CENTRAL UNIVERSITY OF PUNJAB

Master of Arts/Science in Geography

Batch 2025

Department of Geography

Graduate Attributes

The graduate students of M.A. Geography programme are expected to demonstrate a systematic and comprehensive understanding of the subject knowledge and apply their knowledge and skill in finding solutions to the contemporary and emerging social and environmental problems. They will be able to apply their critical, creative and evidence-based thinking to solve the future challenges. They have respect for the diverse culture and pluralistic society and can demonstrate the ethical competency at all stages of life. They have ability to work effectively in a team and demonstrate leadership quality in academic as well as professional environment.

Apart from having these core attributes, the master's graduates, after their completion of M.A. programme, will be able to analyse the human interaction with the environment and how human and environment shape each other. They can describe and analyse the geomorphic, climatic, and environmental processes operating at local, regional and global spatial and temporal scales and generate inventories in geospatial environment and apply the geospatial and geostatistical techniques on geographical and environmental issues. They are also able to conduct physical and social survey projects in diverse environment. They will develop digital capabilities through the skill-based programmes designed for them. They will also recognize the essential value systems including academic ethical practices, the moral dimensions of one's own decisions.

Programme outcome

- **Comprehensive Knowledge**: Understand core areas of physical, human, and regional geography.
- **Geospatial & Analytical Skills**: Gain hands-on experience in GIS, Remote Sensing, GPS, and statistical tools.
- **Research & Fieldwork**: Develop research abilities through field surveys, practicals, and dissertation work.
- **Environmental & Development Insight**: Address issues related to climate change, sustainability, and regional planning.
- **Career & Industry Readiness**: Acquire skills suited for academia, planning, geospatial technologies, and consultancy.
- **Ethics & Lifelong Learning**: Foster ethical thinking, effective communication, and a mindset for continuous learning.

Course Structure for M.A./M.Sc. Geography, 2025-2027 (2+2)					
Course Code	Course Title	Course type	Credit Hours		
			L	P	Cr
Semester-I					
CORE					
MGEO.407	Geographical Thoughts	*C*	3		3
MGEO.402	Geomorphology & Oceanography	*C*	3	-	3
MGEO.404	Population and Social Geography	*C*	3	-	3
MGEO.406	Regional Development and Planning	*C*	3	-	3
Practicals					
MGEO.410	Principles of Cartography (Practical)	*SBC*	-	4	2
MGEO.411	Instrumentation	*SBC*	-	4	2
MGEO. 596	Field Visit and Survey	*SBC*	-	-	1
Elective (select one)					
MGEO.412	Tourism Geography	*DE*	3	-	3
MGEO.414	Biogeography	*DE*	3	-	3
MGEO.415	Economic Geography	*DE*	3	-	3
MGEO.416	Natural Hazards and Disasters	*DE*	3	-	3
MGEO.417	Climate Change and Environmental Sustainability	*DE*	3	-	3
MGEO.418	Spatial and Transportation Planning	*DE*	3	-	3
MGEO.538	Natural Resources and Sustainability				
Tutorial					
xxx	Individualized tutorial (non-credit 2 hours)	*T*	-	-	-
				Total Credits	**20**
Semester-II					
CORE					
MGEO.517	Climatology & Environment Geography	*C*	3	-	3
MGEO.518	Political Geography	*DE*	3	-	3
MGEO.524	GIS and Remote Sensing (Theory)	*C*	3	-	3
Ability					
MGEO.521	Geography of India	*C*	3	-	3
Practicals					
MGEO.525	GIS and Remote Sensing (Practical)	*SBC*	-	4	2
MGEO.522 Or MGEO.523	Quantitative Methods in Geography (Practical) Or Introduction to Earth's material (Practical)	*SBC*	-	4	2
IDC offered					

MGEO.506	Introduction to Climate Change	*IDC*	2	-	2
MGEO.507	Basics of Geoinformatics	*IDC*	2	-	2
Value Added Course (only one)					
MGEO.511	Introduction to Map Reading	*VAC*	2	-	2
MGEO. 512	Data Analysis and Visualization	*VAC*	2	-	2
Tutorial					
xxx	Individualized tutorial (non-credit 2 hours)	*T*	-	-	-
				Total Credit	**20**
Semester-III					
MGEO. 599-1	Dissertation/Internship	*SBC*	-	40	**20**
Semester-IV					
MGEO. 599-2	Dissertation/Internship	*SBC*	-	40	**20**
	Grand total		**L**	**P**	**Cr**
		Hours			**80**

L: Lecture, P: Practical, Cr: Credit, CF: Compulsory Foundation, C: Core, SBC: Skill Based Course, IDC: Inter Disciplinary Course, VAC: Value Added Course, DE: Discipline Elective. Course code starting with EGS belongs to the Department of Geology

MOOCs may be taken up to 40% of the total credits (excluding dissertation credits). MOOC may be taken in lieu of any course, but the content of the course should match minimum 70%. However, student is required to consult Head of the Department prior to the registration of the MOOC.

Swayam is mandatory for all student. Coordinator will coordinate with student for the course to be selected.

Dissertation evaluation as per university rules and guidelines.

Clause for the Multiple entry-exit as per NEP guidelines
● Students entering at level 8 must have met all the requirements for a bachelor's degree with Geography as their main subject. ● The students can choose to exit the program at level 8 with a PG diploma in Geography, provided they complete at least 43 credits.

Examination pattern from 2025-2026 session onwards

Core, Discipline Elective, and Compulsory Foundation Courses	IDC, VAC, Entrepreneurship, Innovation and Skill Development Courses ($\leq$2 credits) or any other theory course of $\leq$2 credits

	Marks	Evaluation	Marks	Evaluation
Internal Assessment	25	Various methods	-	-
Mid-semester test (MST)	25	Descriptive	50	Descriptive (up to 100%) Objective (up to 30%)
End-semester exam (ESE)	50	Descriptive (up to 100%) Objective (up to 30%)	50	Descriptive (up to 100%) Objective (up to 30%)

Dissertation Proposal (Third Semester)			**Dissertation (Fourth Semester)**		
	Marks	Evaluation		Marks	Evaluation
Supervisor	50	Dissertation proposal and presentation	Supervisor/ co-supervisor(s)	50	Continuous assessment (regularity in work, mid-term evaluation) dissertation report, presentation, final viva-voce
HoD and senior-most faculty of the department	50	Dissertation proposal and presentation	External expert	50	Report of dissertation (25), presentation (10), Novelty/originality (5) and final viva-voce (10).

Marks for internship shall be given by the supervisor/internal mentor and external mentor.

Course Title: Geographical Thoughts	**L**	**T**	**P**	**Cr**
Course Code: MGEO.407	3	-	-	3
Total Hours: 45 Hours				

Course Learning Outcome (CLO): At the completion of the course, the student will be able to:
CLO1: Describe the theoretical traditions and contemporary lines of thought of the discipline.
CLO2: Analyse the philosophical and methodological standpoints of leading geographers.
CLO3: Explain the continuities in geographic thought over time.
CLO4: comprehend the debates and issues that geographers have wrestled with for decades.
CLO5: Explain and analyse the contemporary geographical thought.

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 11 Hours	Understanding Geographical themes; Epistemology of Geography; Geographical enquiry in the classification of Sciences; Evolution of Geographical Thought;	CLO1

	Learning activities: Assignment writing, Quiz/test	
Unit II / 11 Hours	Concept of paradigms in Geography: Phases and changing paradigms in geography, Emergence of Modern Geography: contribution of Varenius, Kant, Humboldt, and Ritter. **Learning activities:** Paper reading, Quiz/test	CLO2 CLO3
Unit III / 11 Hours	Concept of Region, Place, and Space; Areal Differentiation and Spatial Organization. Concept of Exceptionalism and the Schaefer-Hartshorne Debate; emergence of Spatial science, quantitative and qualitative revolution **Learning activities:** Quiz/test, Group discussion/ debate	CLO4
Unit IV / 12 Hours	Understanding the concept of environmentalism, Positivism, and the Behavioural approach in geography. Perspective of Humanistic Geography, Feminist Geography, and the Postmodernism approach. Understanding of the Indian subcontinent and its philosophies through Indian geography. **Learning activities:** Group discussion	CLO5

Suggested readings:

1. Cresswell, Tim. (2012). *Geographic Thought: A Critical Introduction*. Malden, MA: Wiley Blackwell
2. Dikshit, R. D. (2018): *Geographical Thought. A Critical History of Ideas*. 2nd Edition. Prentice-Hall of India, New Delhi.
3. Hartshorne, R. (1939): The Nature of Geography, AAG, New York.
4. Harvey, D. (1969). *Explanation in Geography*. Arnold, London
5. Hussain, M. (2014). *Evolution of Geographical Thought*. 6th edition. Rawat Publisher.
6. Livingstone, David. (1992). *The Geographical Tradition: Episodes in the History of a Contested Enterprise*. Oxford: Blackwell.
7. Peet, R. (1998). *Modern Geographical Thought*. Wiley-Blackwell, New York.
8. Soja, Edward. (1989). *Post-modern Geographies, Verso.* London. Reprinted 1997: Rawat Publ., Jaipur, and New Delhi.
9. Tuan, Yi-Fu. (1977). *Space and Place: The Perspective of Experience*. Minneapolis: University of Minnesota Press, Introduction, Epilogue.
10. Sudeepta, Adhikari, (2015), Fundamentals of Geographical Thought, Orient Black Swan
11. Anne Knowles, ed. (2008). *Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship*. Esri Press.

Suggested papers/articles:

1. Schaefer, Fred. (1953). Exceptionalism in Geography: A Methodological Examination. *Annals of the American Association of Geographers* 43: 226–49.
2. Wilson, Robert. (2005). Retrospective Review: Man's Role in Changing the Face of the Earth. *Environmental History* 10 (3), 564-66.
3. Meinig, D W. (1983). Geography as an Art. *Transactions of the Institute of British Geographers* 8: 314–28.
4. Hawkins, Harriet, et al. (2015). What might the geohumanities do? Possibilities, practices, publics, and politics. *GeoHumanities*1 (2): 211–32.
5. Harvey, David. (1984). On the History and Present Condition of Geography: An Historical Materialist Manifesto. *The Professional Geographer* 3: 1–11.
6. Butler, Judith. (2011). Your Behavior Creates Your Gender. Big Think. http://bigthink.com/videos/your-behavior-creates-your-gender.
7. Domosh, Mona. (1991). Toward a feminist historiography of geography. *Transactions of the Institute of British Geographers*. 16 (1): pp. 95–104.

8. Commentary by David Stoddart and Domosh's response: Transactions of the Institute of British Geographers 16(4): 484–490.

Websites/web references:

1. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=17

Course Title: Geomorphology & Oceanography	**L**	**P**	**Cr**
Course Code: MGEO.402	3	-	3
Total Hour: 45 Hours			
Course Learning outcome (CLO): The course would help the students to: CLO1: To know about the Fundamental Concepts in Geomorphology and physical processes that form the landscape. CLO2: To understand how the material is transported both by geomorphic and gravitational processes. CLO3: To understand basic components related to oceanic floor CLO4: To describe the history and development of oceanography including marine biogeochemistry			
Unit/ **Hours**	**Content**		**Mapping with CLO**
Unit I/ 11 Hours	**Fundamental Concepts in Geomorphology:** Concept & fundamentals of geomorphology; Concept of relief – mountains, plateaus, hills, foothills, valleys, plains and Floodplains; Doctrine of Isostasy - Views of Airy and Pratt; Mountain Building Theories – concepts of Kober, Daly and Holmes. **Earth Movements and Interior of the Earth** Plate Tectonics and Continental drift theory; Earth Movements (seismicity/Earthquake, folding, faulting and vulcanicity); Evolution of the earth and Earth's internal structure; composition and characteristics; Rocks and soil: types, formation, and characteristics. **Learning Activities:** Map and model reading		CLO1

Unit II/ 11 Hours	**Geomorphic Processes and landforms** Gradational and Aggradational processes: concept of slope, erosion, and mass wasting. Weathering: Physical and chemical Process; Cycle of Erosion - Concepts of Davis and Penck; Geomorphic landform: fluvial, glacial, Aeolian, coastal and karst; Causes of Geomorphic Hazards (earthquakes, volcanoes, landslides and avalanches) River forms and Morphometric analysis; Applied Geomorphology and topographic analysis using GIS/Remote Sensing/DEM; Extra-Terrestrial Geomorphology **Learning activities:** Map and model reading, case study	CLO2
Unit III/ 12 Hours	Origin, evolution of ocean basins and their environmental response; Topographic; features of the ocean floor; continental margin provinces, ocean basin provinces; coral reefs. Classification of marine sediments, sediment budget, transport and it's; accumulation in the ocean; sedimentation processes on continental shelves – physical processes, sediment response; deep-sea sediments. **Learning activities:** Map and model reading, case study	CLO3
Unit IV/ 11 Hours	Wave dynamics, deep water waves, shallow water waves; Ocean circulation: forces driving currents; surface currents, effects of surface currents on climate; thermohaline circulation - thermohaline circulation patterns, global heat connection and atmospheric Circulation. Wind induced vertical circulation - equatorial upwelling, coastal upwelling, downwelling; Coastal upwelling - its physical, chemical, biological characteristics, Tides - equilibrium theory of tides, dynamical theory of tides, tidal currents in coastal areas, observation and prediction of tides. **Learning activities:** Map and model reading, case study	CLO4
Transaction mode: Lecture, Demonstration, Problem-solving, Tutorial, Seminar, Group discussion. Tools used: PPT, video, animation movie, WhatsApp.		
Suggested readings: 1. Bloom, Arthur L., (1991), Geomorphology: A Systematic Analysis of Late Cainozoic Landforms, Pearson 2. Gregory, Kenneth J. (Ed.) (2014), The SAGE handbook of geomorphology, New Delhi, Sage publications India Private Limited. 3. Harvey, Adrian (2012), Introducing geomorphology: A guide landforms and processes, Edinburgh,		

Dunedin academic press.

4. Huggett, Richard John (2011), Fundamentals of geomorphology, 3rd edition, Routlegde Taylor & Francis group.
5. Thornbury, W.D. (1969) Principles of Geomorphology, New York: John Wiley and Sons, 2nd edition, December 2004.
6. Singh, Savindra (1998). Geomorphology, Allahabad: Prayag Pustak Bhawan.
7. Strahler, A.N. (1992) Physical Geography, New York: John Wiley and Sons.
8. G.C. Leong (2023 Edition), Physical and Human Geography, Oxford University Press YMCA Library New Delhi
9. 1. Garrison, T., 1996.Oceanography-An invitation to Marine Science, Wadsworth Publishing Company 43
10. 2. Gross, M.G., 1972. Oceanography - A view of the Earth, Prentice-Hall.
11. 3. Thurman, B.Y., 1978. Introductory Oceanography, Charles E. Merill Publishing Company.
12. 4. Kale, V. S. and Gupta, A., 2001.Introduction to geomorphology, Orient Longman, Bangalore.
13. 5. Singh, S., 2011.Physical geography, Prayag Pustak Bhawan, Allahabad.
14. 6. Strahler, A.N. and Strahler, 1996.An introduction to physical geography, John Wiley &Sons, UK.
15. 7. S. Davis, R.A. Jr. 1972.Principles of Oceanography, Addison - Wesley Publishing Company.
16. 8. Roonwal, G.S., 1986. The Indian Ocean: Exploitable mineral and petroleum Resources, Narosa Publishing House.
17. 9. Francis P. Shepard, 1977. Geological Oceanography: Evolution of coasts, continental margins & the deep-sea floor, Pan Publication.
18. 10.Bhatt J.J., 1978. Oceanography – Exploring the planet Ocean, D. van Nostrand Company.
19. 11. Singh, Savindra (2017), Oceanography, Pravalika Publications, Allahabad.
20. 12. Devi, Renu (2018), Oceanography: The Surface of The Sea, Random Publication, New Delhi.

Web Resources:

1. https://www.nationalgeographic.org/
2. https://www.nio.org/
3. https://science.nasa.gov/earth-science/focus-areas/oceanography
4. www.usgs.gov

Course Title: Population and Social Geography	**L**	**P**	**Cr**
Course Code: MGEO 404	3	-	3
Hours: 45 hours			

Course Learning Outcome (CLO): By the end of this course, students will be able to:

CLO1: understand the Population and its components for explaining determinants in size, growth and distribution

CLO2: understand the Population and migration theories for analysing underlying factors in demographic dynamics.

CLO3**:** Understand and analyse the socio-cultural concepts in multi-ethnic diversity research with specific reference to Indian Knowledge system.

CLO4: Analyse the cultural landscape and application of various social and cultural aspects of geography and its application to Indian Culture

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 11 Hours	Nature of population geography; Concept of fertility, mortality, migration; Concept of Population Size (over-population and under-population); Concept of Population Pyramids; Population Policies and Human Development Index (HDI) Sources of population data and analysis. *Learning activities: Data collection, group study, and assignments*	CLO1
Unit II /12 Hours	Population Growth Theories: Malthusian, Neo-Malthusian, Cornucopian, Optimum population, and Demographic transition theory; Migration: Definition, types, determinants, and Migration theories. *Learning activities: Literature collection, group study, and assignments*	CLO2
Unit III /11 Hours	Social Geography: nature and Scope; Distribution of socio-cultural elements in Indian context: Social groups; Social diversity; religion and plurality in India and its geographical interpretation. Evolution of socio-cultural regions, Social and ethnic diversity; tribe and national integration; linguistic diversity, nature of social transformation and change in India *Learning activities: Group discussions, Data collection and analysis, Presentations and Assignments*	CLO3
Unit IV /11 Hours	Cultural regions: nature and scope; Concept of Space in relation to Socio-Cultural Ecology; Cultural landscape, assimilation, and adaptation. Cultural concept: perception, behaviourism and cultural relativism, Cultural diffusion in India and Cultural Ecology Convergence and divergence processes, *Learning activities: Group discussions, Data collection and analysis, Presentations and Assignments*	CLO4

Mode of Transaction: Lecture, class discussion, and presentation methods will be used for teaching. Tools such as WhatsApp, ppt., and video will also be used.

Suggested readings:

1. McCarthy, Joy (2010). Social and Cultural Geography, Apple Academic Press, inc.
2. Vincent J. Del Casino Jr., Mary E. Thomas, Paul Cloke, Ruth Panelli (2011). A Companion to Social Geography, Blackwell Publishing Ltd.
3. Nuala C. Johnson Richard H. Schein Jamie Winders (2013). The Wiley- Blackwell Companion to Cultural Geography, John Wiley & Sons, Ltd.
4. Hussain, Majid (2014). Cultural geography, Anmol publications Pvt. Ltd.
5. Mitchell, Donald (2000). Cultural Geography: A Critical Introduction, Wiley–Blackwell.
6. Ahmad, Aijazuddin (2002), Social Geography, Rawat Books
7. Chandna, R. C. (2016). *Population geography* (11th ed.). Kalyani Publishers.

8. Madev, R. (2008). *Social geography*. Rawat Publications.
9. Berger, P. L., & Luckmann, T. (1966). *The social construction of reality: A treatise in the sociology of knowledge*. Anchor Books.
10. Del Casino, V. J. (2009). *Social geography: A critical introduction*. Wiley-Blackwell.
11. Oakes, T., & Price, P. L. (Eds.). (2008). *The cultural geography reader*. Routledge
12. Srinivas, M. N. (1955). *India's villages*. Bombay: Media Promoters & Publishers.
13. Srinivas, M. N. (1962). *Caste in modern India and other essays*. Bombay: Asia Publishing House.
14. Srinivas, M. N. (1966). *Social change in modern India*. Berkeley: University of California Press.

Course title: Regional Development and Planning (Theory)	L	P	C
Course code: MGEO.406	3	-	3
Total hour: 45 hours			

Course Learning outcome (CLO): On completion of this course, students will be able to:

CLO1: Proficient to comprehend basic concepts, scope, and challenges of region and planning region.

CLO2: Proficient to comprehend basic concepts, scope, and challenges of regional development and planning.

CLO3: Competent to explore the theories and models of regional development and planning for regional sustainability in the national and global context

CLO4: Competent to explore the regional development and planning policies and techniques to support regional sustainability in the national and global context.

Unit/Hours	**Content**	**Mapping with CLO**
Unit I /11 Hours	**Introduction to region:** Concept of region; typology of regions, characteristics of region, regional delineation methods, introduction to planning region, characteristics, and delineation methods, planning regions of India. **Learning activities:** Group discussions	CLO1
Unit II /11 Hours	**Introduction to regional development and planning:** Introduction to regional planning, different approaches to regional planning, regional policies in India, challenges in regional planning, concept of Regional Development, indicators of development, Human different regional development indices such as Development Index, Hunger Index etc., Economic development, Regional economic complexes; Inter-regional and intra-regional	CLO2

	functional interactions; Regional disparities in India. World Regional Disparities **Learning activities:** Assignments	
Unit III /11 Hours	**Introduction to regional development and planning models, theories** Approaches to integrated regional planning at different levels: local, regional, and national; Theories of Regional Development (Albert O. Hirschman, Gunnar Myrdal, John Friedman, Dependency theory of Underdevelopment, Global Economic Blocks); Spatial organisation: Central Place Theory, Concept of core and periphery Friedman's Model of Spatial Organisation and Economic Growth. Growth centres and Growth pole theory of Perroux. **Learning activities:** Assignments	CLO3
Unit IV /11 Hours	**Regional development and planning policies and techniques:** Five Year Plans: command area development, planning for backward area, desert drought-prone, Hill and tribal area development; multi-level planning in India: State, District and Block level planning; Decentralized planning and Panchayati raj; watershed management; Regional economic imbalances and inequalities in India; SEZs in regional development. Regional Development and Social Movements in India, advanced tools and techniques in regional development and planning. National regional development institutions and policies like NITI aayog. **Learning activities:** Group discussions	CLO4

Mode of Transaction: methods of the transaction are lecture, audio-video, the discussion which will be followed in teaching using ppt, social media etc.

Suggested readings:

1. Chandna, R. C. (2000). Regional Planning: A Comprehensive Text. Kalyani Publishers., New Delhi.

2. Chaudhuri, J. R. (2001). An Introduction to Development and Regional Planning with special reference to India. Orient Longman, Hyderabad.

3. Cowen, M.P. and Shenton, R.W. (1996). Doctrines of Development. Routledge, London.

4. Doyle, T. and McEachern, D. (1998). Environment and Politics. Routledge, London.

5. Friedmann, J. (1992). Empowerment: The Politics of Alternative Development. Blackwell, Cambridge MA and Oxford.

6. Friedmann, J. and Alonso, W. (ed.) (1973). Regional Development and Planning. The MIT Press, Mass.

7. Hettne, B.; Inotai, A. and Sunkel, O. (eds.) (1999–2000). Studies in the New Regionalism. Vol.I-V. Macmillan Press, London.

8. Isard, W. (1960). Methods of Regional Analysis. MIT Press, Cambridge, MA.

9. Pike, Andy, Rodriguez-pose, Andres, Tomaney, John (2017), Local and Regional

Development, Routledge.

10. Mishra, R. P. (1992). Regional Planning: Concepts, Techniques, Policies and Case Studies, Concept Publishing Co, New Delhi.

11. Wang, Xinhao & Hofe, R. (2010). Research Methods in Urban and Regional Planning,

Springer.

12. V. Nath Edited by S. K. Aggarwal (2009), Regional Development And Planning In India, Concept Publishing Company, New Delhi.

Course Title: Principles of Cartography (Practical)	**L**	**T**	**P**	**Cr**
Course Code: MGEO.410		-	4	2
Total Hour: 60				
Course Learning outcome (CLO): After completing the course, student will be able to: CLO1: gain understanding of the purposes of cartography, recognize the elements of cartographic representation, and how maps work. CLO2: use digital cartographic methods for exploring, critiquing, confirming and presenting geographical relationships. CLO3: increase their proficiency in graphical literacy, geo-visualisation and map modelling. CLO4: Adapt the current knowledge to emerging applications of photogrammetry and UAV technology. CLO5: apply knowledge, techniques, skills and modern tools of photogrammetry to solve technical photogrammetric problems in geosciences and other trans-disciplinary subjects.				

Unit/Hours	**Content**	**Mapping with CLO**
Unit-1/ 30 hours	Exercise 1: Introduction to cartography: basic to advance tools of Digital cartography, Map concepts & content, types numbering and nomenclature of toposheets, scales, design and implementation. Map projections and coordinate system: Shape and size of the Earth: Geoid, spheroid ellipsoid for world and India, the Geographic and Projected Coordinate System, Projection Mechanics and Distortions.	CLO1/ CLO2/ CLO3
Unit-2/ 30 hours	Exercise 3: Map generalization and visualization: Cartographic Problematic, typography & Generalization Operators, Label Appearance and Label Placement, Map Elements and Visual Hierarchy, The Visual Variables & Thematic Map Types, Map Composition & Production and nomenclature of topographical maps. 3D and applied cartography: Terrain analysis and modelling, City and infrastructure model (BIM, City GML), 3D modelling in disaster mitigation and water resource management	CLO4/ CLO5

Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Local field visit discussion. Tools used: PPT, video, animation movie, WhatsApp and Expert's Video Conferencing lectures from various national & international organizations
International to National to Local reachability: The course will have wider reachability from local to international level to understand the complex geographical phenomena occurred over space and time and to reconstructing the three-dimensional model for the real world.
Suggested Readings: ● Cromley G.R. 2000, Digital Cartography, Prentice Hall- Gale, Englewood, New Jersey. ● Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi. ● Robinson, A.H. et al. (2012). Elements of Cartography, John Willy & Sons, New York

Course Title: Instrumentation	**L**	**T**	**P**	**Cr**
Course Code: MGEO.411		-	4	2
Total Hour: 60 Hours				

Course Learning outcome (CLO): Upon the completion the student will be able to able to CLO1: understand and utilise the instrument for carrying out research and project work.

CLO2: carry out field work using instrument

Unit/Hours	**Content**	**Mapping with CLO**
I	**Exercise with instruments** Prismatic Compass, Theodolite, Plain Table Survey, Dumpy level, and Total Station, Clinometer, Rotameter, Pocket and Mirror stereoscope; Thermometer, Barometer, Anemometer, Hygrometer, Rain gauge	CLO1
II	pH meter, Conductivity meter, TDS meter, DO meter, Salinity meter, Clinometer, Mohs Hardness Test; Ground Penetrating Radar, Automatic Weather Station (AWS), Continuous Ambient Air Quality monitoring system, Laser distance meter, Range Finder, Brunton Compass.	CLO2

Mode of Transaction: Lecture, demonstration, Power point, E-tutoring, discussion, assignments, case study.

Suggested readings:

- American Public Health Association (APHA) (2012). Standard method for examination of water and wastewater, 22nd edn. APHA, Washington.

- Yadav, M. S. (2008). Instrumental methods of chemical analysis, New Delhi: Campus Books International.
- Rajvaidya, N., Markandey, D. (2005). Environmental Analysis and Instrumentation, APH Publisher.
- Chatwal, G. R., Anand, S. K. (2013). Instrumental Methods of Chemical Analysis, New Delhi: Himalaya Publishing House.
- Skoag, D. A., Holler, F. J., Crouch, S. R. (2007). Principles of Instrumental Analysis, CENGAGE Learning.

Course Title: Field Visit and Survey	**L**	**T**	**P**	**Cr**
Course Code: MGEO.596		-	2	1

Total Hour: 30 Hours

Course Learning outcome (CLO): Upon the completion the student will be able to:

CLO1: understand basic knowledge of field survey for carrying out research and project work.

CLO2: carry out field work using available instruments

Unit/Hours	**Content**	**Mapping with CLO**
I	Introduction to Field Survey, Methods, Survey Questions and Tools, Purposes of Field Visit and Survey: Market Research, User Experience Research**,** Healthcare, **Education**, Hospitality and Tourism, Retail; Data Collection with Field Survey; Introduction to Field Survey Software: Jotform, Survey Monkey, Magpi, Go Canvas, Paperform	CLO1
II	**Field Survey** Filed work will be conducted using available instrument	CLO2

Mode of Transaction: Lecture, demonstration, Power point, E-tutoring, discussion, assignments, case study and Field visit.

The students are required to submit a field report based on the field study. It will be based on Field observations and data recorded (If any) by the candidate.

Evaluation Criteria:

Evaluation of Field Report: 25 marks

Course Title: Tourism Geography	**L**	**T**	**P**	**Cr**
Course Code: MGEO.412	3	-	-	3
Total Hour: 60 Hours				

Course Learning Outcomes (CLO): On completion of the course, the students will be able to:

CLO1: Proficient to comprehend basic concepts, scope, and understand the basic knowledge of Tourism Geography.

CLO2: Understand the factors affecting the Tourism Development.

CLO3: Familiarize with the classification of Tourism and tourism Destinations in India.

CLO4: Comprehend the Infrastructure and support service as well as Impact of Tourism on Physical, Economic and Social.

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 11 hours	**Introduction to Tourism Geography:** Definition, Nature and Scope of Tourism Geography; Importance of Tourism Geography; Evolution of studies in Tourism Geography; Recent Trends in Tourism Geography: Ecotourism, Agro Tourism	CLO1
Unit II / 11 hours	**Factors Affecting on Tourism Development:** Physical Factors: Relief, Climate, Vegetation Wild Life, water Bodies Socio Cultural Factors: Religion, Historical, Cultural and Sports Economical Factors: Transportation, Industry, Hotel and Accommodation, Tourism Carrying Capacity and Environmental Impacts	CLO2
Unit III / 12 hours	**Classification of Tourism:** Classification Of Tourism Based On: Nationality, Time, Distance, Number of Tourist, Mode of Transportation, Purpose of Travels Nationality: International, Domestic; Time: Long Term, Short Term, Holiday Tourism, Day Trippers; Distance: Global, Continental, Regional, and Local; Number of Tourist: Groups, Individual; Mode of Transportation: Road, Railway, Air Way and Water Way Purpose of Travels: Recreation, Religion, Health, Sport Classification and types of Indian Tourism; Tourism Destinations in Himachal Pradesh, Uttarakhand, Goa, and Rajasthan.	CLO3
Unit IV / 11	**Infrastructure and support service:** Transportation Mode - Road, Railway, Air Way and Water Way; National Tourism Policies and Agencies; Accommodation	CLO4

hours	type – Hotels, Motels, Dharmashala, Government Accommodation, Private Accommodation. **Impact of Tourism**: Physical, Economic and Social	

Mode of Transaction: Lecture, demonstration, Power point, discussion, assignments

Suggested readings:

1. Stephen Page: Geography of Tourism and Recreation: Environment, Place and Space, Routledge.
2. A.K. Bhatia: Tourism Development: Principles and Practices. Sterling Publishers Pvt. Ltd.
3. Ecotourism: Impacts Potentials, and Possibilities-Stephen Wearing and John Neil.
4. Sustainable Tourism – Wahab Salah and John Pigram.
5. Eco-tourism – Fennel.
6. Sustainable tourism –A marketing perspective- Victor C. Middleton & H. Rebecca.
7. Trends in tourism promotion: emerging issues - S. C Bagri.
8. Tourism in the Himalaya in the context of Darjeeling and Sikkim – B. Bhattacharya.

Further Readings:

1. Negi Jagmohan: Travel Agency Operations: Concepts and Principles. Kanishka Publishers.
2. Douglas Pearce: Tourism Development. Longman Pub Group subsequent edition.
3. Garg Deepa: Geography of Tourism. Mohit Publications.
   Arpita Mathur: Tourism Marketing and Travel Agency Business, Neha Publishers and Distributions.

Course Title: Bio-Geography	**L**	**T**	**Cr**
Course Code: MGEO.414	3	-	3

Total Hour: 45 Hours

Course Learning outcome (CLO): By the end of this course students will be able to:

CLO1**:** understand the historical development of biogeography during different time periods.

CLO2: explain and analyse the spatio-temporal variations of plant and animal regions and the factors affecting these variations.

CLO3: understand and analyse the biogeographical consequences of global change like climate change and evolve critical thinking.

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 11 Hours	Nature, scope, significances, approaches and history of Biogeography; Spatial dimension and elements of biogeography; Distribution of forest and major plant community; Distribution of major animal distributions; Bio-geographical regions, realms and biomes, Major Gene Centre **Learning activities: group discussion**	CLO1

Unit II /12 Hours	Basic concept of biogeography, allopatric speciation, evolution, extinction, endemic, geo-dispersal, range and distribution, vicariance; Geo-biochemical cycles (gaseous & sedimentary): carbon, nitrogen, oxygen and phosphorus cycles; Concept of biomass, carbon content and carbo sequestration; Concept of forest carbon index; contribution and policies, carbon footprint and carbon credit, Man-Environment Relationship **Learning activities: assignment**	CLO1/ CLO2
Unit III /11 Hours	Biogeography of the seas; island biogeography; Habitat fragmentation; biogeography of linear landscape features; Biodiversity: types, hotspots, depletion and conservation, **Learning activities: assignment**	CLO2/ CLO3
Unit IV /11 Hours	Biogeographical information, collection, retrieval and application; Biogeographical consequences of global to regional change; changing communities and biomes; Forest disturbances in India; National forest and wildlife policy of India **Learning activities: case study**	CLO3
Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Local field visit discussion. Tools used: PPT, video, animation movie, WhatsApp and Expert's Video Conferencing lectures from various national & international organizations		

Suggested Readings:

1. Richard John Huggett (2010) Fundamentals of Biogeography, Routledge, New York, US
2. Brown, J. H., & A. C. Gibson, Biogeography, St. Louis, Mosby, 1983.
3. Brown, J.H. and Lomolino, M.V., Biogeography, Second Edition, Sinauer Associates, Inc. Sunderland, Massachusetts, 1998.
4. Cox, C.B., Moore, P.D., Biogeography, An Ecological and Evolutionary Approach, 5th ed., Blackwell Science, Cambridge, 2016.
5. MacDonald, Glen, Biogeography: Introduction to Space, Time and Life, John Wiley, New York, 2002.
6. Sandeep Sharma, Soil and Bio-Geography. First Edition, Random Publication, 2017.
7. Agrawal, L.C (2018), Biogeography, Rawat Publications, Jaipur.
8. Darling, Emma (2018), Introductory Biogeography, Larsen & Keller, New York.
9. Robinson, H., Biogeography, The English Language Book Society and Macdonald and Evans, London, 1982. (1999). Digital Photogrammetry, TerraScience, New York, United States.

Course Title: Economic Geography	**L**	**T**	**P**	**Cr**
Course Code: MGEO.415	3	-	-	3
Total Hour: 45 Hours				
Course Learning Outcomes (CLO): At the completion of the course, the student will be able to: CLO1: Understand the geographical dimension in economy and development with the help of models and				

theories.
CLO2: Apply the approaches of economic geography in various field of research

Unit/Hours	Content	Mapping with CLO
Unit I / 11 Hours	Economic Geography: Nature, scope, and approaches; Resources: Significance of Natural and Human resources in Economic Development; Measures of economic development: Rostow's and Myrdal's models. **Learning activities:** group discussion	CLO1
Unit II / 11 Hours	Concept of economic development Theories of development- Rostow's model, Structuralism and dependency theory, Neoliberalism and grass root approach Patterns of uneven development in India **Learning activities:** assignment	CLO1
Unit III / 11 Hours	Factors affecting spatial organisation of economic activities (primary, secondary, tertiary and quaternary), Natural Resources (classification, distribution, and associated problems), Natural Resources Management. **Learning activities:** assignment	CLO2
Unit IV / 12 Hours	Classification of Industries, Factors of Industrial Location and theories; World Industrial Regions, Impact of Globalisation on manufacturing sector in Less Developed Countries. **Learning activities:** case study	CLO2

Suggested readings

1. Bryson, J., et. al. (1999). The Economic Geography Reader, John Wiley, Chichester.
2. Chakraborty, S. and Somik V. (2007). Made in India: The Economic Geography and Political Economy of Industrialization, Oxford, New Delhi.
3. Clark, G., et. al. (2000). The Oxford Handbook of Economic Geography, Oxford, New York.
4. Dodson, R.A. (1998). Society in Time and Space, Cambridge University Press, Cambridge.
5. Grossman, G. (1984). Economic Systems, Prentice Hall, New Jersey.
6. Hanink, D. M. (1997). Principles and Applications of Economic Geography, John Wiley, New York.
7. Hartshorn, Truman, A. and John W. A. (1994). Economic Geography, 3rd Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
8. Hussain, M. (1996). Systematic Agricultural Geography, Rawat Publications, Jaipur.
9. Ilbery, B. W. (1985). Agricultural Geography, Oxford University Press, Oxford, 1985.
10. Shafi, M. (2006). Agricultural Geography, Pearsons Publications, New Delhi.
11. Singh, J. and Dhillon, S.S. (1984). Agricultural Geography, Tata McGraw Hill, New Delhi.

Course Title: Natural Hazards and Disasters	**L**	**P**	**Cr**
Course Code: MGEO.416	3	-	3
Hours: 45 hours			

Course Learning Outcome (CLO): By the end of this course, students will be able to:
CLO1: Understand the basic concept related to hazards and disasters
CLO2: Understand the mechanism of various hazards
CLO3: Utilize the application of geospatial technology in disaster studies.
CLO4: Discuss various agencies for disaster risk reduction.
CLO5: Describe the influence of mitigation, preparation, response, and recovery on natural hazards

Unit/Hours	Content	Mapping with CLO

Unit I / 11 Hours	Concept of Hazard and Disaster; Identification and measurement of natural hazards; Geography and disaster studies **Learning activities:** Poster making and group discussion	CLO1
Unit II /12 Hours	Concept of Vulnerability and its Assessment. Concept of Risk and Its Assessment. Concept of HRVC analysis **Learning activities:** Map reading, Data Collection	CLO2 CLO3
Unit III /11 Hours	Classification of Disasters; Assessment of Natural Hazards; Floods, Cyclones, Droughts, Forest fires, Earthquakes, and landslides. Assessment of Man-made disasters in India and globally. Accidents, Oil spills, stampedes, Pollution, etc. **Learning activities:** Model reading	CLO2 CLO3
Unit IV /11 Hours	Disaster management principles: Mitigation, prevention, preparedness, response, and recovery; Disaster response and management: Policies, Agencies, and organizations in India and Globally; Concept of Disaster Risk Reduction and Global Framework. **Learning activities:** Assignment and case study	CLO4 CLO5

Mode of Transaction: Lecture, class discussion, and presentation methods will be used for teaching. Tools such as WhatsApp, PPT, and video will also be used.

Suggested readings:

1. Hayes, Flynn, (2020). Global flood hazard: Mappings, forecasting, and risk assessment, Syrawood Publishing House.
2. Feidan, Nicola (2019). Natural hazards and disasters: A case study approach, Callisto reference.
3. Schwab, Anna K. (2017). Hazard mitigation and preparedness: An introductory text for emergency management and planning professionals, CRC Press.
4. Vaidyanathan, S. (2011). An introduction to disaster management: Natural disasters and manmade hazards, Ikon Books.
5. Lopez-Carresi, Alejandro (2014). Disaster management: International lessons in risk reduction, response and recovery, Routledge.
6. Reddy, Sunita (2013). Clash of Waves, Indos Books.
7. Kapur, Anu (2010), Vulnerable India: A Geographical Study of Disaster, Sage and IIAS Publication.
8. S Vaidyanathan, An Introduction to Disaster Management: Natural Disaster and Man-Made Hazards.
9. D.R. Khullar, JACS Rao, (2021), Environment & Disaster Management: Ecology, Climate Change & Bio-diversity,3rd Edition, McGraw-Hill Education India Private Limited.
10. R.B. Singh (2006), Natural Hazards and Disaster Management, Rawat Publication.
11. Bird Robinson (2020), Handbook of Natural Hazards and Disasters, Larsen & Keller, New York.
12. www.usgs.gov
13. www.bhuvan.nrsc.gov.in
14. www.emdat.be

Course Title: Climate Change and Environmental Sustainability	**L**	**T**	**P**	**Cr**
Course Code: MGEO.417	3	-	-	3
Total Hour: 45 Hours				

Learning outcome: The course would help the students to get insight about research in Climate Change and Environmental Sustainability.

1. To understand the climate system dynamics and feedback mechanisms shaping climate change.
2. To assess the impacts of climate change across global, regional, and local scales.
3. To evaluate the economic costs of climate impacts and the role of financial systems in managing risks.
4. To critically analyze sustainable development pathways and governance for environmental sustainability.
5. To apply geospatial analytics and sustainability metrics to assess climate impacts and support decision-making.

Unit I: The Science of Climate Change (10 Lectures)

- Climate System Dynamics: Atmospheric chemistry and physics, Ocean-atmosphere interactions (ENSO, AMOC, etc.)
- Paleoclimate and the Anthropocene: Geological evidence of past climate shifts; Human influence in the Anthropocene epoch
- Climate Forcing and Feedback Loops: Radiative forcing, albedo changes, carbon cycle feedback
- Climate Models and Scenarios: GCMs, RCPs, and SSPs, Attribution science and forecasting uncertainties, IPCC reports and global climate targets

Unit II: Section 2: Global to Local Climate Impacts(10Lectures)

- Biosphere and Ecosystem Stress: Range shifts, extinction risks, ocean acidification, Tipping points and planetary boundaries
- Hydroclimatic Extremes and Disasters: Floods, droughts, cyclones, wildfires; Risk modelling and early warning systems
- Human Health and Migration: Disease vectors, food insecurity, mental health; Climate-induced displacement and refugee dynamics
- Economics of Climate Impact: Loss and damage; Climate risk to financial systems and insurance models

Unit III: Pathways to Environmental Sustainability (10 Lectures)

- Environmental Sustainability: Concept of Environmental Sustainability; Three pillars: Environmental, Social, Economic; Sustainable Development Goals (SDGs) and Planetary Boundaries; Life Cycle Assessment for Sustainability; Environmental ethics and environmental justice
- Sustainability Paradigms: Ecological modernization, degrowth, doughnut economics; Resilience theory and socio-ecological systems
- Energy Transitions and Decarbonization: Renewable energy systems, energy justice; Net-zero transitions and just energy transitions
- Sustainable Resource Governance & Infrastructure: Water-energy-food nexus; Forests, oceans, and land use governance (REDD+, SDGs, etc.); Smart cities, green architecture, nature-based solutions

Unit IV: Governance, Approaches and Adaptation Strategies for Climate Action & Sustainability (15 Lectures)

- International Climate Governance & National to Local Adaptation Plans (NAPs): UNFCCC, Kyoto Protocol, Paris Agreement, COP processes; Climate finance mechanisms: GCF, CDM, carbon market; Mainstreaming adaptation and mitigation; Climate-resilient infrastructure and community/ecosystem-based adaptation; Sustainability Advocacy and Communication
- Geospatial Analytics for Climate and Sustainability Applications: Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA); Life Cycle Assessment (LCA) and Carbon

footprint and climate mitigation strategies; Indicators and dashboards (e.g., Ecological Footprint, HDI, GPI, ESG)

- Technological Innovation and Climate Engineering: Carbon removal technologies (BECCS, DAC); Geoengineering ethics and feasibility; Climate Investment and Risks (CIR)
- Monitoring, Reporting, and Verification (MRV): Research Methods for climate and Sustainability; Transparency frameworks; Climate data platforms and AI for sustainability, Sustainability Metrics and Reporting Framework

Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Group discussion. Tools used: PPT, video, animation movie, other digital platforms/Online Modules

Suggested readings:

1. Maslin, M. (2021). Climate change: A very short introduction (4th ed.). Oxford University Press. https://doi.org/10.1093/actrade/9780198867864.001.0001
2. Robertson, M. (2021). Sustainability principles and practice (3rd ed.). Routledge. https://doi.org/10.4324/9781003003581
3. Dessler, A. E. (2021). *Introduction to climate change: Science and solutions*. Pearson Education. ISBN: 9780137474934
4. Heinrichs, H., Martens, P., Michelsen, G., & Wiek, A. (Eds.). (2021). *Sustainability science: Field methods and exercises*. Springer. https://doi.org/10.1007/978-94-017-7242-6
5. DellaSala, D. A. (Ed.). (2018). *Encyclopedia of the Anthropocene* (Vols. 1–5). Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.09989-6
6. Thunberg, G. (Ed.). (2023). The climate book. Penguin Press.
7. Blewitt, J. (2018). *Understanding sustainable development* (3rd ed.). Routledge. https://doi.org/10.4324/9781315271220
8. Leal Filho, W. (Ed.). (2020). *Partnerships for the goals: Encyclopedia of the UN Sustainable Development Goals*. Springer. https://doi.org/10.1007/978-3-319-71067-9
9. Rogers, P. P., Jalal, K. F., & Boyd, J. A. (2012). *An introduction to sustainable development* (2nd ed.). Earthscan/Routledge.
10. Newell, P., Pattberg, P., & Schroeder, H. (Eds.). (2012). *The governance of climate change: Science, politics and power*. Cambridge University Press.

Course Title: Spatial and Transportation Planning	**L**	**P**	**Cr**
Course Code: MGEO.418	3	-	3
Total Hour: 45 Hours			

Course Learning outcome (CLO): On completion of this course, students will be able to:

CLO1: Proficient to comprehend basic concepts, scope, and challenges of spatial planning.

CLO2: Competent to explore the theory, models, tools, and techniques to support spatial planning for spatial sustainability in the national and global context.

CLO3: Proficient to comprehend the concept, scope, and challenges of transportation planning.

CLO4: Competent to explore the advanced planning processes, models, tools, and techniques to support transportation planning and management on the national and global scale.		
Unit/ Hours	**Content**	**Mapping with CLO**
Unit I/ 11 Hours	**Introduction to spatial planning:** The concept of spatial planning, characteristics and history of spatial planning, introduction to urban and regional planning, introduction to integrated land use and transportation planning, introduction to spatial planning and spatial sustainability, spatial planning at national and global scale: challenges and opportunities **Learning activities:** assignment and group discussion	CLO1
Unit II/ 11 Hours	**Advanced spatial planning:** Introduction to spatial planning theories, models, policies, and institutions; spatial planning framework, principles, process, and system; formulation of urban and regional development plan; concepts of sustainable city, dispersed city, compact city, and polycentric system; land use planning and change models; integrated spatial planning and TOD; risk-based land use and master planning; participatory land use planning; advanced tools, and techniques in spatial planning. **Learning activities:** assignment and group discussion	CLO2
Unit III/ 11 Hours	**Introduction to transportation planning:** Introduction to transportation planning and sustainable transportation; transportation planning history; introduction to motorized and non-motorized transportation, transportation & urban pollution, transportation safety, security, and public health: benefits, risks, and trade-offs; regional and global issues in transportation. **Learning activities:** assignment and group discussion	CLO3
Unit IV/ 12 Hours	**Advanced transportation planning:** Measures and indices of connectivity and accessibility; transportation planning theories, models, policies and institutions; transportation planning framework, principles, process and system; mobility and traffic impact analysis; Travel Demand and Choice Model, stated preference analysis methods, Low-carbon and E-transportation planning, Bus Rapid Transit (BRT) and public transportation planning, risk-based transportation planning, environmental Impacts Analysis, transportation finance, transport data collection & analysis, advanced transport network and service area analysis, advanced tools, and techniques in transportation	CLO4

	planning. **Learning activities:** assignment, group discussion and case study	

Transaction mode: methods of the transaction are lecture, audio-video, the discussion which will be followed in teaching using ppt, social media etc

Suggested readings:

1. Acheampong, R. A. (2019). Spatial Planning in Ghana: Origins, Contemporary Reforms and Practices, and New Perspectives, Springer Publisher. https://link.springer.com/book/10.1007/978-3-030-02011-8

2. Berke, Philip R. & David R. Godschalk (2006). Urban Land Use Planning, 5th edition, University of Illinois Press, USA.

3. Grossardt, Ted &Keiron B. (2018). Transportation Planning and Public Participation: Theory, Process, and Practice, 1st edition, Elsevier.

4. Kaiser, E. J. (1995). Urban Land Use Planning, 4th edition, University of Illinois Press, USA.

5. Morimoto, A. (2021). City and Transportation Planning: An Integrated Approach, 1st edition, Routledge, India.

6. Morphet, J. (2010). Effective Practice in Spatial Planning, 1st edition, Routledge. https://www.routledge.com/Effective-Practice-in-Spatial-Planning/Morphet/p/book/9780415492829

7. Schoeman, C. B. (2015). Land Use Management and Transportation Planning, WIT Press, USA.

8. Tumlin, J. (2012). Sustainable Transportation Planning: Tools for Creating Vibrant, Healthy, and Resilient Communities: 1st edition, Wiley.

9. UNECE (2020). A Handbook on Sustainable Urban Mobility and Spatial Planning Promoting Active Mobility, United Nations, Geneva.

10. H.M. Saxena (2022), Transport Geography, Rawat Publication, Jaipur

11. https://www.cdema.org/virtuallibrary/index.php/charim-hbook/methodology/7-land-use-planning/7-1-spatial-planning

12. https://unece.org/sites/default/files/2022-01/spatial_planning_e.pdf

Course Title: Natural Hazards and Disasters	**L**	**P**	**Cr**
Course Code: MGEO.538	3	-	3
Hours: 45 hours			
Course Learning Outcome (CLO): By the end of this course students will be able to: CLO1: understand the basic concept related to disaster CLO2: understand the mechanism of disaster classification CLO3: describe the influence if mitigation, preparation, response, and recovery on natural hazards CLO4: discuss various agencies for disaster risk reduction.			

CLO5: study the application geospatial technology for disaster studies.

Unit/Hours	Content	Mapping with CLO
Unit I / 11 Hours	Introduction to Disaster: Basic concept of Hazard and Catastrophe; Concept of vulnerability and risk; Geographical analysis of Disaster study. **Learning activities:** Models reading	CLO1
Unit II /12 Hours	Classification of Disasters: Natural and man-made disaster; Natural Disaster study (Causes, Assessment and Management): Flood, Cyclones, droughts, forest fires, earthquakes, volcanoes, landslides. Man-made disaster study: Accident, Oil spill, Terrorism, Food poisoning, stampedes. **Learning activities:** Map reading, Data Collection and analysis	CLO2
Unit III /11 Hours	Concept of Disaster Risk Reduction and mitigation, prevention, preparedness, response and recovery; Disaster response and management: Policies, Agencies and organisation. **Learning activities:** Model reading	CLO3
Unit IV /11 Hours	Disaster management plan: formulation and framework; Tools and techniques: Monitoring, tracking and decision support system (DSS), hazard risk vulnerability and capacity analysis (HRVC). **Learning activities:** Assignment and case study	CLO4 CLO5

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as WhatsApp, ppt., and video will also be used.

Suggested readings:

1. Hayes, Flynn, (2020). Global flood hazard: Mappings forecasting and risk assessment, Syrawood publishing house.
2. Feidan, Nicola (2019). Natural hazards and disasters: A case study approach, Callisto reference.
3. Schwab, Anna K. (2017). Hazard mitigation and preparedness: An introductory text for emergency management and planning professionals, Crc press.
4. Vaidyanathan, S. (2011). An introduction to disaster management: Natural disasters and manmade hazards, Ikon books.
5. Lopez-Carresi, Alejandro (2014). Disaster management: International lessons in risk reduction, response and recovery, Routledge.
6. Reddy, Sunita (2013). Clash of Waves, Indos Books.
7. Kapur, Anu, (2010), Vulnerable India: A geographical Study of Disaster, Sage and IIAS Publication.
8. S Vaidyanathan, An Introduction to Disaster Management: Natural Disaster and Man Made Hazards.
9. D R Khullar, JACS Rao, (2021), Environment & Disaster Management: Ecology, Climate Change & Bio-diversity, 3rd Edition, McGraw Hill Education India Private Limited.
10. R.B. Singh (2006), Natural Hazards and Disaster Management, Rawat Publication.
11. Bird Robinson (2020), Handbook of Natural Hazards and Disasters, Larsen & Keller, New York.
12. www.usgs.gov
13. www.bhuvan.nrsc.gov.in
14. www.emdat.be

Course Title: Climatology and Environmental Geography	**L**	**P**	**Cr**
Course Code: MGEO.517	3	-	3
Total Hour: 45 Hours			

Course Learning Outcomes: At the completion of the course, the student will be able to:

CLO1: distinguish between sustainable and unsustainable practices
CLO2: understand the basics of ecology and ecosystem
CLO3: comprehend the concept of landscape ecology, can detect, and characterize landscape patterns
CLO4: demonstrate a basic understanding of environmental issues and their impacts
CLO5: enlist the various government initiatives/policies and their progress

Unit/Hours	Content	Mapping

		with CLO
Unit I / 10 Hours	Fundamentals of Climatology: Earth's Atmosphere: Evolution, Structure, and Composition; Solar and Terrestrial Radiation: Variation, distribution, and effect on the atmosphere; Greenhouse Effect and Global Heat Budget; Temperature: Concept, measurement, scales, daily and annual cycles, vertical and world distribution Atmospheric Dynamics: Stability and Instability in the Atmosphere; Clouds: Types and Formation; Atmospheric Moisture and Precipitation: Concepts, measurements, forms of condensation; Adiabatic temperature changes; Formation and types of precipitation, Global distribution of precipitation **Learning Activities**: Paper reading, Case studies, IMD report analysis, Familiarisation with weather apps, Movie, Test	CLO1
Unit II / 10 Hours	Wind Circulation and Monsoon: General circulation models of the atmosphere; Jet streams, air masses, and fronts: Characteristics and movements; Frontogenesis, Tropical cyclones: Mechanism and characteristics, Indian Monsoon: Genesis and variability, Climatic Oscillations: ENSO Climatic Classification: Empirical and Generic Climate Classifications; Detailed study of Koppen or Thornthwaite classification (choose one), Role of Indian Meteorological Department (IMD) and All India Weather Forecast **Learning Activities**: Paper reading, Case studies, IMD report analysis, Familiarisation with weather apps, Movie, Test	CLO2
Unit III / 13 Hours	**Basics of Environmental Geography** Nature, scope, significances, approaches, and history of Environmental Geography; Human-environment interactions and impacts; Different approach towards sustainable environmental development and its different constituents **Learning activities:** Group discussion/paper reading	CLO3
Unit IV / 12 Hours	focuses on contemporary environmental issues and policy frameworks. It addresses a range of environmental problems such as atmospheric pollution, global warming, climate change, water and land pollution, groundwater depletion, urban heat islands, and deforestation. The unit further explores national and international environmental policies, conventions, treaties, and frameworks including the UNFCCC (1992), Kyoto Protocol (1997), Brundtland Commission, Rio Declaration, Agenda 21, Paris Agreement, various COP meetings, and the Sustainable Development Goals (SDGs). Together, these units equip students with the knowledge to critically assess environmental processes, detect spatial ecological changes, and evaluate sustainable policies and governance mechanisms shaping the global environmental agenda. **Learning activities:** Assignment writing, Quiz/test	CLO4 CLO5

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as WhatsApp, ppt., and video will also be used.

Suggested readings:

1. Akitsu, T. (2019). *Environmental Science: Society, Nature, and Technology*. Jenny Stanford Publishing
2. Simon, S. J. (2018). *Protecting Clean Air: Preventing Pollution*. Momentum Press.
3. Brinkmann, Robert. (2016). *Introduction to Sustainability*. Wiley-Blackwell
4. John, H. (2015). *Global Warming: The Complete Briefing*. Cambridge University Press.
5. Abbi, Y., Jain Shashank. (2015). *Handbook on Energy and Environment management*. The Energy Resources Institute.
6. Saxena, H.M (2017), Environment Geography, Rawat Publications, New Delhi.
7. Singh Savindra (2018), Environmental Geography, Pravalika Publications, Allahabad.

Website/Web references

1. http://moef.gov.in/en/
2. http://www.envis.nic.in/
3. https://www.fsi.nic.in/
4. https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=14
5. https://nptel.ac.in/courses/127/105/127105018/
6. https://nptel.ac.in/courses/122/102/122102006/

https://sdgs.un.org/goals

Course title: Political Geography		L	P	C
Course code: MGEO.518		3	-	3
Total hour: 45 hours				
Course Learning outcome (CLO): At the completion of the course, the student will be able to: CLO1: Understand the concepts and theories of Political Geography CLO2: Analyze and Evaluate the concepts related to spatial structure of state and nation CLO3: Analyze Geopolitics of India and World CLO4: Analysis and application of Bilateral and Multilateral Relation, debate about shift in Global order relating it with current development				
Unit/Hours	**Content**			**Mapping with**
Unit I /11 Hours	Political Geography: nature, scope and development; Boundaries and frontiers, Territorial Sea and Maritime Boundaries, Concepts of Territoriality, Theories: Heartland, Rimland, World System theories**;** Global Strategic Model, **Learning activities:** Group discussions			CLO1
Unit II /11 Hours	Concept of state and Nation; location, size, shape and core areas; Elements of Spatial Structure of the State, concept of organic state-Ratzel Spencer and Schaffer; Geography of federalism, Colonialism and resultant disparities **Learning activities:** Assignments			CLO2
Unit III /11 Hours	India and her neighbors from geopolitical perspective Geopolitical significance of the Indian ocean as a zone of peace, problems, and prospects, Electoral Geography **Learning activities:** Assignments			CLO3
Unit IV /11 Hours	Concept of Geopolitics: climate change; world resource, development and power, Indian ocean; World Organization, Regional organization of cooperation (SAARC, ASEAN, OPEC, EU, BIMSTEC, G-20, Neo-politics of world ORDER and current development. **Learning activities:** Group discussions			CLO4
Mode of Transaction: methods of transaction are lecture, audio-video, discussion which will be followed in teaching using ppt, social media etc.				
Suggested readings: 2. Adhikari, S.: Political Geography, Rawat Publ., Jaipur, 1997. 3. Agnew, J. (ed): Political Geography: A Reader, Arnold, London, 1997. 4. Bergman, E.P.: Modern Political Geography, W.M.C. Brown Co., Pub, Dubuque, 1975.				

5. Dikshit, R.D.: Political Geography: A Contemporary Perspective, Tata McGraw, Delhi, 1996.
6. Dikshit, R.D.: Political Geography-A Century of Progress, Sage Publ., Delhi, 1999.
7. Gopalakrishnan, R.: Geography of India, Jawahar, Delhi, 2001.
8. Painter, J.: Politics, Geography and Political Geography: a Critical Perspective, Arnold, London, 1995.
9. Singh, C.P.: Contributions to Indian Geography-13, Reading in Political Geography, Heritage Publ., New Delhi, 1994.
10. Slowe, P.: Geography and Political Power, Routledge, London, 1990.
11. Taylor, P.: Political Geography, Longman, London, 1995 (revised edition)

Course Title: Remote Sensing and Geographical Information System Theory	L	T	P	Cr
Course Code: MGEO. 524	3	-	-	3
Total Hour: 45 Hours				

Course Learning Outcome (CLO): At the completion of the course, the student will be able to:

CLO1. CLO1: Understand basic concepts and the skills necessary to acquire remote sensing data and extract geo-information for real-time problem solving,

CLO2: comprehend basic concepts and the skills necessary to process and analyse remotesensing data for real-time problem solving,

CLO3: extract, analyse and generate maps, apply their skills to geographical research works

CLO4: comprehend the theoretical framework in geographical information system

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 12 Hours	**Introduction to remote sensing and image classification:** Introduction to remote sensing: history, process, and types;Introduction to electromagnetic radiation and its interaction with the Earth's surface. Remote sensing platforms, sensors, and satellite series; Introduction to Aerial Photography and Photogrammetry; fundamentals of Image Processing and Interpretation; Introduction to change detection analysis	CLO1

Unit II / 11 Hours	**Introduction to Image Processing and Interpretation**: Downloading and familiarization of satellite imagery and aerial photographs, Pre-processing, Visual Image interpretation, digital image classification, Change detection analysis, layout, and reporting.	CLO2
Unit III / 11 Hours	Concept and definition of GIS, History and development of GIS technology, Applications of GIS in various sectors; Geographic information System database: data types (map, attributes, image data) and structure; Spatial and non-spatial data; **Learning activities:** group discussion	CLO3
Unit IV / 11 Hours	Geo-referencing; Map projection; Data entry and preparations (inputs, editing and attributing); Spatial analysis: overlay, buffer and proximity, network analysis; Contours and spot heights; Determination of slope and hill shading; Data interpolation: point and line data; Output generation and layouts. Introduction to Geodatabase; Geodatabase models; Introduction to Geodatabase in open source and commercial software.	CLO3
Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Tools such as WhatsApp, ppt., video will be used.		

Suggested readings:

1. Liu, Jian Guo & Mason, Philippa J. (2016), Image processing and GIS for remote sensing, Techniques and applications, 2nd edition Publication, United Kingdom, Wiley Blackwell.
2. Kennedy, Michael (2013), Introducing geographic information systems with ArcGIS: A workbook approach to learnings, 3rd edition, New jersy, A john wiley&sons publications.
3. Bhatta, Basudeb (2011), Remote sensing and GIS, 2nd edition, New Delhi, oxford university press.
4. Harvey, Francis (2016), A primer of GIS: Fundamental geographic and cartographic concepts, 2nd edition, New York, The Guilford press.
5. Holfmann-wellenhof, B.; Lichtenegger, H.; Collins, J.; Hofmann-wellenhof, B. (2013), GPS global positioning system: Theory and practice 5th edition, New Delhi, Springer (India) private limited.
6. Van Sickle, Jan (2008), GPS for land surveyors, 3rd edition, London, Crc press.
7. Kang-tsung Chang (2002), 'Introduction to Geographic Information Systems' Tata McGraw Hill, New Delhi
8. Gottfried Konecny Remote Sensing, Photogrammetry, and Geographic Information Systems Second edition, CRC Press.
9. Kresse, Danko (Eds.) Springer Handbook of Geographic Information, 2012 Edition.
10. Chakraborty, Deshasis&Sahoo, Rabi N. (2009), Fundamentals of Geographical Information System, Viva Books Private Limited, New Delhi

11. Sabins F., Remote Sensing (1997). Principles And Interpretation, New York.

12. Lillesand T.M., And Kiefer R.M., (1999). Remote Sensing And Image Interpretation, Fourth Edition, Wiley.

13. Jensen J.R., (2000). Remote Sensing Of Environment: An Earth Resource Perspective, Prentice Hall.

14. Joseph, George and C Jeganathan (2018), Fundamentals of Remote Sensing, Third edition. University Press, India.

15. B. Bhatta (2021). Remote sensing and GIS, 3rd edition, Oxford University Press.

16. Rees, W.G., (2001). Physical Principles of Remote Sensing, Cambridge University Press

17. J.R. Jensen. INTRODUCTORY DIGITAL IMAGE PROCESSING A Remote Sensing

Perspective.

18. Sabins, F.F. (2007). Remote Sensing: Principles and Interpretation,3rd Edition.

Website:

www.epgp.inflibnet.ac.in

www.nptel.ac.in

www.esri.com

www.bhuvan.nrsc.gov.in

Course Title: Geography of India	**L**	**P**	**Cr**
Course Code: MGEO.521	3	-	3
Total Hour: 45 Hours			

Course Learning Outcome (CLO): At the completion of the course, the student will be able to:

CLO1: Comprehend the geological history of India plate and Eurasian plate.

CLO2: Understand the Origin of physiographic features in relation to hydrological units of India.

CLO3: Understand the climatic condition and vegetation

CLO4: Discuss the dimensions of growth and distributions of mineral resources, agriculture, and industry.

CLO5: Analyse the social and environmental issues in relation to regional disparities

Unit/Hours	**Content**	**Mapping with**

		CLO
Unit I / 11 Hours	Geological history of India; Origin of Relief feature and Physiographic divisions: Precambrian shield, the Gondwana rift basins; Drainage systems; watershed and basin; **Learning activities:** Map & Model readings	CLO1 CLO2
Unit II/ 11 Hours	Climate of India: Types, Distribution and Mechanism of monsoon, environmental issue; Indian forest: Types and Distributions; Mineral resources: Types and Distribution Belt; **Learning activities:** Data reading and Map reading	CLO3 CLO4
Unit III / 12 Hours	Indian Population: Growth, Distribution and Policies; Regional disparities in the levels of economic development; **Learning activities:** Map reading and case study	CLO5
Unit IV /11 Hours	Agriculture: Salient features of agriculture, agricultural regions, major crops; Agricultural revolution with reference to India; Industry: Industrial belt of India: and New industrial policies; Case study, Map reading and data analysis **Learning activities:** Group discussion and map reading.	CLO4
Mode of Transaction: Lecture, Assignment, Seminar, Group discussion. Tools used: PPT, video, animation movie, WhatsApp, google classroom.		

Suggested readings:

1. Shah S.K. (2018). Historical Geology of India, Scientific Publishers.
2. Khullar D. R. (2018). India a Comprehensive Geography, Kalyani Publication.
3. Sanyal, Sanjeev, Rajendran, Sowmya (2015). The Incredible History of India's Geography, Penguin Books Limited.
4. Verma, Sangeeta, Bodh, P.C. (2018). Glimpses of Indian Agriculture, OUP India
5. Siddhartha K. & Mukherjee S. Ahsan, Qamar (2017). Indian Industry, Kitab Mahal Publishers.
6. Dyson Tim (2018). A Population History of India: From the First Modern People to the Present Day, Oxford University Press.
7. Srinivasan, Krishnamurthy (2017). Population Concerns in India: Shifting Trends, Policies and Programs, Sage Publications India Private Limited.
8. Kumar A.K Shiva Et Al (2013). Handbook of Population and Development in India, Oxford University Press.
9. ICAR Report (2017). Handbook of Agriculture: Facts and Figures for Farmers Students and All Interested in Farming.
10. Rao Mohan (2019). The Lineaments of Population Policy in India Women and Family Planning, Routledge India
11. Hussain, Majid (2022), Geography of India, McGraw Hill Education, Chennai
12. D.R Khullar, (2020), India: A comprehensive Geography, Kalyani Publication, fourth Edition.

1. www.gsi.gov.in
2. www.geosoindia.org
3. www.censusindia.gov.in
4. www.slusi.dacnet.nic.in

5. www.mospi.nic.in

Course Title: Remote Sensing and Geographical Information System Practical	**L**	**T**	**P**	**Cr**
Course Code: MGEO.522	3	-	-	3

Total Hour: 45 Hours

Course Learning Outcome(CLO): At the completion of the course, the student will be able to:

CLO1: comprehend basic concepts and the skills necessary to acquire remote sensing data mining and pre-processing, classification, post-processing, validation and change analysis to extract and manage geo-information for real-time problem solving.

CLOS: comprehend the theoretical framework in geographical information system, apply their skills to geographical research works.

Unit/Hours	**Content**	**Mapping with CLO**
Unit I / 30 Hours	**Fundamentals of Image Processing and Interpretation:** **Basic of Image preprocessing:** Mining of satellite imagery, aerial photograph; reading metadata and basic characteristics of images and aerial photograph; Pre-processing: geometric and radiometric correction, FCC generation, mosaicking, sub-setting, and atmospheric correction. **Basics of Image classification, post processing and validation:** Basic aerial photo interpretation: scale determination, mosaicking and interpretation; Image classification and interpretation: visual interpretation, digital image processing (supervised, unsupervised and hybrid classification);Post processing and accuracy assessment: mixed pixel correction, confusion matrix, user accuracy, producer accuracy, overall accuracy, kappa indices; Change detection analysis: Image-based and map-based approach; Case studies : land use mapping land use change analysis, urban growth monitoring, forestry etc.	CLO1
Unit II / 30 Hours	Geo-referencing Maps/Images, Digitization of Raster Map: Point, Line and Polygon Features; Preparation of Attribute Tables, Editing and Joining Tables, Analysing Attribute Data: Calculating Area, Perimeter, and Length. Spatial Representation: Symbolizing and Map Layouts; Basic Analysis in GIS: Buffering, Overlay and Query Building; GPS Applications. Collection of ground control points using hand held GPS receiver; transferring data from GPS receiver to PC.	CLO2

Mode of Transaction: Lecture, class discussion, presentation methods will be used for teaching. Audio-visual tools such as PPT, video, and WhatsApp will be used.

Suggested readings:

1. Lillesand T.M., And Kiefer R.M., (1999).Remote Sensing and Image Interpretation, Fourth Edition, Wiley.
2. Jensen J.R., (2000).Remote Sensing of Environment: An Earth Resource Perspective, Prentice Hall.
3. Joseph, George, and C Jeganathan (2018), Fundamentals of Remote Sensing, Third edition. University Press, India.
4. B. Bhatta (2021). Remote sensing and GIS, 3rd edition, Oxford University Press.
5. J.R. Jensen. INTRODUCTORY DIGITAL IMAGE PROCESSING: A Remote Sensing

Perspective.

Course Title: Quantitative Methods in Geography (Practical)	L	T	P	Cr
Course Code: MGEO.522	-	-	4	2
Hours: 60 hours				
Course Learning Outcomes (CLO): On completion of the course, the learner will be able to: CLO1: understand quantitative methods, tools, and techniques for analysing data. CLO2: apply quantitative techniques in geographic research. CLO3: The students will learn to create indices and apply geographic models.				

Unit/Hours	**Content**	**Mapping with CLO**
1 Unit/ 30 hours	Exercise Introduction of quantitative methods in Geography: data collection methods, data organization, frequency, graphs and data analysis. Distributional pattern of population, Health and Education, Inter-district inequalities using composite HII (health infrastructure index) and Sorensen's Index, Composite Development Index, Literacy Index	CLO1 CLO2
2 Unit/ 30 hours	Exercise Nearest neighbor analysis using MS Excel, Determinants and matrices, Network Analysis, Connectivity Index-Beta Index; Measures of Accessibility: Proximity analysis; Measures of combination and disparity: S.S. Bhatia's Method, S.M. Rafiullah's method, J.C. Weaver, Sophers Disparity Index, Principal component analysis, Gravity Model; Cause and effect relationship: Granger causality test.	CLO3
Mode of Transaction: Classroom and lab exercises.		

Suggested readings:

1. Sarkar, Ashis (2013), Quantitative geography: Techniques and presentations, New Delhi, Orient blackswan.

2. Kothari, C.R. (2013), Quantitative techniques, 3rd edition Publication New Delhi, Vikas publishing house pvt. ltd.

Further Readings:

1. Berry, B.J.L. and Marble, D.R. (ed), 1968, Spatial Analysis: A Reader in Statistical

Geography, Prentice Hall, New York.

2. Cole, J.P. and Kind, C.A.M. 1968. Quantitative Geography, John, Wiley, New York.

3. Mahmood, A, 1986. Statistical Methods in Geographic Studies. Rajesh Publishers, New Delhi.

Course Title: Introduction to Earth's Material - Practical	**L**	**P**	**Cr**
Course Code: MGEO.523	-	4	2
Total Hour: 60 Hours			

Course Learning outcome (CLO): The student will benefit in understanding:

CLO1: The characteristics of rocks and minerals.

CLO2: Identification of minerals and rocks.

CLO3: Uses of tools that would help in carrying out further research.

Unit/ Hours	**Content**	**Mapping with CLO**
1 Unit/ 30 hours	Definitions of rock and minerals, Classification of rocks; Identification of minerals; Identification of Igneous, sedimentary and metamorphic rocks	CLO1 CLO2 CLO3
2 Unit/ 30 hours	Nature and use of various natural construction material – grain size analysis using sieve test; strength of the natural materials; Water quality test; Identification of hazardous earth material for human health	

Suggested readings:

1. Minerals and Rocks-Exercises in Crystallography, Mineralogy and Hand Specimen Petrology by Cornelius Klein, 2007, Wiley publisher.
2. Earth Materials: Introduction to mineralogy and petrology by Cornelius Klein and Anthony Phillpotts, 2013, Cambridge University press, Cambridge.

Course Title: IDC- Introduction to Climate Change		**L**	**T**	**P**	**Cr**
Course Code: MGEO.506		2	-	-	2
	Total Hour: 30 Hours				
	Course Learning outcome (CLO): After completing the course, student will be able to: CLO1: Explain what climate change is. CLO2: Identify the main drivers of climate change. CLO3: Describe how they plan to adapt to the negative (or positive) impacts of climate change. CLO4: Identify ways to plan climate actions. CLO5: Explain how climate negotiations work. CLO6: Formulate a climate project or policy.				
			with CLO		
Unit I / 06 Hours	**Introduction to Climate Change Science** Introduction to Climate Change Science; Fundamental feedbacks in the Climate System; Natural & Anthropogenic Drivers of Climate Change; **Learning activities:** Group discussions, Presentations, Assignments		CLO1/ CLO2		
Unit II / 08 Hours	**Climate Change Impacts at Global Scale** Observed (in past & present) evidence & projected trends of Climate Change; Carbon cycle feedbacks & Changes in atmospheric greenhouse gases; Extreme weather & Modern surface temperature trends; Introduction to live case studies from global agency datasets (e.g. **Learning activities:** Group discussions, Presentations, Assignments		CLO2/ CLO3		
Unit III / 08 Hours	**Climate Change Impacts at National to Local Level** Ecosystems and biodiversity; Glacier melting, impacts on regional water balance and food resources; Sea level rise and coastal impacts; Human health impacts; Introduction to live case studies from national to local level agency datasets (ISRO/PRL/IITM/IMD/NCOSS etc.); **Learning activities:** Group discussions, Presentations, Assignments		CLO2/ CLO3/C LO4		

Unit IV / 08 Hours	**What Is Our Path Forward?** Millennium and Sustainable Development Goals; Geoengineering: A scientist's perspective; Emissions reductions and scenarios, stabilizing CO2 concentrations; Solution at local to global scale, its approaches & policies: A path of hope; **Learning activities:** Group discussions, Presentations, Assignments	CLO4/ CLO5/ CLO6	
Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Local field visit discussion. Tools used: PPT, video, animation movie, WhatsApp and Expert's Video Conferencing lectures from various national & international organizations			
International to National to Local reachability: The course will have wider reachability from local to international level to understand the today's most dreadful problem of the world and our contribution to curb this at our maxima potential.			
Suggested Readings: ● IPCC, (2013): Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324. ● Kininmonth, William. (2004). Climate Change: A Natural Hazard. Brentwood: Multi- Science Pub. Co. ● Letcher, T. M. (Trevor M.). Climate Change: Observed Impacts on Planet Earth.			

Course Title: IDC- Basics of Geoinformatics	**L**	**P**	**C**
Course Code: MGEO.507	**2**	**-**	**2**
Total Hour: 30 Hours			

Course Learning outcome (CLO): After completing the course, student will be able to:

CLO1: Demonstrate a comprehensive understanding of the principles, techniques, and applications of remote sensing, geographic information systems (GIS), cartography, global positioning systems (GPS), and image interpretation.

CLO2: Analyze and interpret remote sensing data, including satellite images, to extract valuable information about the Earth's surface and natural resources.

CLO3: Apply GIS tools and techniques to manage, analyze, and visualize spatial data, integrating both raster and vector datasets effectively.

CLO4: Evaluate different map projections, scales, and generalization techniques to create accurate and visually appealing maps for various purposes.

CLO5: Utilize GPS and other positioning systems to acquire accurate geographic coordinates and understand their applications in navigation and Geopositioning.

CLO6: Apply image interpretation techniques, including radiometric and spatial

enhancement, band ratios, and classification methods, to extract meaningful information from digital satellite images.

Topic and Contents		**Mapping with CLO**
Unit I / 06 Hours	BASIC PRINCIPLES REMOTE SENSING SATELLITES Remote Sensing: Definition, Advantages and Limitations, Concept & Principles; Electromagnetic Radiation (EMR), Atmospheric windows, Interaction of EMR with atmosphere & Earth's Surface; Resolutions, Remote Sensing Systems, IRS Series of Satellites,	**CLO1**
Unit III / 08 Hours	CARTOGRAPHY & GLOBAL POSITIONING SYSTEM: Introduction to cartography, Map and Scale, Important Map Projections, Generalization-Elements, Classification, Introduction to Global Positioning System, GPS Segments, GPS Positioning Types, Geopositioning, GNSS: NAVSTAR, GLONASS, GALILEO etc.	**CLO4 CLO5**
Unit IV / 08 Hours	IMAGE INTERPRETATION: Concepts about digital image and its characteristics, Image Interpretation; Elements of Image Interpretation; enhancement techniques, Band ratio, Types of Vegetation indices; Classification- supervised & unsupervised	**CLO6**

Transaction mode: Lecture, Demonstration, Problem solving, Tutorial, Seminar, Local field visit discussion. Tools used: PPT, video, animation movie, WhatsApp and Expert's Video

Conferencing lectures from various national & international organizations

International to National to Local reachability: The course will have wider reachability from local to international level to understand the today's most dreadful problem of the world and

our contribution to curb this at our maxima potential.

Suggested readings:

1. Jensen, J.R., (2006) "Remote Sensing of the Environment – An Earth Resources Perspective", Pearson Education, Inc. (Singapore) Pte. Ltd., Indian edition, Delhi.
2. George Joseph, (2004) "Fundamentals of remote sensing", Universities press (India) P Ltd.
3. Lo and Albert K.W. Yeung (2006) "Concepts and Techniques of Geographic Information Systems" Prentice Hall of India, New Delhi.
4. Burrough, Peter A. and Rachael McDonnell, (1998), 'Principles of Geographical Information Systems' Oxford University Press, New York.
5. Ramesh, P. A., (2000): Fundamentals of Cartography, Concept Publishing Co., New Delhi.
6. Leica. A., (2003), GPS Satellite Surveying, John Wiley & Sons, use. New York Terry- Karen Steede (2002).
7. J.R. Jensen, INTRODUCTORY DIGITAL IMAGE PROCESSING A Remote Sensing

Perspective, Pearson.

8. Kresse, Danko (Eds.) Springer Handbook of Geographic Information, Springer.

Course title: Introduction to Map Reading (VAC)	**L**	**T**	**P**	**Cr**
Course code: MGEO.511	**2**	**-**	**-**	**2**

Total Hour: 15 Hours

Course Learning outcome (CLO): After completing the course, student will be able to:

CLO1: apply theoretical knowledge at the ground observation in field and to learn essential observational and practical skills.

CLO2: Formulate their knowledge in field trip and will be able to identify different land features in toposheets for adaptation in field work environment in certain professional and scientific organizations.

Unit/Hours	Content	Mapping with CLO
Unit I / 3 Hours	Introduction to map: Concept, history, types and applications; Scale in map and its usage, procedure of map reading. Learning activities: Group discussion	CLO1
Unit II / 4 Hours	Introduction to Topographical maps: Compositions and conventional symbols. Reading of Toposheets at scale of 1:50,000, Atlas, thematic map, guide map, 3D map and military map. Learning activities: assignment	CLO1
Unit III / 4 Hours	Preparation of Thematic Map/and Generation of Data from the topographical maps (land use map and area under different land-use categories) Learning activities: assignment	CLO2
Unit IV / 4 Hours	Interpretation of Toposheets: Representation of features in classroom exercises. Generation of 3D maps. Learning activities: Case study	CLO2
Mode of Transaction: Hand on exercise with toposheets and lab exercises.		
Suggested Reading: 1. Misra, R.P. and Ramesh, A. (1989). Fundamental of Cartography, Concept Publishing Company, New Delhi. 2. Robinson, A.H. et al. (1992). Elements of Cartography, John Willy & Sons, New York, 6th edition. 3. Singh, R.L. Elements of Practical Geography. https://www.oakton.edu		

Course title: Data Analysis and Visualization (VAC)	**L**	**T**	**P**	**Cr**
Course code: MGEO.512	**2**	**-**	**-**	**2**
Total Hour: 15 Hours				
Course Learning outcome (CLO): After completing the course, student will be able to: CLO1: Apply theoretical knowledge at observation in datasets and to learn the data analysis and interpretation. CLO2: Comprehend the theoretical and Practical knowledge of data visualizations. CLO3: Understand various Functions in MS-Excel for Data Enter and Data analysis CLO4: Apply the different datasets in statistical analysis and visualization.				

Unit/Hours	Content	Mapping with CLO
Unit I / 4 Hours	Data Analysis: Introduction, Importance of data analysis; Data analysis tools and software; Data Analytics Types**:** Exploratory Data Analysis, Predictive Analytics, Prescriptive Analytics, Diagnostic Analytics; Various Phases of Data Analytics	CLO1
Unit II / 3 Hours	Data Visualization: Introduction, Examples, and Learning Resources, Importance of data visualization; Different types of visualizations: **Chart, Table, Graph, Geospatial, Dashboards, Maps;** Data visualization and big data; Visualization tools and software	CLO2
Unit III / 4 Hours	Data Set for MS Excel Fundamentals, Workbook and Worksheet, Navigation - Adjacent Cells, Navigation - within Table, Selecting Cells, Applying Filters, Formatting, Paste Special Features, Paste Special Operations	CLO3
Unit IV / 4 Hours	Data Set for Text Functions; How to convert string into Lower Case; How to convert string into Upper Case; How to convert string into Upper Case; Data Preparation-Data Validation: Data Set for Data Validation**;** Validating Whole Number in the Worksheet	CLO4
Mode of Transaction: Hand on exercise with tools and software of Data analysis		
Suggested Reading: 1. "Beautiful Visualization, Looking at Data Through the Eyes of Experts by Julie Steele, Noah Iliinsky". 2. "The Visual Display of Quantitative Information" by Edward R. Tufte 3. "Information Graphics" by Sandra Rendgen, Julius Wiedemann 4. "Visual Thinking for Design" by Colin Ware 5. "Storytelling With Data: A Data Visualization Guide for Business Professionals" by Cole Nussbaumer Knaflic 6. "Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics" by Nathan Yau		