRAPHY

Programme Code: GEO3404

Syllabus 2024-25

(Course Structure modified as per the Board of Studies meeting held on 29th June 2024)

SEMESTER I

Title of the Course: Geotectonics and Geomorphology
Code: GEO101
L-T-P-C: 3-0-1-4

Course Outcomes

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

CO1. Recall the structure of the Earth's interior, tectonic theories, geomorphological concepts, and types of rocks and minerals.
CO2. Explain endogenic and exogenic processes, geomorphological approaches, and models of landscape evolution.
CO3. Illustrate the development of river networks, weathering processes, and landform creation in different geological structures.
CO4. Differentiate between types of folds, faults, and landforms formed by various erosional and depositional processes.
CO5. Assess the relationship between tectonics, mountain building, and volcanic activities with landform development.
CO6. Construct geological maps and interpret geological histories using strike, dip, and bed succession data.

Catalogue Description

This course will introduce to the large dynamics of the earth's surface to explore the origin and structure of Earth, tectonic movement and crustal deformation by endogenic forces. The course also provides fundamental principles and concepts of geomorphology, exogenic processes and their role in the evolution of landforms under various climatic conditions, and model of landform development. This course will consist of lectures and exercises. All the lectures will be devoted on discussions of basic theories and concepts focusing on practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a vast knowledge about dynamic Earth and its geomorphology.

Course Content

Unit I: Fundamentals of Geotectonics:
Structure of the Earth-Interior, Discontinuity and Seismic Waves, Endogenic and Exogenic Processes; Folds and Faults — Origin and Types, Concept of Isostasy and Isostatic Compensation, Continental Drift, Sea Floor Spreading, Plate Tectonic theory: landforms at plate margins and hotspots; Mountain Building: Orogenic types and Classification - relation with Tectonics, Volcanism and Volcanic landforms

Unit II: Fundamentals of Geomorphology:
Definition and scope of Geomorphology, Landscape, and Landforms; Uniformitarianism and Neocatastrophic Approaches, Basic Concepts of Geomorphology, Geological time scale, System

Approach- Concept and Classification. Development of River Network on Folded, Faulted, Uniclinal, and Domal structures

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

Unit IV: Megascopic Identification of Rocks & Minerals:
Classification of rocks Igneous, Sedimentary, and Metamorphic. Rocks: granite, basalt, dolerite, shale, sandstone, limestone, conglomerate, laterite, slate, phyllite, schist, marble, quartzite, gneiss; Minerals: talc, gypsum, calcite, mica, feldspar, quartz, chalcopyrite, hematite, magnetite, bauxite, galena.

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

Recommended Readings:

1. Husain Majid 2010, Fundamentals of Physical Geography, Second Edition, Rawat Publications, Jaipur and New Delhi.
2. Siddartha K. 2018, Earth Dynamic Surface (Transworld Media & Communications – Publication – Patna,
3. Strahler, A.N. and Strahler, A.H. 1984, Elements of Physical Geography, John Wiley, New York.
4. Selby, M.J., 2005, Earth's Changing Surface, Indian Edition, OUP
5. Singh Savindra (2019), Physical Geography, Prayag Pustak Bhawan, Allahabad.
6. Bloom, A.L. 1992, Geomorphology- Systematic Analysis of Late Cenozoic Landforms, Prentice Hall India, New Delhi.
7. Singh Savindra 2019, Geomorphology, Prayag Pustak Bhawan, Allahabad
8. Strahler, A .N. 1988, Earth Sciences, Harper and Row Publishers, N.D.
9. Thornbury, W.D. 1969. Principles of Geomorphology, 2nd ed, Wiley-India / CBS.
10. Chorley, R.J. 1969: Introduction to Fluvial Processes, Methuen, London
11. Chorley, R.J., Schumm, S. A. and Sugden, D.E. 1984: Geomorphology, Methuen, London
12. Dayal, P. 1996: Textbook of Geomorphology, Shukla Book Depot, Patna.
13. Kale, V. and Gupta, A. 2001: Introduction to Geomorphology, Orient Longman, Kolkata
14. McCullagh, P. 1978: Modern Concepts in Geomorphology, Oxford University Press, Oxford.
15. Morisowa, M. 1968: Streams, their Dynamics and Morphology, McGraw Hill, New York.
16. Ollier, C.D. 1975: Weathering, Longman, London
17. Selby, M. J. 1991: Earth's Changing Surface, Clarendon Press, London
18. Small, R.J. 1978: The Study of Landforms, Cambridge University Press, Cambridge
19. Sparks, B.W. 1960: Geomorphology, Longman, London.
20. Summerfield, M.J. 2003. Global Geomorphology: An Introduction to the Study of landforms, Longman.
21. Strahler, A. 2016. Introducing Physical Geography, 6th ed, Wiley.
22. Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India
23. Harvey, A. 2012. Introducing Geomorphology: A Guide to Landforms and Processes, Dunedin Academic Press.
24. Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.
25. Gregory, K.J., Lewin, J. 2014. The Basics of Geomorphology: Key Concepts, Sage.
26. Billings, M.P. 1971. Structural Geology, Pearson.
27. Frisch, W., Meschede, M., Blakey, R.C. 2011. Plate Tectonics: Continental Drift and Mountain Building. Springer.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	1	0	0	0	3	1	2	0	2	1	0	0	2	1
CO2	1	1	0	1	2	1	3	2	2	1	1	0	1	1
CO3	1	2	1	1	2	1	2	3	2	1	1	2	0	1
CO4	0	1	2	1	2	2	2	3	2	2	1	1	1	0
CO5	1	2	1	0	2	2	1	1	3	1	1	3	1	2
CO6	2	3	1	0	1	1	1	2	2	2	0	2	3	1

Title of the Course: Cartographic Techniques
Code: GEO102
L-T-P-C: 1-0-3-4

Course Objectives

1. To learn the drawing of different map scales.
2. To understand different area measurement techniques.
3. To conceptualize the basic properties of different rocks and minerals.
4. To understand the use of relevant lab instruments.

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

CO1. **Recall** the fundamental concepts of map scale representation, enlargement-reduction, area measurement, and types of map projections.
CO2. **Explain** the principles, classification, and applications of planar, conical, and cylindrical map projections.
CO3. **Demonstrate** the construction of various map projections and accurately draw scales such as linear, diagonal, and vernier.
CO4. **Differentiate** between the properties and suitability of planar, conical, and cylindrical projections for various geographical applications.
CO5. **Assess** the accuracy and utility of specific projections and scale methods for different cartographic requirements.
CO6. **Compile** a well-documented laboratory notebook, showcasing practical skills in scale representation and map projection construction.

Catalogue Description

This paper pertains to study of map scale and projection which is concerned with reducing geographical features of interest to manageable proportions. This unit will also provide students with the opportunity to learn the area measurement, enlargement and reduction methods. The laboratory instruments will be introduced to the students during the lab activities. This course will consist of lectures and exercises. The majority of class time will be spent by students on learning about the construction of different scales and drawing maps. Exercises will be prepared and submitted by the students on the data specified during the course as a part of the continuous assessment along with conduct of an end term examination.

Course Content

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

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

Unit II: Map Projections - Planar Case

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

Unit III: Map Projection – Conical and Cylindrical Cases

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

Unit IV: Laboratory notebook and viva voce

Recommended Readings:

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	1	1	1	0	1	0	0	0	3	1	2	1
CO2	3	1	1	1	1	0	1	0	0	0	3	1	2	1
CO3	3	1	2	2	2	1	1	0	2	1	3	2	3	2
CO4	2	1	1	2	2	1	1	0	1	1	2	1	2	2
CO5	2	1	1	2	2	1	1	0	0	0	2	1	2	2
CO6	1	0	1	2	2	2	1	0	0	0	2	1	2	2

SEMESTER II

Title of the Course: Human Geography
Code: GEO103
L-T-P-C: 3-0-1-4

Course Objectives

1. To understand the key concepts of social geography.
2. To learn components, elements and measures of social region.
3. To conceptualise fundamentals of culture, cultural groups and cultural processes controlling the formation of cultural landscapes.
4. To understand the human adaptation to the environment determined the evolution of the societies.

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

CO1. **Define** key concepts and components of social and cultural geography, including social structure, processes, and patterns.
CO2. **Explain** the relationship between social well-being, quality of life, and social inclusion/exclusion through real-world examples.
CO3. **Analyze** cultural regions and landscapes using the principles of cultural geography, including diffusion and integration.
CO4. **Examine** case studies of human adaptation to diverse environments to identify patterns of development and environmental conflict.
CO5. **Assess** social impact using indices such as HDI, GDI, and Sopher's Disparity Index to evaluate development and inequality.
CO6. **Design** questionnaires and conduct ethnographic surveys to address social problems and gather perceptual data for analysis.

Catalogue Description

This course provides a broad introduction to the conceptual and empirical concerns of two of the major sub-disciplines of contemporary human geography. It is organized into two parts. First part explores social geography, focusing on opening up students' perspectives to the various social elements, processes and issues. The second part introduces with the cultural geography focusing on the cultural processes, cultural groups, and formation of cultural landscape with an emphasis on Indian culture. The course also offers a broader understanding to the evolution of human societies and human adaptation to environment. This course will consist of lectures and exercises. All the lectures will be devoted on discussions of basic theories and concepts focusing on practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. At the end of the course students will get a vast knowledge about society, culture and environment.

Course Content

Unit 1: Concept and Components of Social Geography
Definition, Scope, and Content of Social Geography, Social Structure, and Social Processes: Macro and Micro; Social Patterns, Concept of Space: Social Space, Material Space; Social Elements; Caste, class, religion, race, and their spatial distribution; Social Area Analysis

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

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

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

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

Recommended Readings:

1. Ahmed, A. (2004): Social Geography, Rawat Publication, New Delhi
2. Chapman, K. (1979): People, Pattern, and Process – An Introduction to Human Geography
3. Ghosh, S (2020): A Brief Account of Human Geography, Educreation Publishing.
4. Grover, N. (2004): Cultural Geography: Form and Process, Concept Publishing Co.
5. Guha, R. C: Social Geography. Rawat Publication, New Delhi
6. Chandna, R.C. 2016. Geography of Population: Concepts, Determinants, and Patterns, Kalyani Publishers.
7. Fouberg, E.H., Murphy, A.B., de Blij H.J. 2015. Human Geography: People, Place, and Culture, 11th ed, Wiley.
8. Ghosh, S. 1998. Introduction to Settlement Geography, Sangam Books Ltd.
9. Gould, W.T.S. 2015. Population and Development, Routledge.
10. Gregory, D., Johnston, R., Pratt, G., Watts., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley.
11. Knox, P.L., Marston, S.A. 2014. Human Geography: Places and Regions in Global Context, 6th ed, Pearson Education Limited.
12. Knox, P.L., McCarthy, L.M. 2011. Urbanization: An Introduction to Urban Geography, 3rd ed, Pearson Education Ltd.
13. Mandal, R.B. 2001. Introduction to Rural Settlement, 2nd ed, Concept Publishing Company.
14. Moseley, W.G., Perramond, E., Hapke, H.M., Laris, P. 2013. An Introduction to Human-Environment Geography: Local Dynamics and Global Processes, Wiley-Blackwell.
15. Norton, W. 2014. Human Geography, 8th ed, Oxford University Press.
16. Pickering K. and Owen A. A. (1997): An Introduction to Global Environmental Issues, 2nd edition Rutledge, London.
17. Rubenstein, J.M. 2016. The Cultural Landscape: An Introduction to Human Geography, 12th ed, Pearson Education Limited.
18. Short, R.J. 2017. Human Geography: A Short Introduction, 2nd ed, Oxford University Press.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	1	0	1	0	1	0	1	0	2	0	1	0
CO2	2	2	1	0	1	2	2	1	0	0	2	2	2	1
CO3	0	1	2	0	2	1	0	1	1	0	2	1	1	1
CO4	1	1	2	3	1	2	1	2	0	1	1	2	1	2
CO5	0	1	2	2	1	2	0	1	2	0	1	1	2	1
CO6	1	2	1	0	2	2	2	1	0	1	2	2	1	1

Title of the Course: Thematic Mapping and Surveying
Code: GEO104
L-T-P-C: 1-0-3-4

Course Objectives

1: Develop skills to accurately identify and interpret various physical features represented on topographical sheets.
2: Understand and explain the interrelationships between physical geography and cultural features in a given landscape.
3: Apply surveying techniques to effectively analyze terrain, utilizing contouring methods to represent elevation changes.
4: Utilize advanced leveling methods to analyze and interpret topographic data for enhanced geographical understanding.

Course Outcomes

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

CO1. **Recall** the principles of SOI toposheet numbering and geomorphic feature identification techniques.

CO2. **Explain** the interpretation of mountain and plateau areas using morphometric techniques and profiles.
CO3. **Use** grid-wise analysis to prepare road density and settlement frequency maps with interpretations.
CO4. **Correlate** physical and cultural elements like relief, drainage, and settlements using toposheets.
CO5. **Assess** survey and leveling data using techniques like contouring, profiling, and slope analysis.
CO6. **Develop** a comprehensive project file with exercises applying various surveying and toposheet interpretation methods.

Catalogue Description

This course provides a comprehensive understanding of Indian topographical sheets and their nomenclature, focusing on the principles of toposheet numbering as defined by the Survey of India. Students will learn to identify and interpret various physical features, including macro and micro geomorphic elements, and apply morphometric techniques to analyze mountain and plateau areas. In addition, the course emphasizes the interpretation of weather maps and

the analysis of landforms, exploring the relationships between physical and cultural features across relief, drainage, natural vegetation, settlements, and transport networks.

Practical skills in surveying and leveling will be developed through hands-on experiences with closed and open traverse surveys using a prismatic compass and dumpy level. Students will also engage in contouring techniques and micro-slope analysis. The course concludes with the preparation of a project file that includes exercises from each unit, alongside a viva voce assessment to showcase learned competencies.

Course Content

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

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

Unit II: Identification and analysis of features from Toposheet

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

Unit III: Surveying and Levelling

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

Unit IV: Laboratory Notebook and viva voce

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

Recommended Readings:

1. Gopal Singh (1996) – Map Work and Practical Geography, Vikas Publications, New Delhi.
2. Kanetkar, T.P. and Kulkarni, S.V. 1972: Surveying and Levelling, Part I, Pune VidyarthiGriha
3. Prakashan, Pune.
4. Kanetkar, T.P. and Kulkarni, S.V. 1972: Surveying and Levelling, Part II, Pune VidyarthiGriha
5. Prakashan, Pune
6. Mishra, R.P.and Ramesh (1989) – Fundamentals of Cartography, Concept, New Delhi.
7. Monk house, F.J and Wilkinson, M.R.(1968) _ Maps and Diagrams, Methuen, London
8. Negi, B.S. (1998) –Practical Geography, Kedarnath and Ramnath, Meerut.
9. Robinson, A.H. (1995) – Elements of Cartography, John Willey, New York.
10. Sarkar, Ashis, Practical Geography: A Systematic Approach, Orient Longman Pvt. Ltd.,
11. Kolkata.2000
12. Misra, R.P. and Ramesh, A. 1986: Fundamentals of Cartography, McMillan, New Delhi.

13. Plat: Basics and Advanced Geological Maps (Selected Exercise)

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	1	2	1	1	1	0	0	0	2	1	1	0
CO2	1	2	1	2	2	1	2	1	1	0	2	2	2	1
CO3	1	1	2	2	2	1	2	1	1	1	2	2	2	2
CO4	1	1	2	3	2	1	2	1	1	1	3	2	2	2
CO5	2	1	2	3	2	2	1	1	2	1	3	2	3	2
CO6	1	1	2	2	3	2	1	1	2	1	2	2	3	3

SEMESTER III

Title of the Course: Climatology

Code: GEO201
L-T-P-C: 3-0-1-4

Course Objectives

1. To learn the composition and structure of atmosphere, vertical and horizontal temperature distribution, and the global energy balance.
2. To understand the distribution and variation of pressure belts, and its relation with global wind circulation.
3. To conceptualize the fundamental mechanisms of condensation processes and precipitation
4. To understand the development of cyclones and anti-cyclones, and classification system of global climate.

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

CO1. **Define** key concepts such as atmospheric layers, heat budget, and global pressure belts.
CO2. **Explain** the processes of temperature inversion, monsoon variability, and the greenhouse effect.
CO3. **Demonstrate** the ability to interpret weather maps and analyze synoptic charts.
CO4. **Distinguish** between different types of air masses, condensation processes, and precipitation forms.
CO5. **Assess** the climatic classification systems by Köppen and Thornthwaite for their regional relevance.
CO6. **Design** a comparative representation of climatic data using climographs and ombro-thermic diagrams.

Catalogue Description

This course is designed to give an understanding the physical aspects of Earth's climate system and the factors that influence and control them. This course will serve as an introduction to the study of the atmosphere. In this course students will explore the structure and composition of the atmosphere, global energy balance and transfer, physics of wind motion on earth, wind circulation and related phenomenon, atmospheric stability and instability, precipitation processes, tropical and mid latitude disturbances, weather systems and classification of world climatic zones. This course will consist of lectures and exercises. All the lectures will be devoted on discussions of basic theories and concepts focusing on practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a vast knowledge about the dynamic nature of climate and weather.

Course Content

Unit I: Atmospheric Layers and Thermal Variation
Nature, Composition and Layered Structure of the Atmosphere, Factors Controlling Insolation; Heat Budget of the Atmosphere, Horizontal and Vertical Distribution of Temperature; Inversion of Temperature; Green House Effect and Importance of Ozone Layer.

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

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

Unit IV: Weather Disturbance and Climatic Classification:(20 hours)
Tropical Cyclone and Weather Disturbances, Mid-Latitude Cyclone and Anti-Cyclone, Climatic Classification after Koppen and after Thornthwaite: 1931 And 1948

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

Recommended Readings:

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	0	0	1	0	1	0	1	0	1	3	0	1	1
CO2	1	2	2	3	1	2	2	1	2	0	2	3	1	3
CO3	3	0	3	3	1	1	1	1	3	2	3	3	1	3
CO4	0	1	1	3	1	0	1	2	1	1	1	2	1	2
CO5	1	0	0	3	3	1	2	0	1	2	3	0	1	1
CO6	1	1	0	1	3	1	2	3	1	2	2	3	2	3

Title of the Course: Statistical Methods in Geography
Code: GEO202
L-T-P-C: 1-0-3-4

Course Objectives

1. Understand the significance of statistical techniques in Geography and differentiate between descriptive and inferential statistics for effective data analysis.
2. Calculate and interpret measures of central tendency and dispersion, including mean, median, mode, and standard deviation, while applying hypothesis testing methods.
3. Analyze relationships between variables through regression analysis, including simple and nonlinear regression, and utilize time series methods for data interpretation.
4. Develop a comprehensive project that demonstrates the application of statistical methods and data analysis techniques, culminating in a viva voce presentation.

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

CO1. **Define** statistical concepts and types of data, including parametric and non-parametric classifications.
CO2. **Illustrate** central tendency and dispersion measures using diagrams like boxplots and violin plots.
CO3. **Construct** frequency distributions, histograms, and trend lines for analyzing statistical datasets.
CO4. **Differentiate** between normal and skewed distributions and evaluate residuals in regression models.
CO5. **Critically** assess statistical hypotheses using tests like Student's T-Test and Chi-square test.
CO6. **Develop** a comprehensive project file integrating methods from the syllabus into practical exercises.

Catalogue Description
This course will open up to the students various basic and advanced statistical tools for performing different data oriented operations. Perusing this course, the students will also become confidence to interpret statistical results. This course will also help students to boost their career. Classes are conducted by lecture as well as PowerPoint presentation, whiteboard presentation and illustration of statistical problem solving s per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a broad knowledge about statistical methods in the geographical domain.

Course Content

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

Unit II: Measures of Central Tendency and Dispersion

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

Unit III: Data Analysis

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

Unit IV: Laboratory Notebook and viva voce

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

Recommended Readings:

1. Alvi, Z. 1995: Statistical Geography-Methods & Application, Rawat Publications, Jaipur.
2. Berry B. J. L. and Marble D. F. (eds.): Spatial Analysis – A Reader in Geography.
3. Clark, W.A.V. and Hosking, P.L. 1986: Geographical Methods for Geographers, John Wiley and Sons, New York
4. Croxton, F.E., Cowden, D.J. & Klein, S 1969: Applied General Statistics, Prentice Hall of India Pvt. Ltd., New Delhi
5. Dickinson, G.C. (1973): Statistical Mapping and Presentation of Statistics
6. Ebdon D., 1977: Statistics in Geography: A Practical Approach
7. Goon, A.M., Gupta, M.K. &Dasgupta, B. 1992: Basic Statistics, Volume 1, The World Press Pvt. Ltd., Kolkata
8. Goon, A.M., Gupta, M.K. &Dasgupta, B. 1992: Fundamentals of Statistics, Volume 1, The World Press Pvt. Ltd., Kolkata
9. Gregory, S. 1985: Statistical Methods and the Geographer, Longman, London
10. Hammond P. and McCullagh P. S., 1978: Quantitative Techniques in Geography: An Introduction, Oxford University Press.
11. King L. S., 1969: Statistical Analysis in Geography, Prentice-Hall
12. Mahmood A., 1977: Statistical Methods in Geographical Studies, Concept.
13. Mahmood, A. 1998: Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
14. Norcliffe, G.B. 1977: Inferential Statistics for Geographers-An Introduction, Hutchinson and Co., London
15. Pal S. K., 1998: Statistics for Geoscientists, Tata McGraw Hill, New Delhi

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	0	0	2	2	0	2	0	0	0	3	0	0	0

CO2	2	2	0	2	2	0	0	0	2	0	1	3	0	0
CO3	2	0	3	0	2	0	3	0	3	0	3	0	3	0
CO4	0	0	3	2	0	2	3	0	2	0	2	3	3	3
CO5	0	2	0	2	3	2	0	2	3	2	2	0	0	3
CO6	3	2	3	0	0	2	3	3	2	3	3	3	3	3

SEMESTER IV

Title of the Course: Hydrology and Oceanography
Code: GEO203
L-T-P-C: 3-0-1-4

Course Objectives

1. To understand the definition, scope, and components of hydrology and their significance.
2. To analyze the global hydrological cycle's physical and biological roles in the environment.
3. To examine groundwater types, their movement factors, and issues related to over-utilization.
4. To explore ocean floor configuration, properties of ocean water, and the impact of oceanic processes.

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

CO1. **Define** key concepts of hydrology, global hydrological cycle, and ocean floor configuration.
CO2. **Explain** the components of hydrology, oceanic properties, and their controlling factors.
CO3. **Illustrate** hydrographs, rating curves, and morphometric analysis of drainage basins using data.
CO4. **Examine** the movement of groundwater and ocean currents, highlighting influencing factors and patterns.
CO5. **Assess** human impacts on the hydrological cycle and issues related to groundwater overutilization.
CO6. **Construct** hydrological diagrams, rainfall dispersion maps, and interpret oceanic and hydrological datasets.

Catalogue Description

This course is designed to give an understanding of hydrological processes including precipitation, evaporation, rainfall interception, soil water, ground water and runoff. It also provides an understanding of global hydrological cycle, fundamental mechanisms behind it and basic hydrological analysis. The module also aimed to introduce the physical, chemical and biological aspects of the oceans. The objective of this part is to help the student to understand our oceans and their influence on environment, climate. The economic importance of oceans and potential environmental damage has also been considered. This course will consist of lectures, model demonstrations, group discussions and exercises. The focus will be on explaining the fundamental characteristics, composition and processes of hydrological cycle and ocean water. The majority of class will be taken through PPT presentation, documentary video, models and lectures in an interacting environment with the students. Students will be given tasks for teaching demonstrations on selective brief topics to improve their explanatory capacity and communication skills. Projects, models, assignments will be prepared and submitted by the students during the course as a part of the continuous assessment. Mock tests, quiz competition, open book examinations, group discussions will be conducted after completion of each unit of the module.

Course Content

Unit 1: Introduction to Hydrology

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

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

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

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

Unit V: Hydrology Lab
Unit Construction and interpretation of rating curves, Construction and interpretation of hydrographs and unit hydrographs, Monthly rainfall dispersion diagram, and Construction of Theissen polygon from precipitation data.

Recommended Readings:
1. Linsley, K., Kohler, M. and Paulhus, J.L. (1975): Applied Hydrology, Tata McGraw Hill, New York.
2. Meinzer, O.E. (1942): Hydrology, Dover Publication Inc. New York.
3. Rahgunath, H.M. (1997): Hydrology- Principles, analysis, Design, New Age International Pvt. Ltd, New Delhi
4. Sverdrup, H.U. (1942): The Oceans, their Physics, Chemistry, and General Biology, Prentice-Hall, New York.
5. Todd, D.K. (1959): Ground Water Hydrology, John Wiley and Sons, New York
6. Walton, W.C. (1970): Ground Water Resource Evaluation, McGraw Hill, Tokyo
7. Andrew. D. Ward and Stanley, Trimble (2004): Environmental Hydrology, 2nd edition, Lewis Publishers, CRC Press.
8. Karanth, K.R. (1988): Ground Water: Exploration, Assessment and Development, Tata- McGraw Hill, New Delhi.
9. Ramaswamy, C. (1985): Review of floods in India during the past 75 years: A Perspective. Indian National Science Academy, New Delhi.
10. Singh, Vijay P. (1995): Environmental Hydrology. Kluwer Academic Publications, The Netherlands.
11. Garrison T. (1998): Oceanography, Wordsworth Company, Belmont.
12. Sharma, R.C. and Vatal, M. (1980): Oceanography for Geographers, Chaitanya Publishing House, Allahabad.
13. Sverdrup, K.A. and Armbrust, E.V. (2008): An Introduction to the World Ocean, McGraw Hill, Boston.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	0	1	2	2	0	1	1	1	0	3	1	1	2
CO2	3	0	1	2	2	1	2	2	2	0	3	2	2	2
CO3	3	0	3	2	2	1	1	2	1	0	3	3	2	1
CO4	3	0	3	3	2	2	2	3	2	1	3	2	1	3
CO5	2	0	1	2	2	1	3	2	2	2	2	2	3	1
CO6	3	1	2	2	3	1	2	3	2	0	2	3	2	3

Title of the Course: Economic Geography
Code: GEO204
L-T-P-C: 3-0-1-4

Course Objectives

1. To understand the concept, classification, and sustainable utilization of resources using economic and environmental approaches.
2. To analyze the global distribution and critical issues related to primary activities, including agriculture, forestry, fishing, and mining.
3. To explore factors influencing industrial location, growth models, and key industries with a focus on their resource base, distribution, and challenges.
4. To assess the role of tertiary activities, international trade theories, and the impact of technology on trade and transportation systems.

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

CO1. **Define** key concepts and classification of resources, economic activities, and tertiary services.
CO2. **Explain** resource utilization, sustainable practices, and economic activity classifications in global contexts.
CO3. **Demonstrate** the use of economic and industrial models to analyze resource-based industries and trade strategies.
CO4. **Examine** agricultural, industrial, and service sectors to evaluate their role in regional economic development.
CO5. **Assess** sustainability, resource conservation strategies, and trade impacts on global and local economies.
CO6. **Design** field-based reports analyzing agricultural systems, industrial activities, and service-oriented businesses using economic tools.

Catalogue Description
This course will provide a basic but comprehensive idea about the Earth's resources and sectoral economic divisions. The course also focuses on resource distributions and locations. Completing of

this course will give students a better understanding of economic activities and their resulting pattern. And This course will consist of lectures and exercises. All the lectures will be devoted to discussions of fundamental theories and concepts focusing on the practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as PowerPoint presentation, audio-visual animation and documentary presentation, case studies analysis as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a vast knowledge about economic processes and development issues.

Course Content

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

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

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

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

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

Recommended Readings:

1. Alexander J.W. (1976): Economic Geography, Prentice Hall of India. New Delhi.
2. Alexanderson G. (1988): Geography of manufacturing, Prentice Hall of India. New Delhi.
3. Berry, Conkling & Ray (1988): Economic Geography Prentice Hall of India, New Jersey.
4. Guha, J.L. and Chattaraj, P.R. 1989: A New Approach to Economic Geography: A Study of Resources, World Press, Kolkata 8.
5. Hartshorne, T. A. and Alexander, J. W. (1988): Economic Geography, Prentice Hall

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	2	1	1	1	0	1	0	0	1	2	1	2	0
CO2	1	2	1	2	2	0	1	1	1	1	2	2	2	2
CO3	1	1	3	2	2	1	1	0	1	1	2	2	2	2
CO4	2	2	2	1	1	2	2	1	0	1	2	1	2	2
CO5	0	1	2	2	1	1	2	0	0	1	1	1	1	2
CO6	1	0	1	1	2	2	1	2	1	0	2	2	2	2

Title of the Course: Fundamentals of GIS
Code: GEO205
L-T-P-C: 1-0-3-4

Course Objectives

1. To learn the basic concept of digital cartography.
2. To understand different data structures.
3. To conceptualize the different projection systems of the world.
4. To learn different techniques of digital map preparation.

Course Outcomes

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

CO1**. Define** the concepts, advantages, and disadvantages of Digital Cartography and GIS data structures.
CO2. **Explain** the process of raster image input, georeferencing, and digitization in digital mapping.
CO3. **Use** GIS tools to assign map scales and prepare map layouts for digital mapping.
CO4. **Identify** errors and deformations in map projections and their impact on digital cartography.
CO5. **Assess** the suitability of different map projection systems for various geographic regions.
CO6. **Develop** a project file with exercises demonstrating practical applications of digital cartography techniques.

Catalogue Description

This course will enable students to learn the basics of Digital cartography including concepts of GIS. The course will expose students to environment of digital cartography and its applicability. This course will consist of lectures and exercises. The focus will be on the basics of digital cartography. The majority of class time will be spent by students on learning about the digitization and geo referencing. Exercises will be prepared and submitted by the students on the data specified during the course as a part of the continuous assessment. Exercises could be assignment or power point presentation.

Course Content

Unit 1: Basics of Digital Cartography

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

Unit II: Digital mapping

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

Unit III: Laboratory Notebook

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

Recommended Readings:

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	2	1	2	2	1	0	1	1	2	2	2	1
CO2	2	1	2	2	2	2	1	0	1	1	2	2	2	2
CO3	2	2	2	2	3	3	2	1	2	1	2	2	3	2
CO4	2	2	3	2	2	2	2	1	2	1	2	3	2	3
CO5	2	1	2	2	2	2	2	0	1	1	2	2	2	2
CO6	2	2	2	3	2	2	2	2	2	1	3	2	2	3

SEMESTER V

Title of the Course: Environmental Geography
Code: GEO301
L-T-P-C: 3-0-1-4

Course Objectives

1. To introduce students to the foundational concepts of environmental science, including its scope, components, and the relationship between humans and the environment.
2. To examine the formation, types, and properties of soil as a critical abiotic component, along with methods of soil conservation.
3. To explore ecosystem structures and functions, including energy flow, biogeochemical cycles, and biodiversity, in both terrestrial and aquatic ecosystems.
4. To analyze global and local environmental problems and policies, including conservation efforts, environmental movements, and the concept of sustainable development.

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

CO1. **Identify** the components of the environment, including abiotic and biotic factors and human relationships.
CO2. **Explain** the processes of soil formation and the factors influencing soil types and properties.
CO3. **Apply** the concept of energy flow and ecological pyramids in real-world ecosystem analysis.
CO4. **Analyze** the impact of environmental degradation and pollution on ecosystems and human health.
CO5. **Assess** the effectiveness of environmental policies and movements in addressing global and local issues.
CO6. **Construct** hazard maps and biodiversity indices using GIS and soil analysis techniques.

Catalogue Description

This course will promote a sensitive awareness of environment, to encourage students about biological life, places and landscapes. This will help to explore the relationship between humans and environment amidst diverse landscapes. The students will study how soils are forming in physical environment and its importance on life system. This course will also provide the students the opportunity to understand global ecosystems and differential biomes. It also make student aware about the environmental problems and the necessity of conservation and environmental planning. This course will consist of lectures and exercises. The focus will be on the environmental problems and their management. The majority of class time will be spent by students on learning about the of biotic and abiotic environment, human-environment relationship, soil forming factors, physical and chemical properties of soil, trophic structure, food web, energy flow in different ecosystems, concept of environmental hazards and disaster, environmental movements, environmental programmes and policies. Exercises will prepared and submitted by the students on the subject specified during the course as a part of the continuous assessment. Exercises could be assignment or power point presentation.

Course Content

Unit 1: Nature and Concepts
Environmental Science: Introduction, Scope, approaches to study of the environment, Components of the environment: Energy, Abiotic and Biotic components, Human-Environment Relationships – Historical Progression, Environmental degradation, and pollution.

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

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

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

Unit V: Field Works and Mapping Techniques
Soil sample collection, analysing soil texture, construction of ternary diagram, construction of biological diversity index, hazard mapping on GIS platform

Recommended Readings:
1. Anderson, J.M. (1981): Ecology for Environmental Science: Biosphere, Ecosystems and Man, Arnold, London.
2. Nobel and Wright (1996): Environmental Science, Prentice Hall, New York.
3. Odum, E.P. (1971): Fundamental of Ecology, W.B. Sanders, Philadelphia.
4. Saxena, H.M. (1994): PrayavaranevnParisthitikiBhugool (Geography of Environment and Ecology) Rajasthan Hindi Granth Academy, Jaipur.
5. Singh, S. (1991): Environmental Geography, Prayag Pustak Bhawan, Allahabad.
6. Strahler, A.H. and Strahler A.N. (1977): Geography and Mans Environment, John Wiley, New York.
7. William, M.M. and John, G. (1996): Environmental Geography - Science, Landuse and Earth System, John Wiley and Sons, New York.
8. Chandna, R.C. (2002): Environmental Geography, Kalyani, Ludhiana.
9. Cunninghum, W.P. and Cunninghum, M.A. (2004): Principals of EnvironmentalScience: Inquiry and Applications, Tata Macgraw Hill, New Delhi.
10. Goudie, A. (2001): The Nature of the Environment, Blackwell, Oxford.
11. 4. Mal, S. and Singh, R.B. (Eds.) (2009) : Biogeography and Biodiversity. Rawat Publication, Jaipur
12. Miller, G.T. (2004): Environmental Science: Working with the Earth, Thomson BrooksCole, Singapore.
13. MoEF, (2006): National Environmental Policy-2006, Ministry of Environment and Forests, Government of India.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	2	1	2	1	2	1	0	1	1	1	1	1
CO2	2	1	2	1	2	1	1	1	0	1	1	1	1	1
CO3	2	2	3	2	2	1	2	2	1	1	2	2	1	2
CO4	2	1	1	3	2	2	2	1	1	0	2	1	2	1
CO5	1	2	2	3	1	2	1	2	2	1	2	1	2	2
CO6	1	2	2	3	2	2	2	1	2	1	2	2	2	1

Title of the Course: Regional Planning and Development

Code: GEO302
L-T-P-C: 3-0-1-4

Course Objectives

1. To learn the basics of the region,itstypes with details of development with different development indicators.
2. To perceive planning regions and different models and theories for regional development.
3. To imbibe different temporal plans and regional development trajectories of India over time.
4. Apply the development models in developing different backward regions of India.

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

CO1. **Recall** the concepts and types of regions, including formal and functional regions.
CO2. **Explain** regionalization approaches, scales, and dimensions, and the bases of regional division.
CO3. **Apply** economic, social, and environmental indicators to measure development in various regions.
CO4. **Compare** and contrast regional planning models like Growth Pole, Myrdal, and Friedmann.
CO5. **Assess** the effectiveness of regional planning strategies in addressing regional disparities in India.
CO6. **Design** and apply regional delineation methods and planning models in practical lab exercises.

Catalogue Description

This course will give an introduction to basic concepts and theories within the field of regional planning and the history and experiences of regional planning in India over the years concentrating on political and practical challenges faced by planning systems. Issues concerning the management of different aspects of sustainability in planning are explored with the help of a case study. This course will consist of lectures and exercises. All the lectures will be devoted to discussions of fundamental theories and concepts focusing on the practical implementation of knowledge and critical thinking.

Classes will be conducted by lecture as well as PowerPoint presentation, audio-visual animation and documentary presentation, case studies analysis as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a vast knowledge about regional development processes and planning issues.

Course Content

Unit I: Regions and Development

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

Unit II: Planning Regions and Allied Theories

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

Unit III: Regional Planning in India

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

Unit IV: Regional Planning and Prospects

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

Unit V: Regional Planning Lab

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

Recommended Readings:

1. Chatterjee, S. P. (1973): Physiography of India, Gazetteer of India, Vol. I, Chopra, P. N. (Ed.), Govt. of India, New Delhi.
2. Singh, R. L. (1989): India – A Regional Geography, National Geographical Society of India, Varanasi.
3. Spate, O. H. K. and Learmonth, J. A. (1972): India and Pakistan, Methuen Co. Ltd., London.
4. Ganguly, D. S., Damodar Valley Corporation.
5. Mamoria. C.B. 1996, Economic and Commercial Geography of India. Revised edition.ShivlalAggarwalaan Co. Agral.
6. Bhat L S. – Regional Planning in India, Statistical Publishing Society, Calcutta, 1973.
7. Bhat L. S. et. at.: Micro-Level Planning: A Case Study of Karnal Area, Haryana, K.B. Publishing, New Delhi, 1976.
8. Chand M. &Puri V.K.– Regional Planning in India, Allied Publishers Pvt. Ltd., N.Delhi, 1983.
9. Friedman J. & Alonso W. – Regional Development and Planning – A Reader, M.I.T. Press, Cambridge, Mass, 1967.

10. Friedmann, J. and Alonso, W.: Regional Development Policy – A Case Study of Venezuela, M.I.T. Press, Cambridge, Mass, 1966.
11. Glasson J. - An Introduction to Regional planning: Concept, Theory & Practice, Hutchinson &Co. (Publishers) Ltd., London, 1983.
12. Glikson, Arthur: Regional Planning and Development, Netherlands Universities Foundation for International Cooperation, London, 1955.
13. Gosal, G. S. and Krishan, G.: Regional Disparities in Levels of Socio-Economic Development in Punjab, Vishal Publications, Kurukshetra, 1984.
14. Inamdar, N. R. &Kshire, V.K., - District Planning in India: A Case study of Maharastra, Oxford & IBH Publishing Co., Delhi, 1986.
15. Kundu A. & Raza M. – Indian Economy: The Regional dimension – Spectrum Publishers, N. Delhi, 1982.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	1	1	2	1	1	0	2	1	2	1	1	1
CO2	2	2	1	2	1	1	1	0	2	1	2	2	2	2
CO3	3	2	2	2	2	2	2	1	2	1	2	2	2	2
CO4	2	2	2	2	1	2	1	1	1	1	1	2	2	2
CO5	3	1	2	2	2	2	1	1	1	1	2	2	2	2
CO6	2	2	2	1	2	2	1	1	1	1	2	1	1	2

Title of the Course: Fundamentals of Remote Sensing
Code: GEO303
L-T-P-C: 1-0-3-4

Course Objectives

1. To learn the basic concepts of remote sensing.
2. To develop a skill in Aerial photo and Satellite Image interpretation.
3. To know about different types of Satellites, Sensors and their resolutions.
4. To learn the techniques of image processing.

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

CO1. **Define** remote sensing, its platforms, types, and principles of aerial photography and satellite systems.

CO2. **Explain** the interaction of EMR with the atmosphere and Earth's surface in satellite remote sensing.

CO3. **Apply** image processing techniques, such as band combination and mosaicking, to satellite images.

CO4. **Analyze** satellite images to categorize land use and land cover using image interpretation techniques.

CO5. **Evaluate** the performance of different satellite sensors based on their resolution and capabilities.

CO6. **Develop** a project file using methods from the syllabus to complete a series of exercises.

Catalogue Description

This course will introduce the basics of remote sensing including the concepts of aerial photograph different types of aerial photography, techniques for acquiring aerial photograph, principals of Remote Sensing, types of satellites, sensors etc. This course will also enable students to learn the concept of image processing including selection of band combination i.e. true and false colour composite, image mosaic, and preparation of land cover/land use map using image interpretation technique. Overall the course will expose students to environ of remote sensing and its applicability. The image processing software will be introduced to the students during the lab activities. This course will consist of practical exercises while different fundamentals to be introduced to the students. The majority of the class will be spent by the students using remote sensing software to comprehend the basics of satellite imagery and allied features. Practical exercises will be submitted by the students on the data collected during the field as a part of the continuous assessment.

Course Content

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

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

Unit II: Basics of Image Processing

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

Unit III: Laboratory Notebook

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

Recommended Readings:

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	0	2	1	2	1	1	1	2	0	2	3	2	2
CO2	2	1	2	1	2	1	1	1	2	0	2	3	2	2
CO3	2	1	2	2	2	3	1	2	2	0	3	2	2	3
CO4	1	1	2	3	2	2	2	2	2	0	2	3	2	3
CO5	1	0	1	2	3	2	2	1	2	0	2	3	2	2
CO6	2	1	2	2	2	2	1	2	2	1	3	2	2	3

Title of the Course: Internship
Code: GEO304
L-T-P-C: 0-0-4-4

Course Objectives

1. To enhance students' understanding of industry practices through firsthand observations during site visits.
2. To develop critical analysis skills by evaluating interactions with industry professionals and organizations.
3. To encourage collaborative learning by engaging in group discussions and reflections post-industry visits.
4. To improve written communication skills through the preparation and submission of a comprehensive Industry Interaction Report.

Course Outcomes

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

CO1. **Recall** key observations and insights gained from industry interactions and visits.
CO2. **Explain** the significance of the industry visit and its relevance to the course.
CO3. **Apply** concepts learned in class to analyze industry practices and their impact.
CO4. **Examine** and compare different industry processes observed during the visit.
CO5. **Critique** industry practices based on theoretical knowledge and personal observations.
CO6. **Develop** recommendations or suggestions for improvements in the industry based on visit findings.

Catalogue Description

This course will help students to show their knowledge in industries or different research institutes. This course directly provides exposure of practical experiences of the learned skills and tool sets. Students shall involve themselves with the activities of different institute and industries. Finally, they need to submit a details report of the activities and experience to the university. This course tremendously helps in boosting confidence of the student.

Course Content

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	1	1	0	1	1	2	1	2	0	1	2	2	1	1
CO2	0	1	1	2	2	1	2	2	2	1	2	2	1	2
CO3	1	2	0	2	1	2	2	2	1	1	2	3	2	1
CO4	1	1	2	2	1	2	1	2	2	2	1	2	1	3
CO5	2	1	1	1	2	2	2	1	2	1	1	1	2	2
CO6	2	2	1	1	2	1	2	1	2	2	2	1	2	2

SEMESTER VI

Title of the Course: Geography of India
Code: GEO305
L-T-P-C: 3-0-1-4

Course Objectives

1. To get an exposure of the physiographic and climatic diversity of India.
2. To understand demographic and economic setup of India.
3. To know about geographical problems of India and about regional planning to combat those problems.
4. To understand the physical, social, cultural and economic setup of West Bengal.

Course Outcomes

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

CO1. **Identify** the geological setup, physiographic regions, and drainage systems of India.
CO2. **Explain** the characteristics and classification of climatic, soil, and vegetation regions of India.
CO3. **Analyze** the distribution and utilization of resources like minerals, power, and forest resources in India.
CO4. **Compare** socio-cultural regions of India and their influence on demographic patterns.
CO5. **Assess** the impacts of industrial development, including automobile and IT industries, on India's economy.
CO6. **Design** a comparative analysis of regional development using resources and industrial belts in West Bengal.

Catalogue Description
This course is basic to the learners of geography. It imparts detailed knowledge about the physical features of the great subcontinent of India, its mountains, plateaus, alluvial plains, coastal plains, desserts, drainage systems and networks. It also gives knowledge about the resources of the Indian landmass, minerals and industries, its economies, agricultural systems, etc. It also tells about the detailed socio-cultural components and regions of India – its races, castes, language groups, ethic and tribal groups, etc. Further, it tries to develop an understanding of various problems over the Indian subcontinent, and also a problem-solving approach using planning strategies. Finally, it gives an understanding of West Bengal as a part of the India, giving a detailed description of its geography. This course will consist of lectures and exercises. The focus will be on the physical, economic and social characteristics of the Indian Territory. The majority of class time will be spent by students on learning about the landforms and various processes of landscape evolution in India, how different socio-cultural groups are found over India, where and why. Exercises will be prepared and submitted by the students on the data specified during the course as a part of the continuous assessment. Exercises could be assignment or power point presentation.

Unit 1: Physical Settings of India
Geological setup of India; Physiographic regions of India (R.L. Singh), Drainage System (Peninsular and Extra Peninsular): Characteristics and classifications; Climatic, Soil, and Vegetation Region of India.

Unit II: Demography and Economy
Population size and growth; age and sex structure; rural-urban distribution; Socio–cultural regions of India (Sopher); Resource distribution: Forest resources – distribution and utilization; Mineral and power resources distribution and utilization of Iron ore, Coal, Petroleum, Natural Gas, Bauxite and

Hydroelectricity; Industrial development: Automobile Industry, Information Technology, and Industrial Regions.

Unit III: Regional Problems and Planning

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

Unit IV: Geography of West Bengal

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

Unit V: Geography of India Lab

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

Recommended Readings:

1. Bose, A. et. al. eds, 2001: Population in India's Development, 1947-2000, Vikas, New Delhi.
2. Chatterjee, S. P. (1973): Physiography of India, Gazetteer of India, Vol. I, Chopra, P. N. (Ed.), Govt. of India, New Delhi.
7. Khullar, D. R. (2006): India. A Comprehensive Geography. Kalyani Publishers., New Delhi.
8. Mandal R. B. (ed.), 1990: Patterns of Regional Geography – An International Perspective. Vol. 3 – Indian Perspective.
9. Mita, A. Levels of regional Development India Census of India, Vol. Part I-A (i) and (ii) New Delhi, 1967.
11. Pathak, C. R. 2003: Spatial Structure and Processes of Development in India. Regional Science Assoc., Kolkata
12. Routray, J.K. Geography of Regional Disparity Asian Institute of Technology, Bangkok, 1993.
14. Sdyasuk Galina and P Sengupta (1967): Economic Regionalisation of India, Census of India
15. Sharma, T. C. 2003: India - Economic and Commercial Geography. Vikas Publ., New Delhi.
16. Singh R. L., 1971: India: A Regional Geography, National Geographical Society of India.
17. Singh, Jagdish 2003: India - A Comprehensive & Systematic Geography, GyanodayaPrakashan, Gorakhpur.
18. Spate O. H. K. and Learmonth A. T. A., 1967: India and Pakistan: A General and Regional Geography, Methuen.
19. Tirtha, Ranjit 2002: Geography of India, RawatPubls., Jaipur & New Delhi.
20. Tiwari, R. C. (2007): Geography of India, PrayagPustakBhawan, Allahabad
22. Wadia, D.N: Geography of India, McMillan & Co., London, 1967.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	2	2	2	2	1	2	0	1	2	2	3	2
CO2	3	2	2	2	1	2	2	1	0	1	2	2	2	3
CO3	3	2	1	2	3	2	2	2	0	1	2	3	2	2

CO4	2	2	2	3	1	2	2	3	0	2	2	2	2	2
CO5	3	2	2	2	2	2	2	2	1	2	2	2	3	2
CO6	3	2	1	3	2	3	2	2	0	2	3	2	2	3

Title of the Course: Evolution of Geographical Thought
Code: GEO306
L-T-P-C: 3-0-1-4

Course Objectives

1. To explore the relationship between geography and other disciplines, emphasizing human-environment interactions.
2. To examine the evolution of geographical thinking from classical to modern periods across cultures.
3. To analyze the various approaches in geography, including environmental determinism, positivism, and feminism.
4. To evaluate the impact of the Quantitative Revolution and post-modernism on geographical concepts and practices.

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

CO1. **Recall** the nature of Geography and its relation to other disciplines.
CO2. **Explain** human-environment relationships and the core concepts in Geography.
CO3.**Apply** approaches like ideographic and nomothetic to spatial organization and areal differentiation.
CO4. **Compare** the geographical thinking evolution during Classical, Medieval, and Modern periods.
CO5.**Critically** assess modern debates such as Environmental Determinism, Possibilism, and Positivism in Geography.
CO6. **Create** a detailed analysis of the changing perceptions of world maps and historical voyages.

Catalogue Description

This course will introduce about the emergence of geography as a scientific discipline in global academia. It tells us about the history of geography, how different nations and people contributed to the enrichment of the subject matter from the ancient times to modernity. It also draws attention towards future scope and prospects of geography and geographers. This course will consist of lectures and exercises. The focus will be on the different paradigm shifts in geography from time to time and the development of the discipline and its various sub-fields. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will be able to explain evolution of geographical thoughts.

Course Content

Unit 1: Nature and Concepts in Geography:

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

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

Unit III: Modern Debates and Thoughts:
Environmental Determinism and Possibilism; Empiricism and Positivism, Systematic and Regional approaches in Geography, Probabilism, and Structuralism

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

Unit V: Evolution of Geographical Thought Lab
Changing Perception of maps of the world (Ptolemy, Ibn Battuta, Mercator), Mapping voyages; Columbus, Vasco da Gama, Magellan, Thomas Cook

Recommended Readings:

1. Adhikari, S. (2002): Fundamentals of Geographical Thought, ChaitanyaPublishing. House, Allahabad.
2. Harvey, D. (1969): Explanations in Geography, London.
3. Hartshorne, R. (1939): The Nature of Geography: Association of American Geographers, USA.
4. Harvey, Milton E., and Brian, P. Holly (Ed.) (1981): Themes in Geographical Thought, Rawat Publication, Delhi.
5. Hossain, M. (2004): Evolution of Geographical Thought, Rawat Publications, Jaipur.
6. Johnston, R. J. et al (Ed.) (1981) The Dictionary of Human Geography, Blackwell, England.
7. Peet, R. (Ed.) (1977): Radical Geography, Methuen, London.
8. Haggett.: Geography – A Modern Synthesis.
9. Arentsen M., Stam R. and Thuijis R. (2000): Post-modern Approaches to Space, ebook.
10. Bonnett, A. (2008): What is Geography? Sage.
11. Dikshit, R. D. (2005): Geographical Thought: A Contextual History of Ideas, Prentice–Hall India.
12. Hartshone, R. (1959): Perspectives of Nature of Geography, Rand MacNally and Co.
13. Holt-Jensen, A. (2011): Geography: History and Its Concepts: A Students Guide, SAGE.
14. Johnston, R. J. (1997): Geography and Geographers, Anglo-American Human Geography since 1945, Arnold, London.
15. Kapur, A. (2001): Indian Geography Voice of Concern, Concept Publications.
16. Martin Geoffrey, J. (2005): All Possible Worlds: A History of Geographical Ideas, Oxford.
17. Soja, E. (1989): Post-modern Geographies, Verso, London. Reprinted 1997, Rawat Publ., Jaipur and New Delhi.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	2	1	1	2	2	1	2	1	0	2	2	2	0
CO2	2	3	2	3	2	2	1	2	2	1	2	2	2	3
CO3	2	2	2	2	2	2	2	0	2	1	2	3	2	2
CO4	2	3	2	1	1	1	2	3	2	2	2	0	3	2
CO5	2	3	2	2	2	2	2	1	2	2	2	3	2	2
CO6	2	2	2	1	1	2	2	2	2	3	2	2	2	2

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

Course Objectives

1. To analyze and select appropriate field techniques for rural or urban problem studies.
2. To design effective questionnaires and survey schedules for data collection on various issues.
3. To prepare comprehensive project reports, focusing on data analysis and interpretation.
4. To conduct individual case studies on disaster management, emphasizing primary and secondary data collection.

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

CO1. **Recall** various field techniques and tools used in rural/urban environmental studies.
CO2. **Explain** the significance of selecting appropriate field techniques for socio-economic and physical surveys.
CO3. **Use** observation methods and questionnaires to collect data in rural/urban fieldwork.
CO4. **Analyze** physical and socio-economic data collected during field surveys to identify key issues.
CO5. **Evaluate** the effectiveness of disaster management projects based on field-based case studies.
CO6. **Design** a comprehensive field report with methodology, analysis, and interpretation based on collected data.

Catalogue Description

Field trips are enriching experiences for students to test their knowledge gained throughout the program. This course is designed to gain a new knowledge or clarifying concepts learned in the classroom. Field excursion will provide opportunities to the students to explore the knowledge of physical, social and cultural geography to find the solution for environmental pollution, economic development and social progress. Through this course students can foster interest and motivation to learn and research in various aspects of Geography. Concomitantly writing of the project and their oral presentation will help to improve their thinking, writing and communication skills. This course will consist of lectures, hands-on training to handle various field instruments, field visits, data collection, data analysis, report writing and presentation. The focus will be on enhancing problem identification capacity, data collection from field and their analysis. The majority of classes will be

invested on field, and in laboratory for data analysis and interpretation. Students will be given tasks for preparing questionnaires, data tabulation and analysis, laboratory testing, identifying and relating the factors for physical and social conditions. Submission of the prepared report and its presentation should be done by the students at the end of the course.

Course Content

Unit 1: Selection of study area:
Selection of either a rural area or an urban area based on cadastral or municipal maps to study specific problems (Rural / Urban / Physical / Human / Environmental). Field Techniques and Tools: Merits, Demerits, and Selection of the Appropriate Technique; Observation (Participant / Non-Participant), Questionnaires (Open/ Closed / Structured / Non-Structured); Interview with Special Focus on Focused Group Discussions; Space Survey (Transects and Quadrants,Constructing a Sketch), Field Tour Planning: Collection of Material for Physical and Socio-Economic Surveys.

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

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

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

Recommended Readings:

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

CO-PO-PSO correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	1	2	1	1	1	1	1	0	2	2	2	2
CO2	2	2	1	2	1	2	2	1	1	0	2	1	2	2
CO3	2	1	1	2	1	1	2	1	1	0	2	2	2	2
CO4	2	2	2	3	2	2	2	2	2	0	2	2	2	2
CO5	2	1	2	2	2	2	2	2	2	1	1	2	2	2
CO6	2	1	2	2	2	2	3	2	2	1	2	2	2	2

Title of the Course: Project
Code: GEO308
L-T-P-C: 0-0-4-4

Course Objectives

1. To identify contemporary issues suitable for analysis using Geoinformatics techniques.
2. To analyze data related to selected contemporary issues through Geoinformatics.
3. To develop project proposals addressing contemporary issues using Geoinformatics methodologies.
4. To effectively write and present project findings on contemporary issues in Geoinformatics.

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

CO1. **Recall** contemporary issues in Geoinformatics for problem identification and analysis.
CO2. **Explain** the application of Geoinformatics in solving contemporary issues.
CO3. **Use** Geoinformatics tools to identify and analyze real-world issues.
CO4. **Examine** contemporary issues critically using Geoinformatics data and techniques.
CO5. **Assess** the effectiveness of Geoinformatics methods in addressing contemporary issues.
CO6. **Develop** a comprehensive project report on contemporary issues using Geoinformatics techniques.

Catalogue Description

This course is to equip students to work individually on designated topic in applied geography and geospatial domain. The course is very specific and goal oriented. The course specifically focuses on enhancing skill of students in delivering seminar presentation. It will also improve the analytical capacity of students. Testing hypothesis, making extensive literature review and making change detection and geographic study of the place on habitat, economy and society is the purpose of the course. This course aims to generate confidence in students to present a topic on front of larger audience. Supervisor will look after the progress of the study time to time of the student. Student must prepare a power point presentation which is to be presented for final evaluation.

Course Content

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

Recommended Readings:

1. Basu, R. and Bhaduri, S. ed, (2007): Contemporary Issues and Techniques in Geography, Progressive Publishers, Kolkata.

2. Hammond, R, and McCullagh, P. (1978): Quantitative Techniques in Geography: An Introduction, Oxford University Press, Oxford.

3. Creswell, J. (1994): Research Design: Qualitative and Quantitative Approaches Sage Publications.

4. Mukherjee, N. (1993): Participatory Rural Appraisal: Methodology and Application. Concept Publs. Co., New Delhi.

5. Mukherjee, N. (2002): Participatory Learning and Action: with 100 Field Methods. Concept Publs. Co., New Delhi.

6. Robinson, A. (1998): "Thinking Straight and Writing That Way", in Writing Empirical Research Reports:A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.

7. Special Issue on "Doing Fieldwork" The Geographical Review 91:1-2 (2001).

8. Stoddard, R.H. (1982): Field Techniques and Research Methods in Geography, Kendall/Hunt.

9. Wolcott, H. (1995): The Art of Fieldwork. Alta Mira Press, Walnut Creek, CA.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	0	1	3	0	1	0	2	2	3	1	2	1
CO2	1	1	1	2	2	2	1	1	2	2	3	2	1	3
CO3	2	0	3	2	3	1	2	1	1	3	1	3	3	2
CO4	3	1	2	3	2	1	3	2	1	1	2	2	2	3
CO5	0	1	1	0	1	2	2	0	2	1	2	3	1	1
CO6	2	2	1	1	2	3	1	2	2	2	1	2	3	2

SEMESTER VII

Title of the Course: Agricultural Geography
Code: GEO401
L-T-P-C: 3-0-1-4

Course Objectives

1. To examine the origin of agriculture and its major gene centers, emphasizing the relationship between agriculture and human civilization.
2. To analyze major agricultural types globally and evaluate the effectiveness of models like Von Thunen and Whittlesey.
3. To assess the characteristics and challenges of Indian agriculture, focusing on technological changes and their impact on productivity.
4. To explore sustainable agricultural practices in tropical regions, emphasizing ecological conservation and innovative farming techniques.

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

CO1. **Recall** the origin and diffusion of agriculture and its impact on human civilization.
CO2. **Explain** the factors influencing tropical agriculture, including physical, economic, and technological determinants.
CO3. **Apply** agricultural systems models like Von Thunen and Whittlesey to real-world farming scenarios.
CO4. **Analyze** the challenges and technological changes influencing agricultural productivity in India.
CO5. **Evaluate** the success and failures of India's agricultural revolutions and their socio-economic impact.
CO6. **Design** sustainable agricultural practices to address tropical agriculture's environmental and productivity challenges.

Catalogue Description
This course is designed to define the basic concept of agricultural geography with includes the origin and evolution of agriculture, techniques of agricultural regionalization, agricultural systems of the world, methods of measuring agricultural productivity and efficiency, application of agricultural geography. It will enrich students' knowledge on the determinants of agriculture, agricultural regionalization models, characteristics and problems of Indian agricultural system, role of technological changes in agricultural productivity and efficiency. This course will further illustrate different allied areas in agriculture and methods of sustainable agricultural practices.This course will consist of lectures and exercises. The focus will be on the origin and evolution of agricultural system, agricultural regionalization, agricultural system of the world, Indian agricultural system and application of agricultural geography. The majority of class time will be spent by students on learning about the methods of estimating agricultural productivity, efficiency, crop combination and diversification, methods of agricultural regionalization, characteristics, problems and challenges of Indian agriculture, allied areas in agriculture and methods of sustainable agricultural practices. Exercises will prepared and submitted by the students on the subject specified during the course as a part of the continuous assessment. Exercises could be assignment or power point presentation.

Course Content

Unit 1: Introduction to Agricultural Geography

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

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

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

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

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

Recommended Readings:

1. Basu, D.N., and Guha, G.S., 1996: Agro-Climatic Regional Planning in India, Vol.I& II, Concept Publication, New Delhi.
2. Bryant, C.R., Johnston, T.R, 1992: Agriculture in the City Countryside, Belhaven Press, London.
3. Burger, A., 1994: Agriculture of the World, Aldershot, Avebury.
4. Dhillon, J.S. Agricultural Geography
5. Gregory H. P. (1970), "Geography of Agricultural", Prentice Hall New York
6. Grigg, D.B., 1984: Introduction to Agricultural Geography, Hutchinson, London.
7. Husain, Majid. (1999), "Agricultural Geography", Rawat Pub. New Delhi
8. Ilbery B. W., 1985: Agricultural Geography: A Social and Economic Analysis, Oxford University Press.
9. Mohammad, N., 1992: New Dimension in Agriculture Geography, Vol. I to VIII, Concept Pub., New Delhi.
10. Mohammad, N., 1992: New Dimension in Agriculture Geography, Vol. I to VIII, Concept Pub., New Delhi.
11. Roling, N.G., and Wageruters, M.A.E.,(ed.) 1998: Facilitating Sustainable Agriculture, Cambridge University Press, Cambridge.
12. Shafi, M., 2006: Agricultural Geography, Doring Kindersley India Pvt. Ltd., New Delhi
13. Singh, J. and Dhillon, S.S. (1984), "Agricultural Geography", 2nd edition, Tata McGraw-Hill, New Delhi.
14. Singh, J., 1974: An Agricultural Atlas of India: A Geographical Analysis, Vishal Publications, Kurukshetra.
15. Singh, J., and Dhillon, S.S., 1984: Agricultural Geography, Tata McGraw Hill, New Delhi.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	0	1	1	0	1	0	0	1	0	3	1	1	0
CO2	3	1	2	1	2	1	1	0	1	1	2	3	2	1
CO3	2	2	3	1	2	2	0	1	1	1	3	2	2	2
CO4	2	1	1	3	1	2	2	1	2	2	1	2	3	2
CO5	1	0	2	1	0	3	1	0	2	0	3	1	2	1
CO6	0	1	1	3	3	2	2	1	1	1	2	3	3	3

Title of the Course: Urban Geography
Code: GEO402
L-T-P-C: 3-0-1-4
Course Objectives

1. To explore the definition and scope of urban geography through various approaches and frameworks.
2. To analyze the processes of urbanization in different historical contexts and their impact on global cities.
3. To evaluate urban aesthetics and changing urban spaces, focusing on concepts like gentrification and smart city initiatives.
4. To assess urban planning policies in India, considering employment, housing, and environmental sustainability challenges in major cities.

Course Outcomes
On completion of this course, the students will be able to:
CO1. **Define** key terms and concepts in urban geography, such as urbanization and urban space.
CO2. **Explain** the different approaches to studying urban geography, including positivist and structuralist approaches.
CO3. **Analyze** the process of urbanization in developed and developing countries using case studies.
CO4. **Compare** urban patterns and issues like gentrification, suburbanization, and smart cities in different contexts.
CO5. **Assess** the impacts of urban problems like displacement, housing, and sustainability in major cities.
CO6. **Prepare** urban land use maps and analyze trends in urban growth using census and satellite data.

Catalogue Description

The main objective of this course is to introduce the concepts and basics of urban spaces and urban geography. It deals with critical issues of urban geography including patterns of growth and development of urbanisation on distinct spatio-temporal scale while highlighting the key concepts and concerns of urban problems and implications. This course will consist of lectures and exercises. All the lectures will be devoted on discussions of basic theories and concepts focusing on practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep

thinking, problem-solving attitude, model making etc. at the end of the course students will get a vast knowledge about concepts, processes, pattern and problems of urban landscape.

Course Content

Unit 1: Introduction to Urban Geography:
Definition of Urban Geography: Nature and scope; Approaches: Positivist approaches, Behavioural and humanistic approaches, Structuralist approaches, Urbanization: Definition and measurements; the process of urbanization during the ancient, medieval, modern and postmodern period; Globalization and the political economy of Urbanization.

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

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

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

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

Recommended Readings:

1. Graham, S. and Marvin, S. (2001): Splintering Urbanism: Networked Infrastructures, Technological Motilities, and the Urban Condition, Rutledge
2. Hall T. (2006): Urban Geography, Taylor and Francis.
3. Harvey, David (1989) The Conditions of Postmodernity, Blackwell Oxford.
4. Kaplan, D.H., Wheeler, J.O. and Holloway, S.R. (2008): Urban Geography, John Wiley.
5. Knox, P.L. and McCarthy, L. (2005): Urbanization: An Introduction to Urban Geography, Pearson Prentice Hall New York.
6. Knox, P.L. and Pinch, S. (2006): Urban Social Geography: An Introduction, Prentice-Hall.
7. Kundu, A (1992) Urban Development and Urban Research in India, Khanna Publication, New Delhi.
8. Mayer H.M. and Kohn, C.F. (1958), Reading Urban Geography. University of Chicago Press,Chicago.
9. Pacione, Michael (2001), Urban Geography - A Global Perspective, Routledge, London.
10. Ramachandran, R. (1992): The Study of Urbanisation, Oxford University Press, Delhi.
11. Singh, K. and Steinberg, F. (eds.) (1987) Urban India in Crisis, New Age International, New Delhi.

12. Singh, R.B. (Ed.) (2015): Urban development, challenges, risks and resilience in Asian megacities.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	0	0	2	1	0	1	0	0	2	0	0	1
CO2	2	1	2	1	3	1	1	1	2	1	3	2	1	2
CO3	2	0	3	1	2	0	1	1	3	0	3	2	2	2
CO4	3	1	2	1	2	0	1	1	2	0	3	2	2	2
CO5	2	1	1	1	2	3	2	2	2	1	2	2	1	2
CO6	1	0	1	3	2	1	0	2	1	0	2	3	2	3

Title of the Course: Advanced Geoinformatics
Code: GEO403
L-T-P-C: 1-0-3-4

Course Objectives

1. To introduce the fundamental concepts and applications of multispectral, hyperspectral, thermal, and microwave remote sensing.
2. To develop an understanding of GIS data types, digitization processes, and raster/vector data structures for spatial analysis.
3. To train students in image preprocessing techniques, including radiometric and geometric correction, and enhance skills in image classification.
4. To enable the application of remote sensing and GIS in analyzing land use, urban sprawl, and forest monitoring through project-based exercises.

Course Outcomes

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

CO1. **Recall** concepts and applications of multispectral, hyperspectral, thermal, and microwave remote sensing.
CO2. **Explain** digital image concepts, including pixels, DN values, grey levels, and color models.
CO3. **Apply** GIS data structures (raster, vector) and analyze spatial data using map manipulation techniques.
CO4. **Analyze** vector and raster data for thematic map preparation and operations like buffering and overlay.
CO5. **Evaluate** image enhancement methods and classification schemes for land use/land cover applications.
CO6. **Design** image preprocessing and classification workflows for urban sprawl and forest monitoring applications.

Catalogue Description

This course is designed to provide students with a critical understanding of the theory and practice of Geographical Information Systems (GIS) and allied remote sensing and image processing techniques within the field of applications in geography. It will enrich students' knowledge on the geo referencing, image processing, image classification, overlay analysis and thematic mapping. This course will further focus on the application of Remote Sensing and GIS. This course will consist of lab based exercises. The focus will be on the image processing, image classification, thematic mapping and use of remotely sensed images in the field of u land use land cover mapping, rban sprawl analysis and forests monitoring. The majority of class time will be spent by students on learning about the methods image processing, techniques of image classification using remote sensing and GIS softwares and application of remote sensing and GIS in different fields. Exercises will prepared and submitted by the students on the subject specified during the course as a part of the continuous assessment. Students will prepare a Laboratory notebook based on their class assignments.

Course Content

Unit I: Advances in Remote Sensing

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

Unit II: GIS Data Structure and Operations

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

Unit III: Image Processing and Applications

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

Unit IV: Laboratory Notebook

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

Recommended Readings:

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

9. Mukherjee, S. (2004) Textbook of Environmental Remote Sensing, Macmillan, Delhi.
10. Nag P. and Kudra, M., 1998: Digital Remote Sensing, Concept, New Delhi.
11. Narayan, L.R.A. (1999): Remote Sensing and Its Application, Universities Press (India) Ltd., Hyderabad.

CO-PO-PSO correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	1	1	2	1	1	0	0	1	2	2	1	1
CO2	2	1	1	1	3	1	1	0	1	1	3	2	2	2
CO3	1	1	2	2	2	2	1	0	0	0	3	2	3	2
CO4	1	2	2	3	2	2	2	0	1	1	2	2	3	2
CO5	0	1	2	3	3	2	2	1	2	2	2	3	3	3
CO6	0	1	1	3	3	2	2	1	3	3	2	2	3	3

Title of the Course: Research Methodology
Code: GEO404
L-T-P-C: 3-0-1-4

Course Objectives

1. To introduce students to the fundamental concepts of geographic research and guide them in framing research questions, objectives, and hypotheses.
2. To provide knowledge of sampling techniques, statistical populations, and the characteristics of a good sample in research methodology.
3. To enable students to collect, process, and analyze qualitative and quantitative data, utilizing appropriate methods and representation techniques.
4. To equip students with skills for academic report writing, including literature review, citation management, and effective use of academic databases for structured research.

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

CO1. **Define** key terms and concepts related to research, including types, motivations, and objectives.
CO2. **Explain** the significance and process of conducting a literature review and citation methods.
CO3. **Select** and evaluate research problems, and formulate research objectives based on specific criteria.
CO4. **Differentiate** between sampling methods and apply principles to sample size calculation.
CO5. **Assess** the coherence, reliability, and validity of data used in scientific research.
CO6. **Write** an introduction, methods, and results sections of a scientific research paper.

Catalogue Description

The primary objective of this course is to develop a research orientation among the students and to acquaint them with fundamentals of research methods and research writing capability. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific research

methods useful for geographers and their approach. It includes discussions on sampling techniques, literature review, research designs and techniques of analysis. Through the field study and term project students will be able to explore their understanding of the research methods. The project will be based on local environmental problem.

Course Content

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

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

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

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

Recommended Readings:

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	1	3	2	3	2	0	1	0	3	2	1	0
CO2	2	1	2	3	2	3	2	0	1	1	3	2	2	0
CO3	3	1	3	2	3	2	2	1	2	0	3	3	3	2
CO4	3	1	2	2	3	1	2	1	1	0	2	3	2	3
CO5	3	2	3	2	2	2	2	0	2	1	3	3	2	2
CO6	3	1	3	3	2	3	3	0	2	0	2	2	2	3

Title of the Course: Resource Geography
Code: GEO405
L-T-P-C: 3-0-1-4

Course Objectives

1. To understand the concept, scope, and classification of resources and their utilization approaches.
2. To analyze the global distribution and management of natural resources like forests and minerals.
3. To evaluate the causes and management strategies for environmental crises like deforestation and floods.
4. To explore sustainable resource development and the role of national policies in conservation.

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

CO1. **Define** and classify different types of resources, understanding their nature and scope.
CO2. **Explain** the global distribution and management issues related to resources like energy and minerals.
CO3. **Apply** Zimmerman's model to analyze resource processes and assess resource adequacy.
CO4. **Evaluate** the causes and impacts of resource depletion and propose management strategies.
CO5. **Design** sustainable resource development plans based on eco-friendly technologies and national policies.
CO6. **Assess** the local resource conditions through mapping and case studies on resource scarcity and depletion.

Catalogue Description

This course gives major emphasis on resources management and solution of problem arising from resource utilization. The course also concentrates on resource distributions and locations. The course also enhances planning capabilities of the student with respect resource optimization. This course will consist of lectures and exercises. All the lectures will be devoted to discussions of fundamental theories and concepts focusing on the practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as PowerPoint presentation, audio-visual animation and documentary presentation, case studies analysis as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get in depth knowledge about resources and allied topics.

Course Content

Unit I: Concept and Nature of Resources

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

Unit II: Distribution and Management of Natural Resources

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

Unit III: Environmental Crisis and Management

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

Unit IV: Concept of resource conservation and Sustainability

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

Unit V: Resource Analysis Lab

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

Recommended Readings:

1. Adams, W.M.1995: Green development: Environmental sustainability in the Third World, London: Rout ledge.
2. Burton, I. and Kates, R.W. 1978: Readings in Resources Management and Conservation, McGraw Hill, New York.
3. Canter, L. W. 1996: Environmental Impact Assessment, 2nd edition, New York: McGraw Hill.
4. Chapman J.L. and Reiss, M.J. 1993: Ecology: Principles and applications, Cambridge: Cambridge University Press.
5. Clark, G.L; Feldman, M.P. and Gertler, M.S. (eds.) 2000: The Oxford Handbook of Economic Geography,
6. Oxford University Press, Oxford and New York.
7. Cutter S. N., Renwich H. L., and Renwick W., 1991: Exploitation, Conservation, Preservation: A Geographical Perspective on Natural Resources Use, John Wiley and Sons, New York.
8. David W. Pearce and Kerry R. Turner 1999: Economics of Natural Resources and the Environment, The Johns Hopkins University Press, Baltimore.
9. Gadgil M. and Guha R., 2005: The Use and Abuse of Nature: Incorporating This Fissured Land: An Ecological History of India and Ecology and Equity, Oxford University Press. The USA.
10. Holechek J. L. C., Richard A., Fisher J. T., and Valdez R., 2003: Natural Resources: Ecology, Economics and Policy, Prentice Hall, New Jersey.
11. Hoyt, J.B. (1973) Man and the earth, Prentice Hall, New Jersy.
12.Husain, M. (2010) Human Geography, Rawat Publication, Jaipur.
13.John Bowers (1997), Sustainability and Environmental Economics, Addison Weley Longman Ltd, Singapore.
14.Jones G. and Hollier G., 1997: Resources, Society and Environmental Management, Paul Chapman, London.
15.Klee G., 1991: Conservation of Natural Resources, Prentice Hall, Englewood.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	1	1	1	1	2	1	1	1	0	0	2	2	2	1
CO2	2	2	1	2	2	2	1	2	1	1	2	2	2	1
CO3	1	0	2	2	2	3	2	3	0	1	2	2	1	2
CO4	2	1	2	2	2	2	1	2	1	1	2	2	2	1
CO5	1	1	2	2	2	2	2	1	2	1	2	2	2	1
CO6	1	1	1	1	1	2	2	2	1	2	2	2	2	2

SEMESTER VIII

Title of the Course: Disaster Management
Code: GEO406
L-T-P-C: 3-0-1-4

Course Objectives

1. Analyze sources and impacts of air, water, soil, and noise pollution using geographers' approaches.
2. Assess community vulnerabilities and develop disaster management strategies for natural and man-made hazards.
3. Critically evaluate global environmental issues and appraise sustainable development initiatives for effective resource management.
4. Examine land-use dynamics and their effects on environmental changes, including degradation and conservation strategies.

Course Outcomes

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

CO1. **Identify** the components of the environment and their relationship in the context of pollution.

CO2. **Explain** the significance of environmental perception and its impact on pollution management.

CO3.**Analyze** the sources and impacts of various types of pollution and suggest management strategies.

CO4.**Compare** natural, quasi-natural, and man-made hazards and assess their social and environmental impacts.

CO5.**Critically** evaluate the effectiveness of international environmental policies like Montreal and Kyoto Protocols.

CO6.**Develop** an environmental management plan based on the monitoring of air, water, and soil pollutants.

Catalogue Description

This course provides an in-depth examination of environmental pollution, community vulnerabilities, and the dynamics of land use. Students will critically analyze various forms of pollution—air, water, soil, and noise—exploring their sources, impacts, and management strategies through a geographical lens. The course will also cover the concepts of hazards and disasters, focusing on vulnerability assessment and effective disaster management strategies for both natural and man-made events. Further, students will engage with global environmental issues, appraising sustainable development initiatives and international protocols aimed at addressing resource crises. The curriculum includes an exploration of land-use and land-cover dynamics, assessing their impacts on environmental change and degradation. Practical components will involve environmental monitoring techniques, enabling students to measure pollutants and analyze landscape patterns.

This course will consist of lectures and exercises. All the lectures will be devoted to discussions of fundamental theories and concepts focusing on the practical implementation of knowledge and critical thinking. Classes will be conducted by lecture as well as PowerPoint presentation, audio-visual animation and documentary presentation, case studies analysis as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc.

By the end of the course, students will be equipped with the knowledge and skills to evaluate and propose effective strategies for environmental management and sustainability.

Course Content

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

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

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

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

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

Recommended Readings:

1. Anderson J.M. (1981): Ecology for Environmental Science: Biosphere, Ecosystems and Man, Arnold, London.
2. Nobel and Wright (1996): Environmental Science, Prentice Hall, New York.
3. Odum, E.P. (1971): Fundamental of Ecology, W.B. Sanders, Philadelphia.
4. Saxena, H.M. (1994): PrayavaranevnParisthitikiBhugool (Geography of Environment and Ecology) Rajasthan Hindi Granth Academy, Jaipur.
5. Singh, Savinder (1991): Environmental Geography, PrayagPustak Bhawan, Allahabad.
6. Strahler, A.N. and Strahler, A.H. (1973): Environmental Geosciences: Interaction between natural systems and Man, John Wiley and Sons, New York.
7. Strahler, A.H. and Strahler A.N. (1977): Geography and Mans Environment, John Wiley, New York.
8. William, M.M. and John, G. (1996): Environmental Geography - Science, Landuse and Earth System, John Wiley and Sons, New York.
9. Alexander, D. (1993): Natural Disasters, Research Press, New Delhi, 619 P.

10. Blaikie, P. Cannon, Davis and Wisenes (1994): At Risk, Natural Hazards, People's Vulnerability and Disasters, Pouthledge, London, 320 P. 15.
11. Bryant, E. A. (1991): Natural Hazards: Cambridge University Press, Cambridge, Pg 294.
12. Burotn, I. Kates, R. W. and White, G. F. (1974): The Environment as a Hazard, Oxford University Press.
13. 17. Coch, N. C. (1994): Geo-Hazards, Prentice Hall, N. Y., Pg.305.
14. Environment and Development: R. Bhattacharyya, (Edited).
15. Environmental Geology: B. W. Murck and et al, John Willey.
16. Gilbert, F. White, ed. (1974): Natural hazards – Local, Natural and Global, Oxford University Press, N.Y.
17. Morrisawa, M., (1996): Geomorphology and Natural Hazards,Elscvia, Amsterdam, pg 411
18. Natural Hazard: Edited by White.
19. Smith, K. (1996): Environmental Hazards: Assessing Risk and Reducing Disaster, Routledge, Pg.398.
20. Turner, M.G., Gardner, R.H. and O'Neill, R.V. (2001): Landscape Ecology in Theory and Practice:
21. Pattern and Process, Springer Science & Business Media, New York
22. Jana, N.C. and De, N.K. (1997): The Land - Multifaceted Appraisal and Management, Sribhumi Publishing Company, Kolkata

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	0	1	1	1	0	0	0	1	0	3	2	2	1
CO2	2	3	2	3	0	2	1	1	2	1	2	3	3	2
CO3	1	1	0	1	1	0	0	0	1	0	2	2	3	2
CO4	3	2	1	2	2	1	2	1	1	0	2	1	3	3
CO5	0	1	1	2	1	1	0	1	1	2	2	1	2	2
CO6	1	2	1	3	2	3	2	2	2	1	2	1	2	3

Title of the Course: Population and Settlement Geography
Code: GEO407
L-T-P-C: 3-0-1-4

Course Objectives

1. To introduce the nature, scope, and trends in population geography and data sources.
2. To analyze the factors influencing spatial distribution and density of populations globally and locally.
3. To explore population dynamics and demographic attributes, focusing on issues like fertility, mortality, and migration.
4. To evaluate rural-urban settlement issues and the infrastructure challenges in contemporary India.

Course Outcomes

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

CO1. **Identify** the sources of demographic data (Census, Vital Statistics, NSS) used in India.

CO2. **Explain** the concept of population density and factors influencing its spatial distribution.

CO3. **Apply** demographic theories (Malthus, Marx) to analyze population growth in India and China.

CO4. **Compare** rural and urban settlement patterns using classical models (Burgess, Hoyt, Christaller).

CO5. **Assess** the implications of emerging population issues such as ageing, sex ratio, and HIV/AIDS.

CO6. **Develop** a population projection model using life tables and nearest neighbor analysis for settlement patterns.

Catalogue Description

This course will introduce the students with the growth of the world's population, settlement and associated problems and shows an understanding of the causes and consequences of over-population and under- population. It will define the main components influencing population growth; will also describe the relationship between population and settlement both urban and rural. This paper also illustrates different theories of settlement and also highlight case studies associated urban infrastructural issues. Classes are conducted by lecture as well as PowerPoint presentation, audio-visual animation and documentary presentation, case studies analysis as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-solving attitude, model making etc. at the end of the course students will get a board knowledge about population related phenomena and settlement issues.

Course Content

Unit I: Population Dynamics

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

Unit II: Demographic Attributes and Concerns

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

Unit III: Introduction to Rural and Urban Settlements

Definition, nature, types and characteristics of settlements; Morphology of rural settlements: site and situation, Social segregation rural land use morphology; Types and Patterns of Rural Settlements; Rural house types and forms with reference to India, Urban settlements: Characteristics and definition, Census definition and categories in India; Concept of Metropolitan, Conurbation, Megacity, Megalopolis, Ecumenopolis and Necropolis, Morphology and Functions of Settlements:

Classical models of Burgess, Homer Hoyt, Harris and Ullman, Central Place theory of Christaller; City Region, Umland and Rural-urban Fringe and Continuum

Unit IV: Rural-Urban Infrastructure: Issues and Concerns

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

Unit V: Spatial Demography and Settlement Patterns

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

Recommended Readings:

1. Carter, H.1975: The Study of Urban Geography, Edward Arnold, London
2. Daniel, P. 2002: Geography of Settlement, RawatPubls., Jaipur & New Delhi.
3. G. Dickinson, R. E. (1964): City and Region.
4. Ghosh, S. 1998: Settlement Geography, Orient Longman Ltd., Kolkata.
5. Hudson, F. S. (1976) : Geography of Settlement.
6. Johnson, J.H. 1977 Urban Geography- An Introductory Analysis, Pergamon Press, Oxford
7. Mandal, R.B. 2001: Introduction to Rural Settlements, Concept Publishing Company, New Delhi
8. Misra, H.N. (1987) Rural Geography, Vol. IX, Contributions to Indian Geography, Heritage Publishers, New Delhi.
9. Ramachandran R., 1989: Urbanisation and Urban Systems of India, Oxford University
10. Singh R.L. & K.N. Singh: Readings in Rural Settlement Geography, NGSI Varanasi, 1975
11. Agarwala, S.N. 1985: India's Population Problems, Tata McGraw Hill, New Delhi
12. Chandna, R.C. 1986: A Geography of Population, Kalyani Publishers, New Delhi
13. Clarke, J. I. 1971: Population Geography and the Developing Countries, Pergamon Press, Oxford
14. Clarke, J. I. 1972 Population Geography, Pergamon Press, Oxford
15. Hassan, M.H. 2005: Population Geography, Rawat Publications, New Delhi
16. Mamoria, C.B. India's Population Problem, KitabMahal New Delhi, 1981.
17. Mitra, Ashok India's Population: Aspects of Quality and Control Vol I & II. Abhiman Publications, New Delhi, 1978.
18. Trewartha, G.T. 1969: A Geography of Population- World Patterns, John Wiley, New York.
19. Zacharia, E. and Sinha, V.C., 1986: Elements of Demography, Allied Publishers Pvt Ltd, New Delhi

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	0	2	1	2	1	0	2	1	2	1	0	1
CO2	2	2	1	2	1	2	2	0	2	1	2	2	2	2
CO3	2	1	2	2	2	2	2	0	2	2	2	2	2	2

CO4	2	2	2	2	1	2	2	0	2	1	2	2	2	2
CO5	1	2	2	2	2	2	2	1	2	2	2	2	2	1
CO6	2	2	2	2	2	2	3	0	2	2	2	2	2	3

Title of the Course: Geography of Health and Wellbeing
Code: GEO408
L-T-P-C: 3-0-1-4

Course Objectives

1. To understand the definitions, nature, and scope of health and wellbeing geography.
2. To analyze the linkages between environment, development, and health trends.
3. To evaluate the impact of various environmental pollutants on human health.
4. To assess healthcare systems and policies in developed and developing countries.

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

CO1. **Define** the key concepts of health, wellbeing, and their environmental linkages.

CO2. **Explain** the impact of environmental factors on health risks and disease transmission.

CO3. **Use** GIS tools to analyze and map health data and environmental health disparities.

CO4. **Assess** the distribution and causes of diseases using epidemiological principles and spatial analysis.

CO5. **Critically** evaluate global healthcare systems, policies, and their impact on health equity.

CO6. **Design** thematic maps and visualizations to represent health trends and regional disparities.

Catalogue Description

This course will introduce to the concepts of health and well-being and how public health is emerging as a key issue in geographical discipline at present. The course focuses on the key concepts of health and diseases, linkages between health, environment and development, health equity in the era of increasing poverty and inequality to give students an understanding of the distributional pattern and processes of health outcomes. The course also introduces to the disease classification schemes of WHO and ICD, thereby imparting knowledge and awareness about the global burden of diseases, globalisation and impacts of changing lifestyles on emerging non-communicable diseases (such as cardio-vascular, diabetes, cancer, etc.). Also, establishing linkages between regional development and accessibility to healthcare is very important for geographers, so as to provide possible solutions to the inaccessibility problems and making everyone aware about the global policies and organisational functions related to healthcare. Classes will be conducted by lecture as well as power point presentation, audio-visual animation and documentary presentation as per the requirement. The tutorials will help the students to understand the theories and concepts with deep thinking, problem-

solving attitude, model making etc. At the end of the course students will get a vast knowledge on various dimensions of geography of health and wellbeing.

Course Content

Unit 1: Basic Concepts:
Introduction to geography of health and wellbeing: Definition, Nature and Scope, Perspectives on Health and wellbeing: Linkages with environment, development and health; Driving forces in health and environmental trends – population dynamics, urbanization, poverty and inequality.

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

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

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

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

Recommended Readings:

1. Akhtar Rais (Ed.), 1990: Environment and Health Themes in Medical Geography, Ashish Publishing House, New Delhi.
2. Avon Joan L. and Jonathan APatzed. 2001: Ecosystem Changes and Public Health, Baltimin, John Hopling Unit Press(ed).
3. Bradley,D.,1977: Water, Wastes and Health in Hot Climates, John Wiley Chichesten.
4. Christaler George and HristopolesDionissios, 1998: Spatio Temporal Environment Health Modelling, Boston Kluwer Academic Press.
5. Cliff, A.D. and Peter,H., 1988 : Atlas of Disease Distributions, Blackwell Publishers, Oxford.
6. Gatrell , A.C. (2002) Geographies of Health: An Introduction, Blackwell,
7. Gatrell, A.,andLoytonen (1998). GIS and Health, London: Taylor and Francis Ltd.
8. Gesler, W.M. (1992). Therapeutic landscapes: Medical issues in light of the new cultural geography.
9. Hardham T. and TannavM.,(eds): Urban Health in Developing Countries; Progress, Projects, Earthgoan, London.
10. Meade.M.S and Emch M: Medical Geography, London: The Guilford Press.
11. Moeller Dade wed., 1993: Environmental Health, Cambridge, Harward Univ. Press.
12. Murray C. and A. Lopez, 1996: The Global Burden of Disease, Harvard University Press.
13. Phillips, D.andVerhasselt, Y., 1994: Health and Development, Routledge, London.
14. Rais, A. and Learmonth, A.T.A.: Geographical Aspects of Health and Diseases in India.
15. Smyth, Fiona (2008). Medical geography: Understanding health inequalities. Progress in Human Geography 32 (1): 119-127.
16. Sattenspiel, L. (2009). *The geographic spread of infectious diseases*. Princeton University Press.
17. Souris, M. (2019). *Epidemiology and geography: principles, methods and tools of spatial analysis*. John Wiley & Sons.
18. Boscoe, F. P. (Ed.). (2013). Geographic health data: fundamental techniques for analysis. CABI.
19. Ozdenerol, E. (2016). Spatial health inequalities: Adapting GIS tools and data analysis. CRC Press.
20. Peppard, J., & Smith, S. (Eds.). (2018). An Introduction to Human Geography: Issues for the 21st Century (5th ed.). Pearson.
21. Haynes, R., & Gale, S. (Eds.). (2017). The Routledge Handbook of Health Geography. Routledge.

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	2	1	0	0	1	0	1	2	1	1	1	0	2	1
CO2	2	1	1	0	2	2	1	1	2	1	1	2	2	0
CO3	0	0	2	2	3	1	2	2	0	1	2	3	2	2
CO4	2	1	1	2	1	1	2	2	1	2	2	1	2	1
CO5	0	0	2	3	1	2	1	1	2	2	2	2	2	1
CO6	2	0	0	2	2	1	2	3	2	2	1	2	2	3

Title of the Course: Dissertation

Code: GEO409
L-T-P-C: 0-0-12-12

Course Objectives

1. Analyze data to address specified research problems and achieve research objectives effectively.

2. Appraise ethical considerations in research and development, fostering professional integrity and responsibility.

3. Design comprehensive research reports and scientific articles suitable for publication in academic contexts.

4. Construct a personalized research design to facilitate ongoing learning and inquiry throughout their careers.

Course Outcomes

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

CO1. **Recall** geographical theories and hypotheses related to the study of geographical phenomena.

CO2. **Explain** the comparison of geographical characteristics between two places or phenomena.

CO3. **Apply** comparative methods to analyze changes in geographical characteristics over time.

CO4. **Analyze** geographical problems affecting habitats, economies, and societies.

CO5. **Assess** the effectiveness of theories in explaining geographical phenomena and changes over time.

CO6. **Design** a research methodology for studying geographical problems related to human habitats and society.

Catalogue Description

This course focuses on the comprehensive development of research skills in geography, guiding students through the process of conducting an original geographical study. Students will engage in data analysis, ethical considerations, report writing, and research design. Through individual dissertation projects, learners will explore geographical theories, compare phenomena, and address societal issues, culminating in a presentation of their findings.

Course Content

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

1) Each Examinee shall prepare a Dissertation Paper individually under the supervision of a Departmental Faculty on his / her own chosen Theme.
2) The Report must be documented in triplicate (1 = examinee, 2 = seminar library, 3 = supervisor) under the following Heads – *Introduction & Conceptual Background; Statement of the Problem; Objectives of Study; Literature Review; Methodology including data/information/map collection; Location of the Study Area; Analysis, Display and Interpretation of Data (relating to each Objective separately); and Conclusion.*

3) The Dissertation Paper should contain *Acknowledgement, Preface, Table of Content, List of Tables,*
4) *List of Figures, List of Photographs, List of References, Appendix, and Bibliography/ Reference.*
5) Pages containing Illustrations (Sketches, Graphs, Diagrams, Maps, Photographs, etc.) = 25(maximum).
6) Word Limit = 8000 (maximum) excluding Tables and Appendix (Computer typed, Line Spacing= 1½, Arial Narrow / Times New Roman / Helvetica 10 / 11 / 12).
7) Each Examinee shall submit a copy of the Report before the actual day of Examination (to be announced by the convener each year).
8) Each Examinee shall present his / her Paper before an audience comprising Internal / External
9) Examiners and others on the day of Examination using OHP or LCD Projector (maximum 25 slides about ―c*oncept / idea / theme; major objectives; methodology; study area; observations and analysis; conclusion*).
10) Time allotted for each presentation = 20 minutes (maximum).
11) Marks on Report and Presentation shall be separately awarded by the Internal and External
12) Examiners and then averaged.

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

CO-PO-PSO Correlation Matrix

CO/PO-PSO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
CO1	3	1	0	1	1	1	0	0	1	1	2	1	1	1
CO2	1	3	1	1	1	0	1	0	1	2	1	2	1	1
CO3	1	1	3	1	0	2	1	1	1	0	2	2	2	2
CO4	2	0	1	3	1	1	2	2	1	0	1	1	2	1
CO5	1	0	2	1	3	2	2	1	1	1	1	2	2	2
CO6	0	1	1	2	2	3	1	1	2	2	1	2	2	3

ADAMAS UNIVERSITY
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF GEOGRAPHY
CO – PO & PSO MAPPING

Name of the Programme: B.Sc. (Geography)

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO101	**1.00**	**1.50**	**0.83**	**0.50**	**2.00**	**1.33**	**1.83**	**1.83**	**2.17**	**1.33**	**0.67**	**1.33**	**1.33**	**1.00**
CO1	1	0	0	0	3	1	2	0	2	1	0	0	2	1
CO2	1	1	0	1	2	1	3	2	2	1	1	0	1	1
CO3	1	2	1	1	2	1	2	3	2	1	1	2	0	1
CO4	0	1	2	1	2	2	2	3	2	2	1	1	1	0
CO5	1	2	1	0	2	2	1	1	3	1	1	3	1	2
CO6	2	3	1	0	1	1	1	2	2	2	0	2	3	1
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO102	**2.33**	**0.83**	**1.17**	**1.67**	**1.67**	**0.83**	**1.00**	**0.00**	**0.50**	**0.33**	**2.50**	**1.17**	**2.17**	**1.67**
CO1	3	1	1	1	1	0	1	0	0	0	3	1	2	1
CO2	3	1	1	1	1	0	1	0	0	0	3	1	2	1
CO3	3	1	2	2	2	1	1	0	2	1	3	2	3	2
CO4	2	1	1	2	2	1	1	0	1	1	2	1	2	2
CO5	2	1	1	2	2	1	1	0	0	0	2	1	2	2
CO6	1	0	1	2	2	2	1	0	0	0	2	1	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**

GEO103	1.00	1.33	1.50	0.83	1.33	1.50	1.00	1.00	0.67	0.33	1.67	1.33	1.33	1.00
CO1	2	1	1	0	1	0	1	0	1	0	2	0	1	0
CO2	2	2	1	0	1	2	2	1	0	0	2	2	2	1
CO3	0	1	2	0	2	1	0	1	1	0	2	1	1	1
CO4	1	1	2	3	1	2	1	2	0	1	1	2	1	2
CO5	0	1	2	2	1	2	0	1	2	0	1	1	2	1
CO6	1	2	1	0	2	2	2	1	0	1	2	2	1	1
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO104	1.33	1.17	1.67	2.33	2.00	1.33	1.50	0.83	1.17	0.67	2.33	1.83	2.17	1.67
CO1	2	1	1	2	1	1	1	0	0	0	2	1	1	0
CO2	1	2	1	2	2	1	2	1	1	0	2	2	2	1
CO3	1	1	2	2	2	1	2	1	1	1	2	2	2	2
CO4	1	1	2	3	2	1	2	1	1	1	3	2	2	2
CO5	2	1	2	3	2	2	1	1	2	1	3	2	3	2
CO6	1	1	2	2	3	2	1	1	2	1	2	2	3	3
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO201	1.50	0.67	1.00	2.33	1.50	1.00	1.33	1.33	1.33	1.33	2.33	1.83	1.17	2.17
CO1	3	0	0	1	0	1	0	1	0	1	3	0	1	1
CO2	1	2	2	3	1	2	2	1	2	0	2	3	1	3
CO3	3	0	3	3	1	1	1	1	3	2	3	3	1	3
CO4	0	1	1	3	1	0	1	2	1	1	1	2	1	2
CO5	1	0	0	3	3	1	2	0	1	2	3	0	1	1
CO6	1	1	0	1	3	1	2	3	1	2	2	3	2	3
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
GEO202	1.50	1.00	1.50	1.33	1.50	1.00	1.83	0.83	2.00	0.83	2.33	1.50	1.50	1.50
CO1	2	0	0	2	2	0	2	0	0	0	3	0	0	0
CO2	2	2	0	2	2	0	0	0	2	0	1	3	0	0
CO3	2	0	3	0	2	0	3	0	3	0	3	0	3	0
CO4	0	0	3	2	0	2	3	0	2	0	2	3	3	3
CO5	0	2	0	2	3	2	0	2	3	2	2	0	0	3

CO6	3	2	3	0	0	2	3	3	2	3	3	3	3	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO203	**2.83**	**0.17**	**1.83**	**2.17**	**2.17**	**1.00**	**1.83**	**2.17**	**1.67**	**0.50**	**2.67**	**2.17**	**1.83**	**2.00**
CO1	3	0	1	2	2	0	1	1	1	0	3	1	1	2
CO2	3	0	1	2	2	1	2	2	2	0	3	2	2	2
CO3	3	0	3	2	2	1	1	2	1	0	3	3	2	1
CO4	3	0	3	3	2	2	2	3	2	1	3	2	1	3
CO5	2	0	1	2	2	1	3	2	2	2	2	2	3	1
CO6	3	1	2	2	3	1	2	3	2	0	2	3	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO204	**1.33**	**1.33**	**1.67**	**1.50**	**1.50**	**1.00**	**1.33**	**0.67**	**0.50**	**0.83**	**1.83**	**1.50**	**1.83**	**1.67**
CO1	3	2	1	1	1	0	1	0	0	1	2	1	2	0
CO2	1	2	1	2	2	0	1	1	1	1	2	2	2	2
CO3	1	1	3	2	2	1	1	0	1	1	2	2	2	2
CO4	2	2	2	1	1	2	2	1	0	1	2	1	2	2
CO5	0	1	2	2	1	1	2	0	0	1	1	1	1	2
CO6	1	0	1	1	2	2	1	2	1	0	2	2	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO205	**2.00**	**1.50**	**2.17**	**2.00**	**2.17**	**2.17**	**1.67**	**0.67**	**1.50**	**1.00**	**2.17**	**2.17**	**2.17**	**2.17**
CO1	2	1	2	1	2	2	1	0	1	1	2	2	2	1
CO2	2	1	2	2	2	2	1	0	1	1	2	2	2	2
CO3	2	2	2	2	3	3	2	1	2	1	2	2	3	2
CO4	2	2	3	2	2	2	2	1	2	1	2	3	2	3
CO5	2	1	2	2	2	2	2	0	1	1	2	2	2	2
CO6	2	2	2	3	2	2	2	2	2	1	3	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO301	**1.67**	**1.50**	**2.00**	**2.17**	**1.83**	**1.50**	**1.67**	**1.33**	**1.00**	**0.83**	**1.67**	**1.33**	**1.50**	**1.33**
CO1	2	1	2	1	2	1	2	1	0	1	1	1	1	1
CO2	2	1	2	1	2	1	1	1	0	1	1	1	1	1
CO3	2	2	3	2	2	1	2	2	1	1	2	2	1	2

CO4	2	1	1	3	2	2	2	1	1	0	2	1	2	1
CO5	1	2	2	3	1	2	1	2	2	1	2	1	2	2
CO6	1	2	2	3	2	2	2	1	2	1	2	2	2	1
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO302	**2.50**	**1.67**	**1.67**	**1.67**	**1.67**	**1.67**	**1.17**	**0.67**	**1.50**	**1.00**	**1.83**	**1.67**	**1.67**	**1.83**
CO1	3	1	1	1	2	1	1	0	2	1	2	1	1	1
CO2	2	2	1	2	1	1	1	0	2	1	2	2	2	2
CO3	3	2	2	2	2	2	2	1	2	1	2	2	2	2
CO4	2	2	2	2	1	2	1	1	1	1	1	2	2	2
CO5	3	1	2	2	2	2	1	1	1	1	2	2	2	2
CO6	2	2	2	1	2	2	1	1	1	1	2	1	1	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO303	**1.67**	**0.67**	**1.83**	**1.83**	**2.17**	**1.83**	**1.33**	**1.50**	**2.00**	**0.17**	**2.33**	**2.67**	**2.00**	**2.50**
CO1	2	0	2	1	2	1	1	1	2	0	2	3	2	2
CO2	2	1	2	1	2	1	1	1	2	0	2	3	2	2
CO3	2	1	2	2	2	3	1	2	2	0	3	2	2	3
CO4	1	1	2	3	2	2	2	2	2	0	2	3	2	3
CO5	1	0	1	2	3	2	2	1	2	0	2	3	2	2
CO6	2	1	2	2	2	2	1	2	2	1	3	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO304	**1.17**	**1.33**	**0.83**	**1.50**	**1.50**	**1.67**	**1.67**	**1.67**	**1.50**	**1.33**	**1.67**	**1.83**	**1.50**	**1.83**
CO1	1	1	0	1	1	2	1	2	0	1	2	2	1	1
CO2	0	1	1	2	2	1	2	2	2	1	2	2	1	2
CO3	1	2	0	2	1	2	2	2	1	1	2	3	2	1
CO4	1	1	2	2	1	2	1	2	2	2	1	2	1	3
CO5	2	1	1	1	2	2	2	1	2	1	1	1	2	2
CO6	2	2	1	1	2	1	2	1	2	2	2	1	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO305	**2.83**	**1.83**	**1.67**	**2.33**	**1.83**	**2.17**	**1.83**	**2.00**	**0.17**	**1.50**	**2.17**	**2.17**	**2.33**	**2.33**
CO1	3	1	2	2	2	2	1	2	0	1	2	2	3	2

CO2	3	2	2	2	1	2	2	1	0	1	2	2	2	3
CO3	3	2	1	2	3	2	2	2	0	1	2	3	2	2
CO4	2	2	2	3	1	2	2	3	0	2	2	2	2	2
CO5	3	2	2	2	2	2	2	2	1	2	2	2	3	2
CO6	3	2	1	3	2	3	2	2	0	2	3	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO306	**2.00**	**2.50**	**1.83**	**1.67**	**1.67**	**1.83**	**1.67**	**1.67**	**1.83**	**1.50**	**2.00**	**2.00**	**2.17**	**1.83**
CO1	2	2	1	1	2	2	1	2	1	0	2	2	2	0
CO2	2	3	2	3	2	2	1	2	2	1	2	2	2	3
CO3	2	2	2	2	2	2	2	0	2	1	2	3	2	2
CO4	2	3	2	1	1	1	2	3	2	2	2	0	3	2
CO5	2	3	2	2	2	2	2	1	2	2	2	3	2	2
CO6	2	2	2	1	1	2	2	2	2	3	2	2	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO307	**2.00**	**1.33**	**1.50**	**2.17**	**1.50**	**1.67**	**2.00**	**1.50**	**1.50**	**0.33**	**1.83**	**1.83**	**2.00**	**2.00**
CO1	2	1	1	2	1	1	1	1	1	0	2	2	2	2
CO2	2	2	1	2	1	2	2	1	1	0	2	1	2	2
CO3	2	1	1	2	1	1	2	1	1	0	2	2	2	2
CO4	2	2	2	3	2	2	2	2	2	0	2	2	2	2
CO5	2	1	2	2	2	2	2	2	2	1	1	2	2	2
CO6	2	1	2	2	2	2	3	2	2	1	2	2	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO308	**1.83**	**1.00**	**1.33**	**1.50**	**2.17**	**1.50**	**1.67**	**1.00**	**1.67**	**1.83**	**2.00**	**2.17**	**2.00**	**2.00**
CO1	3	1	0	1	3	0	1	0	2	2	3	1	2	1
CO2	1	1	1	2	2	2	1	1	2	2	3	2	1	3
CO3	2	0	3	2	3	1	2	1	1	3	1	3	3	2
CO4	3	1	2	3	2	1	3	2	1	1	2	2	2	3
CO5	0	1	1	0	1	2	2	0	2	1	2	3	1	1
CO6	2	2	1	1	2	3	1	2	2	2	1	2	3	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**

GEO401	1.83	0.83	1.67	1.67	1.33	1.83	1.00	0.50	1.33	0.83	2.33	2.00	2.17	1.50
CO1	3	0	1	1	0	1	0	0	1	0	3	1	1	0
CO2	3	1	2	1	2	1	1	0	1	1	2	3	2	1
CO3	2	2	3	1	2	2	0	1	1	1	3	2	2	2
CO4	2	1	1	3	1	2	2	1	2	2	1	2	3	2
CO5	1	0	2	1	0	3	1	0	2	0	3	1	2	1
CO6	0	1	1	3	3	2	2	1	1	1	2	3	3	3
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO402	2.17	0.67	1.50	1.17	2.17	1.00	0.83	1.33	1.67	0.33	2.50	1.83	1.33	2.00
CO1	3	1	0	0	2	1	0	1	0	0	2	0	0	1
CO2	2	1	2	1	3	1	1	1	2	1	3	2	1	2
CO3	2	0	3	1	2	0	1	1	3	0	3	2	2	2
CO4	3	1	2	1	2	0	1	1	2	0	3	2	2	2
CO5	2	1	1	1	2	3	2	2	2	1	2	2	1	2
CO6	1	0	1	3	2	1	0	2	1	0	2	3	2	3
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO403	1.00	1.17	1.50	2.17	2.50	1.67	1.50	0.33	1.17	1.33	2.33	2.17	2.50	2.17
CO1	2	1	1	1	2	1	1	0	0	1	2	2	1	1
CO2	2	1	1	1	3	1	1	0	1	1	3	2	2	2
CO3	1	1	2	2	2	2	1	0	0	0	3	2	3	2
CO4	1	2	2	3	2	2	2	0	1	1	2	2	3	2
CO5	0	1	2	3	3	2	2	1	2	2	2	3	3	3
CO6	0	1	1	3	3	2	2	1	3	3	2	2	3	3
	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PSO 01	PSO 02	PSO 03	PSO 04
GEO404	2.67	1.17	2.33	2.50	2.33	2.33	2.17	0.33	1.50	0.33	2.67	2.50	2.00	1.67
CO1	2	1	1	3	2	3	2	0	1	0	3	2	1	0
CO2	2	1	2	3	2	3	2	0	1	1	3	2	2	0
CO3	3	1	3	2	3	2	2	1	2	0	3	3	3	2
CO4	3	1	2	2	3	1	2	1	1	0	2	3	2	3
CO5	3	2	3	2	2	2	2	0	2	1	3	3	2	2

CO6	3	1	3	3	2	3	3	0	2	0	2	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO405	**1.33**	**1.00**	**1.50**	**1.67**	**1.83**	**2.00**	**1.50**	**1.83**	**0.83**	**1.00**	**2.00**	**2.00**	**1.83**	**1.33**
CO1	1	1	1	1	2	1	1	1	0	0	2	2	2	1
CO2	2	2	1	2	2	2	1	2	1	1	2	2	2	1
CO3	1	0	2	2	2	3	2	3	0	1	2	2	1	2
CO4	2	1	2	2	2	2	1	2	1	1	2	2	2	1
CO5	1	1	2	2	2	2	2	1	2	1	2	2	2	1
CO6	1	1	1	1	1	2	2	2	1	2	2	2	2	2
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO406	**1.67**	**1.50**	**1.00**	**2.00**	**1.17**	**1.17**	**0.83**	**0.83**	**1.33**	**0.67**	**2.17**	**1.67**	**2.50**	**2.17**
CO1	3	0	1	1	1	0	0	0	1	0	3	2	2	1
CO2	2	3	2	3	0	2	1	1	2	1	2	3	3	2
CO3	1	1	0	1	1	0	0	0	1	0	2	2	3	2
CO4	3	2	1	2	2	1	2	1	1	0	2	1	3	3
CO5	0	1	1	2	1	1	0	1	1	2	2	1	2	2
CO6	1	2	1	3	2	3	2	2	2	1	2	1	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO407	**1.83**	**1.67**	**1.50**	**2.00**	**1.50**	**2.00**	**2.00**	**0.17**	**2.00**	**1.50**	**2.00**	**1.83**	**1.67**	**1.83**
CO1	2	1	0	2	1	2	1	0	2	1	2	1	0	1
CO2	2	2	1	2	1	2	2	0	2	1	2	2	2	2
CO3	2	1	2	2	2	2	2	0	2	2	2	2	2	2
CO4	2	2	2	2	1	2	2	0	2	1	2	2	2	2
CO5	1	2	2	2	2	2	2	1	2	2	2	2	2	1
CO6	2	2	2	2	2	2	3	0	2	2	2	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO408	**1.33**	**0.50**	**1.00**	**1.50**	**1.67**	**1.17**	**1.50**	**1.83**	**1.33**	**1.50**	**1.50**	**1.67**	**2.00**	**1.33**
CO1	2	1	0	0	1	0	1	2	1	1	1	0	2	1
CO2	2	1	1	0	2	2	1	1	2	1	1	2	2	0
CO3	0	0	2	2	3	1	2	2	0	1	2	3	2	2

CO4	2	1	1	2	1	1	2	2	1	2	2	1	2	1
CO5	0	0	2	3	1	2	1	1	2	2	2	2	2	1
CO6	2	0	0	2	2	1	2	3	2	2	1	2	2	3
	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PSO 01**	**PSO 02**	**PSO 03**	**PSO 04**
GEO409	**1.33**	**1.00**	**1.33**	**1.50**	**1.33**	**1.50**	**1.17**	**0.83**	**1.17**	**1.00**	**1.33**	**1.67**	**1.67**	**1.67**
CO1	3	1	0	1	1	1	0	0	1	1	2	1	1	1
CO2	1	3	1	1	1	0	1	0	1	2	1	2	1	1
CO3	1	1	3	1	0	2	1	1	1	0	2	2	2	2
CO4	2	0	1	3	1	1	2	2	1	0	1	1	2	1
CO5	1	0	2	1	3	2	2	1	1	1	1	2	2	2
CO6	0	1	1	2	2	3	1	1	2	2	1	2	2	3

GEO308	**1.5**	**3**	**2.75**	**2.75**	**1.75**	**2.5**	**2**	**1.75**	**1**	**1**	**2.5**	**2.25**	**2.5**	**2.25**
CO1	2	3	2	2	1	1	1	1	1	1	3	2	2	1
CO2	1	3	3	3	2	3	2	2	1	1	2	3	2	2
CO3	1	3	3	3	2	3	3	2	1	1	3	2	3	3
CO4	2	3	3	3	2	3	2	2	1	1	2	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO401	**1.75**	**2.5**	**2.5**	**2.25**	**1.75**	**2**	**2**	**2.25**	**1.25**	**1**	**2.5**	**2.25**	**2.75**	**2.5**
CO1	2	3	2	1	2	1	2	2	1	1	2	2	3	2
CO2	2	3	3	2	1	2	2	2	1	1	3	2	2	2
CO3	2	2	3	3	2	2	1	2	1	1	2	3	3	3
CO4	1	2	2	3	2	3	3	3	2	1	3	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO402	**2.5**	**2.25**	**2.75**	**1.75**	**1.75**	**2**	**2**	**1.5**	**1.25**	**1**	**3**	**2.25**	**2.5**	**2**
CO1	2	2	2	1	1	1	1	1	1	1	3	2	2	1
CO2	2	2	3	2	2	2	1	1	1	1	3	2	2	2
CO3	3	3	3	2	2	2	3	2	1	1	3	3	3	2
CO4	3	2	3	2	2	3	3	2	2	1	3	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO403	**1.75**	**1.25**	**1.5**	**2.5**	**3**	**1.25**	**1.25**	**1**	**1**	**1**	**2.5**	**2.5**	**2.75**	**2.75**
CO1	2	1	1	2	3	1	1	1	1	1	3	2	3	2
CO2	2	1	2	2	3	1	1	1	1	1	2	3	2	3
CO3	2	1	1	3	3	2	1	1	1	1	2	3	3	3
CO4	1	2	2	3	3	1	2	1	1	1	3	2	3	3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO1	PSO2	PSO3	PSO4
GEO404	**1**	**1.5**	**2.25**	**2.5**	**1**	**2.25**	**2.25**	**1.5**	**1**	**1**	**2.5**	**2.25**	**3**	**2.75**
CO1	1	1	1	1	1	1	1	1	1	1	2	2	3	2
CO2	1	2	3	3	1	3	3	2	1	1	3	3	3	3
CO3	1	2	3	3	1	3	3	2	1	1	3	2	3	3
CO4	1	1	2	3	1	2	2	1	1	1	2	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO405	**2**	**2.25**	**2.25**	**2.25**	**1.25**	**1.75**	**2.5**	**1.25**	**1**	**1**	**3**	**2.25**	**2.75**	**2.25**
CO1	3	2	2	2	1	2	2	1	1	1	3	2	2	1
CO2	2	3	2	2	2	1	2	1	1	1	3	3	3	2
CO3	2	2	3	3	1	2	3	1	1	1	3	2	3	3
CO4	1	2	2	2	1	2	3	2	1	1	3	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO406	**1.25**	**2.75**	**2.75**	**2.5**	**1.5**	**1.5**	**1.5**	**2.25**	**1**	**1**	**3**	**1.75**	**2.75**	**2.75**
CO1	1	3	2	3	2	1	1	2	1	1	3	2	3	2
CO2	1	3	3	2	1	2	2	2	1	1	3	2	3	3
CO3	1	3	3	2	1	2	2	3	1	1	3	1	3	3
CO4	2	2	3	3	2	1	1	2	1	1	3	2	2	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO407	**2**	**2.25**	**2.25**	**2.25**	**1.25**	**1.75**	**2.5**	**1.25**	**1**	**1**	**2.75**	**1.75**	**2.5**	**2.25**
CO1	3	2	2	2	1	2	2	1	1	1	2	1	2	1
CO2	2	3	2	2	2	1	2	1	1	1	3	3	3	2
CO3	2	2	3	3	1	2	3	1	1	1	3	2	3	3
CO4	1	2	2	2	1	2	3	2	1	1	3	1	2	3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PSO1	PSO2	PSO3	PSO4
GEO408	**1.25**	**2.25**	**2.25**	**2.75**	**1**	**2.75**	**2.75**	**2.5**	**1.5**	**1.5**	**2.5**	**2.25**	**2.5**	**2.5**
CO1	2	2	2	2	1	3	2	2	1	1	3	2	2	2
CO2	1	3	2	3	1	3	3	2	1	2	2	3	2	2
CO3	1	2	3	3	1	3	3	3	2	1	3	2	3	3
CO4	1	2	2	3	1	2	3	3	2	2	2	2	3	3
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
GEO409	**1**	**3**	**2.75**	**2.75**	**1**	**2.75**	**2**	**1**	**1.25**	**2**	**2.5**	**1.5**	**2.5**	**2.25**
CO1	1	3	3	3	1	2	2	1	1	1	3	2	3	2
CO2	1	3	2	2	1	3	2	1	1	3	2	1	2	2
CO3	1	3	3	3	1	3	2	1	2	2	2	1	3	2
CO4	1	3	3	3	1	3	2	1	1	2	3	2	2	3