



Syllabus for
M.Sc. (Geography)
Based on National Education Policy-2020

Effective from 2025-2026

Department of Geography
Dr. Nityanand Himalayan Research & Study Centre, Doon University,
Dehradun, Uttarakhand (India)
(A State Government University as per Doon University Act 2005)

Introduction

With the implementation of the National Education Policy (NEP) 2020, the Master of Science in Geography programme at Doon University has been redesigned to align with the evolving academic and professional landscape. The revised syllabus reflects a progressive shift towards a more skill-oriented and application-based approach, equipping students with competencies that are not only theoretical but also practically grounded. A major emphasis has been placed on hands-on training in geospatial technologies, field-based research, and data analysis, enabling students to respond to real-world geographical challenges with practical solutions. One of the key highlights of the revised curriculum is the focused integration of Disaster Management, with special attention given to regional dimensions and vulnerabilities specific to the Himalayan and surrounding regions. This ensures that students are not only aware of global frameworks of disaster risk reduction but are also sensitised to local and regional contexts. The programme also encourages strong academia-industry collaboration, opening avenues for internships, joint projects, and industry-led workshops to bridge the gap between classroom learning and professional expectations. In keeping with the NEP's vision of promoting holistic and globalised education, the syllabus fosters national and international research exposure through academic exchanges, collaborative research opportunities, and participation in conferences and seminars. Overall, the NEP-aligned MSc Geography programme at Doon University strives to create a dynamic learning environment where students are trained to become skilled professionals, critical thinkers, and informed researchers who are well-prepared to address the geographical and environmental challenges of the 21st century.

Objectives

1. To develop advanced conceptual understanding of geographical theories and spatial processes across physical, human, and regional geography, enabling students to critically analyze environmental and socio-economic patterns.
2. To impart practical skills in geospatial technologies, including GIS, Remote Sensing, and GPS, through hands-on training and project-based learning, preparing students for research, planning, and industry-based roles.
3. To build expertise in Disaster Risk Reduction and Management, with particular emphasis on regional hazards and vulnerabilities, fostering an applied understanding of mitigation, preparedness, and resilience-building strategies.
4. To promote interdisciplinary research and collaboration by integrating academic knowledge in core areas of geography.
5. Demonstrate proficiency in geospatial technologies and field-based research methods
6. Effectively engage in interdisciplinary research and collaborative projects.
7. knowledge with real-world problems through academia-industry partnerships, fieldwork, internships, and community-based research.
8. To enhance national and international academic exposure by encouraging participation in seminars, research projects, academic exchange programmes, and collaborative learning platforms, preparing students for

global academic and professional careers.

Outcomes

By the end of the course, the students should be able to:

- Master cutting-edge geographical theories and spatial dynamics across physical, human, and regional landscapes, empowering students to decode complex environmental and socio-economic patterns with critical insight.
- Harness advanced geospatial technologies like GIS, Remote Sensing, and GPS through immersive, hands-on projects, equipping students to excel in research, urban planning, and industry-driven innovation.
- Cultivate expertise in Disaster Risk Reduction and Management, zeroing in on regional hazards to pioneer proactive mitigation, preparedness, and resilience strategies.
- Showcase fluency in geospatial tools and field research methodologies, transforming geographical challenges into actionable solutions.
- apply geographical knowledge, tools, and techniques to address various geo-environmental and human challenges, contributing to effective problem-solving
- Bridge academic theory with real-world impact through dynamic academia-industry partnerships, fieldwork, internships, and community-driven research initiatives.
- Amplify global academic and professional readiness by diving into seminars, research ventures, international exchange programs, and collaborative platforms, shaping trailblazers for a connected world.

NEP (M.Sc. Geography) COURSE STRUCTURE

Table 1

List of Discipline Specific Core (DSC) Courses

Course Code	Title of the courses	Credit	Sub total	Remark
Semester-I				
GGC-501	Geographical Thought	4	16	Core course
GGC-502	Advanced Geomorphology	4		Core course
GGC-503	Geography of India	4		Core course
GGC-504	Environment Geography	4		Core course
GGC-505	Cartographic Techniques in Geography	2	2	Practical Core
DSE	Elective Subject	2	2	Elective Course
SEC	Seminar/ Presentation	2	2	Communication Skills
	Total No. of credits		22	

Semester-II

GGC-551	Geography of Natural Resource	4	16	Core course
GGC-552	Cultural Geography	4		Core course
GGC-553	Climatology and Climate Change	4		Core course
GGC-554	Population Geography	4		Core course
GGC-555	Fundamentals of Remote Sensing and GIS	2	2	Practical Core
DSE	Elective Subject	2	2	Elective course
SEC	Field Work	2	2	Survey
	Total No. of credits		22	

Semester-III

GGC-601	Natural Hazards and Disaster Management	4	16	Core course
GGC-602	Urban Geography	4		Core course
GGC-603	Oceanography	4		Core course
GGC-604	Spatial Economics	4		Core course
GGC-605	Advanced GIS and Remote Sensing	2	2	Practical Core
DSE	Elective Subject	2	2	Core course
SEC	Internship	2	2	Field Training
	Total No. of credits		22	

Semester-IV

GGC-651	Research Methodology	4	4	Core course
GGC-652	Quantitative Techniques	2	2	Practical Core

GGC-653	Major Dissertation	16	16	Dissertation
	Total No. of Credits		22	

Discipline Specific Core (DSC): It represents those courses of Geography (Table 1), which would be pursued by a student as a mandatory requirement of his/her programme. These courses will be appropriately graded and arranged across the semesters of study, being undertaken by the student.

Table 2
List of Discipline Specific Elective (DSE) Courses

S.No.	Course Code	Title of Theory Course	Credits
1	GGE-121	Regional Geography of Uttarakhand	2
2	GGE-122	Himalayan Climate change and sustainability	2
3	GGE-123	Traditional Knowledge system and sustainability	2
4	GGE-124	Geography of the Himalayan Mountain	2
5	GGE-125	Regional geography of Migration	2
6	GGE-126	Regional Hazards and Disasters	2
7	GGE-127	Political Geography	2
8	GGE-128	Advanced Digital Image Processing	2
9	GGE-129	Social Geography of India	2
10	GGE-130	Health and Medical Geography	2
11	GGE-131	Geo-Hydrology	2

The Discipline Specific Elective (DSEs): It represents those courses of Geography for which the students have the liberty to choose in different semesters. Such courses will be available for the students in case of single discipline programme as well as multidisciplinary programme.

Table 3
List of Skill Enhancement Courses (SEC)

Course Code	Title of Theory Course	Credit
GES 107	Field Surveying	2
GES 108	Internship	2
GES 109	Seminar/Presentation	2

Departmental Guide: Each student undertaking dissertation work at an external institution will be assigned a faculty member from the Department of Geography, Doon University. This Departmental Guide will be responsible for the overall academic guidance and assessment of the dissertation.

SEMESTER -I

GGC-501: Geographical Thought (4 credit, Max marks: 100 = (50 End Sem, 30 Mid Sem, and 20 Internal Assessment))

Unit-I: Geography as a scientific discipline , methods and approaches Geography as the study of areal differentiation Man - environment relationship , and spatial organization . The measure of significance in geography , Time and genesis in Geography : Development of Dualism in Geography- Physical Dualisms . vs. Human Geography , Systematic vs. Regional Geography ; other dualisms.

Unit-II: Geography between the inter-war periods, Regional Geography of Hartshorne, Areal Differentiation and Nature of Geography.

Unit-III: Quantitative Revolution ; Quantification and statistical analysis in geography - Its role and main reactions to it : Development of Models and Paradigms in geography - uses , objectives and types of models , Systems theory in geography ; Locational spatial analysis and Spatial Organizations.

Unit-IV: Philosophical issues in scientific methods : Positivism and Logical Positivism in Geography : Perception , and Behavioural geography , and Humanistic geography ; and geography of place , Gender , Inequality and Development, Recent development and changes in indian geography and its future. Modern techniques and concepts in geography; remote sensing, systems approach and geographic information system..

Suggested Readings:

1. Hartshorne , R. The Nature of Geography
2. Hartshorne , R. Perspective on the Nature of Geography
3. Minshull , R. The Changing Nature of Geography , London , 1970
4. Harvey , D. Explanation in Geography , London , 1969
5. Spate , O.H.K. Let me Enjoy - Essays Partly Geographical

GGC-502: Advanced Geomorphology (4 credit, Max marks-100= (50 End Term exam+30 Mid Sem+20 Internal Assessment))

Unit- I: Nature, Scope and significance of geomorphology. Fundamental geomorphological concepts as given by W. Thornbury, applied Geomorphology.

Unit- II: The dynamic earth : continents,ocean, ,Diastrophism and catastrophism , Material of the Earth crust-Rocks, Isostasy , Plate tectonics , Mountain building , Mass - movement and landforms .

Unit-III: Theories of landscape development by G Gilbert . W.M. Davis , W.Penck , J.T. Hack , and L.C. King .

Unit-IV: Process on earth surface : Erosion and Weathering Landforms on Earth surface ; Glacial and Glacio - fluvial landforms, Peri Glacial landforms, Fluvial landforms, Karst landforms , Coastal and Aeolian

Suggested Readings:

1. Bloom , A.L. (1978) : A Systematic Analysis of late Cenozoic Landforms , Englewood Cliffs , New York .
2. Condon , K.C. (1989) : Plate Tectonics and Crustal Evolution . Pergamon Press . New York
3. Chorley , R.J. (ed .) : Spatial Analysis in Geomorphology , London , Methuen . Unwin , London .
4. Chorley , R.J. , S.A. Schum and D.E. Sugden (1985) : Geomorphology , London
5. Coats , D.R. (1981 , ed .) . Geomorphology and Engineering , George Allen and Unwin , Oxford University Press ,

GGC-503: Geography of India (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment)

Unit-I: Geological history, physiographic divisions , drainage system , Indian Monsoon: origin & mechanism, Climatic division , Distribution and types of soils and natural vegetation.

Unit-II: Agricultural regionalization and agro-climatic zones , Cropping pattern, Crop intensity and crop combination . Agricultural productivity, Green Revolution, and other agricultural revolutions, Agricultural land use policy in India . Power generation and utilization : Major - river valley projects and Mineral zones of India.

Unit-III: Industrial development . Types of industry; mineral - based , agro based and forest - based industries , household industry , engineering and other demand - based industries , new industrial policy and Industrial regionalization . Transport networks: roadways, railways, airways, waterways - problems and policies, International Trade - trends and direction.

Unit-IV: Population distribution , density and growth , population problems and policies . Regional Development Plans of India, NICs, BRICs, and geo-politics of regional development.

Suggested Readings:

1. Singh , R.L. (ed .) India , A Regional Geography
2. Tiwari , R.C. Geography of India , Allahabad , 2003
3. Gopalakrishnan R. Geography of India , Jawahar Publishers Gyanodaya Pr . , Gorakhpur.2003
4. Singh , Jagdish India : A Comprehensive Systematic Geography , Publication , 1968

GGC-504: Environment Geography (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment)

Unit I: environmental geography: nature and scope , concept , types of environment; Ecological principles; Ecology, Man – environment relationship.

Unit II: Ecological concept : Ecosystem , structure , types. Function of ecosystem : Trophic levels; Food chains and food webs; Energy flow in the ecosystem; Circulation of matter in the ecosystem, Biogeochemical cycles, ecosystem productivity.

Unit III: Biogeography : concept , world Biomes: Bio climatic zones . Influence of man on Environment; Environmental hazards : classification and types and impact. Human Impact on Climate , Vegetation, Soil and Water.

Unit IV: Environmental pollution : meaning definition , types . Environment conservation

and sustainable development (UNSDs). Environmental consciousness; Global environmental conservation Initiatives, environmental legislation; Environmental impact assessment; Disaster management: Climate change and global perspective.

Suggested Readings:

1. Singh, S. Environmental Geography. Prawalika Publication, Allahabad, 2016.
2. Barucha, Arach. Textbook of Environmental Studies, University Press India, Hyderabad. 2016.
3. Saxena, H. M. Environmental Geography. Rawat Publications. Jaipur, 2015
4. Siddhartha, K. Ecology and Environment. Kisalaya Publication Pvt. Ltd. Newdelhi. 2015.
5. Gautam, A. Geography of resources: Exploitation, conservation and management. Sharda Pustak Bhawan, Allahabad, 2013.
6. Sharma, Y.K. Environmental Geography: Resource and Development, Lakshmi Narayan Agarwal, Agra 2008
7. Roy, P. K. Resource Studies. New Central Book Agency, Calcutta, 2006.
8. Alexander, Mike. 2008. Management planning for nature conservation: A theoretical basis & practical guide, Springer.
9. Clarke, G. L. 1967. Elements of ecology, New York: John Wiley Pub.
10. Bharucha, E. (2005). *Textbook of environmental studies for undergraduate courses*. University Press.
11. Balakrishnan, M., 1998. Environmental Problems and Prospects in India, in Das, R.C., et. al. Oxford & IBH Pub., New Delhi.
12. Robbins, P., Hintz, J. G., & Moore, S. A. (2022). *Environment and society: a critical introduction*. John Wiley & Sons.
13. Das, R. C., 1998. The Environmental Divide: The Dilemma of Developing Countries, A.P.H. Pub., New Delhi.
14. Freedman, Bill. 1995. Environmental Ecology: The Ecological Effects of Pollution, Disturbance, and Other Stresses, Academic Press. London.
15. Gole, P., 2001. Nature Conservation and Sustainable Development in India, Rawat Pub., Jaipur.
16. Chandna, R. C. (2002). Environmental Geography. Ludhiana: Kalyani.
17. . Cunningham, W. P. & Cunningham, M. A. (2004). Principles of Environmental Science: Inquiry and Applications, New Delhi: Tata McGraw Hill.
18. . Goudie, A. (2001). The Nature of the Environment, Oxford: Blackwell.
19. Miller, G. T. (2004). Environmental Science: Working with the Earth, Singapore: Thomson Brooks Cole.
20. . Singh, S. (1997). Environmental Geography, Allahabad: Prayag Pustak Bhawan.
21. . UNEP (2007). Global Environment Outlook: GEO4: Environment for Development, United Nations Environment Programme.

Suggested Readings:

Sharma, B.L. & Puar P. Global Environmental Challenges. Rohini Books, Publishers & Distributors, Jaipur, 2004.

Saxena, H. M. Environmental Management. Rawat Publications, Jaipur, 2000.

Agrawal, A. & Sunita N. The Relationship between Environment and Development, the First citizen report 1996

Goudie, Andrew. The Human Impact on the Natural Environment. Blackwell Oxford, 1994.

Mukerji, A. and V.K. Agnihotri. Environment and Development. Concept , New Delhi, 1993.

Smith, R. L. Man and his Environment: An Ecosystem Approach. Harper & Row, London, 1992.

Burton, I.; R.W. Kates & G.F. Whiley. The Environment as Hazards. O. U. P., New York, 1978.

Munn, R.E. Environmental Impact Assessment: Principles and Procedures. John Wiley & Sons, New York, 1979.

Edington, J.M. & Edington M.A. Ecology and Environmental Planning. Chapman & Hall, London 1977.

Detwyler, J.R. Man's Impact on Environment. Pelican, 1970.

U.N.E.P.: Global Environmental Outlook . U.N. Pub. New York. Online

GGC-505: Cartographic Techniques in Geography (2 Credits, Max Marks 100 (Practical 50+File 30+Viva Voce 20))

Unit I: Map Projection: Properties and Types. Construction, Characteristics and Uses of Map projections; Conical Projection with 1 and 2 Standard Parallel, Bonne's Projection, Simple Cylindrical Projection, Lambert Cylindrical Equal-Area Projection, Gall's projection, Sinusoidal and Mollweide's Projections, Mercator's Projection, Zenithal Projections, Polyconic Projections and UTM Projection.

Unit II: Significance of map. Types, Index system, Grid reference, Map reading Component of topographical map- scale, direction, symbols, coordinates, direction, distance, Identification of land forms. Interpretation of land use, drainage and settlements pattern Study and Interpretation of any two topographical sheets, one hill and one plain. **Depiction of relief**: Contours and contouring from spot heights; Altimetric frequency curve, block diagrams (one point perspective) Slope and gradient, relief profiles, methods of slope analysis (e.g., Wentworth's & Smith's methods) construction of longitudinal and transverse profiles.

Unit III: Geological Maps and their Interpretation; Folded and faulted structures, effect of relief on the sequence and pattern of rock outcrops. Geological cross section maps and interpretation (Single and Double series maps)

Unit IV: Drainage Analysis: Ordering, Density, Frequency, Longitudinal Profiles, Graded profile, Hypsometric Curve.

Suggested Readings:

1. Steers, J.A : An Introduction to the Study of Map Projections
2. Barrett, E.C. & Curtis, L.F. : Introduction to Environmental Remote Sensing
3. Dickinson, G.C. : Maps and Aerial Photographs
4. Smith, H.T.V. : Aerial Photographs and Their Applications

Elective Subject (DSE):

SEC: Field Training (2 credit, Max marks 100; 75 marks for External and 25 marks for Internal assessment)

Students will be required to do the mapping in structurally deformed terrain under the

supervision of faculty members. The field work should be at least 2 to 3 weeks duration and the students will submit a report of the field training to the department for the evaluation purposes.

SEC Seminar (Credit 2, Maximum Marks- 100 (75 marks for External and 25 marks for Internal assessment))

Student will deliver a seminar related to the problem and research methodology of the dissertation before the faculty members, research scholars and M.Sc. students. Head of the department will constitute a board to evaluate the presentation of the candidate.

SEMESTER-II

GGC-551: Geography of Natural Resources (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-1: Scope and Approaches to Resource Geography , Concept of Resources related to man nature and culture , Classification of resources ,Functioning of ecosystems, **Unit-II:** Land , water , minerals , energy resources and their global distribution . Biotic resources and Biotic succession ; Biomes of the world, Anthromes(anthropogenic biomes), Biomes and climate change, . Use and misuse of resources . Problems of energy crisis.

Unit-II: Agricultural Regions of the World (Derwent Whittlesey) . Theory of Agricultural Location (Von Thunen) , Theory of Industrial Location (Weber) ,

Unit III: Resources management and Disaster risk reduction (DRR): Role of natural resources in mitigating hazards (e.g., landslides, floods).Integration of TKS: Traditional Knowledge systems concept, mitigation practices in DRR.

Unit-IV: Sustainable management of natural resources: Forestry, water, minerals, and renewable energy, traditional Knowledge system (TKS) and sustainable development.

Suggested Readings:

1. Hartshorn . T.A. & Alexander , J.W. Economic Geography , 3sedn . , 1994
2. Perman, R., Ma, Y., Common, M., Maddison, D., & McGilvray, J. (2011). Natural Resource and Environmental Economics (4th).
3. Boesch , Hans A Geography of World Economy
4. Fryer , D.W. World Economic Development
5. Gregor , H.F. Environment and Economic Life : An Economic and Social Geography
6. Highsmith , R.M. (r .) Case Studies in World Geography
7. Gurjar, R.K., Jat, B.C., 2009. Geography of Water Resources, Madson.Rawat Publications.
8. Amita Baviskar (ed) (2007): Waterscapes the Cultural Politics of a NaturalResource Permanent Black Himalaya, Uttaranchal.
9. . Arun Kumar Singh (June 2004): Privatization of Rivers in India, VikasAdhyayan Kendra, Mumbai
10. Shripad Dharmadhikary (2002): Water: Private, Limited FundamentalIssues in Privatisation and Corporatisation of Water in India. ManthanAdhyayan Kendra, Badwani (M.P)
11. Riccardo Petrella, Translated by Patrick Camiller, (2001): The WaterManifesto Arguments for A World Water Contract, Books for Change,Bangalore, Ind
12. Roy, P. K (2001): Economic Geography, A Study of Resources, NewCentral Book Agency, Kolkata.
13. Sangvai Sanjay (ed) (2000): The River and Life People Struggle in theNarmada Valley, Earth care Books, Mumbai.
14. Asthana, D.K., and Meera Astana., 1998. Environmental Problems and Solutions, S.Chand and Co., New Delhi.

15. Husain, M., 1994. Resource Geography. Perspectives in Economic Geography. New Delhi
Anmol Publications

GGC-552: Cultural Geography (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: Nature, scope, and development of Cultural Geography, Major concepts - Cultural Landscape, cultural diffusion, Cultural Ecology, cultural hearths.

UNIT II: Evolution of Culture and Humanization on the Earth, Cultural impact of migration and mobility, Migration processes and cultural development, Technological revolutions and cultural transformation,; Urbanization, globalization, and cultural change.

UNIT III: Origin and distribution of races and ethnic groups, related theories. Religion as a cultural force: distribution and influence. World distribution of languages; Major linguistic cultural groups.

UNIT IV: Criteria of Regional classification of cultures. Cultural regionalization- major contributors and frameworks, Cultural regions and Cultural realms of the world - Monsoon Asian, Meso - African. Western European, Anglo - American, Challenges of cultural convergence and fragmentation.

Suggested Readings

1. Ahmed, A (1999). Social Geography. Rawat Publications, Jaipur
2. Majid Husain. *Human Geography*. Rawat Publications.
3. Cater, J and Jones, T (2000). Social Geography: An Introduction to Contemporary Issues. Hodder Arnold, London.
4. Smith, DM (1994). Geography and Social Justice. Blackwell, Oxford.
5. Crang, M (1998). Cultural Geography, Routledge, London
6. Robertson, I and Penny, R (2003). Studying Cultural Landscapes. Oxford University Press, London.
7. Chandna, R.C. *Geography of Population: Concepts, Determinants & Patterns*. Kalyani Publishers (for cultural components).

GGC-553: Climatology and Climate Change (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-1: Elements of climate, Meaning, Nature and Scope of climatology, Structure of atmosphere and its characteristics; Solar radiation and terrestrial heat balance; humidity and precipitation, Atmospheric pressure & Global Atmospheric circulation. Air masses, fronts and associated atmospheric disturbances (cyclogenesis and cyclolysis).

Unit-II: Historical Climatology and global climate change, Micro - climatology, Climatic Classification: Thornthwaite's, Koppen-geiger's, Major climate types of the world. **Regional Climatology:** India's climatic region: Koppen & Trewartha; Southern Oscillation, Walker cell and Detailed study of Indian monsoon. **Applied climatology** with special reference to sources and analysis of Indian climate, Study of Extreme climate

events with respect to India, Heat waves, Floods, Tropical Cyclones, Cloud bursts .

Unit-III: ; Climatic Changes : Theories and Evidence of Paleo - Climates; Energy balance and climate change, Green house gases, and GH effect; Global warming- causes, impact and challenges ; ozone depletion ; Global climate change scenarios, Impact and extreme climate/weather events.

Unit-IV: Climate models and future climate change, Carbon Emissions, Reducing Carbon Emissions, Climate Policy, Renewable Energy, Carbon pricing and Carbon credits, Climate Justice, Global warming Gridlock, Pragmatism and Climate policy, Climate change Adaptation.

Suggested Readings:

1. Hoyt, J.B. 1992. Man, and the Earth, Prentice Hall, U.S.A.
2. Lal, D. S. 2003. Climatology, Allahabad: Sharda Pustak Bhawan.
3. Lapedes, D.N. 1974. Encyclopaedia of Environmental Science (eds.), McGraw Hill.
4. Mountain and Tree cover in Mountain Regions Report. 2002, UNEP-WCMC.
5. Parmesan, C., Yohe, G. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature, 421 (6918), 37–42.
6. Singh Savindra 2015. Paryawaran Bhoogol, Prayag Pushtak Bhawan, Allahabad (Hindi).
7. Sivaperuman, Chandrakasan et al. 2018. Biodiversity and Climate Change Adaptation in Tropical Islands. Academic Press, London.
8. Trewartha G. T., 1980. An Introduction to Climate, McGraw Hill Company, New York.

GGC-554: Population Geography (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment)

Unit I: Meaning , Nature , Scope and Significance of Population Geography , Concepts approaches and Methods of population study , Sources of population data Development of population geography, population geography and demography.

Unit-II: Population Distribution , Growth , Density , Factors in population growth , App - S Structure , Fertility . Literacy and mortality analysis . Occupational and C structure . Population Cycle . Broad World patterns.

Unit III: Theories of population growth . Demographic Transition Model . Population Typology . Population Pressure . Inequality of resource availability , Over - Under and Optimum population , Population - Resource Regionalization.

Unit IV: Human Development Index . Population Policies of developed (Canada . Japan) and developing (China , Brazil) countries , Population Projection , National population Policies in India . Human Resource Development planning.

Suggested Readings:

1. Clarke , John I. Population Geography
2. Wilson , M.G.A. Population Geography

3. Bose , A. Patterns of Population change in India , 1951-61
4. Zelinsky , W. A Prologue to Population Geography
5. Woytinsky , S.N. & World Population and Production Woytinsky , E.W.I.

GGC-555: Fundamentals of Remote Sensing and GIS (2 Credits, Max Marks 100 (Practical 50+File 30+Viva Voce 20))

Unit I: Meaning, principles, processes and stages of Remote sensing. Satellite and sensors: active and passive. Concept of resolution, photography vs. image, Electromagnetic Radiation (EMR) Interaction of EMR with the Earth surface & atmosphere . Types of Platforms Basic principles of Thermal & Microwave Remote Sensing , infrared (TR) Region of EMR , Characteristics of IR Images and their use , Radar Image Characteristics , Advantages of Radar Imagery.

Unit II: Aerial Photo Theory and Interpretation : Stereo test card vision testing. Fiducial marks , tilt , mosaic . Types of air photographs , Identification of features and mapping.

Unit III: Meaning , scope & concepts , History & development , Elements of GIS : GIS Software . Types of data , data models and structure (Raster and Vector) , Representation of spatial and non - spatial Information , Data Input Methods: Geo-referencing, digitisation. Data Base , Data integration, Geospatial Data Analysis.

Unit IV: Digitization (point , line and polygon) . Sub setting with AOI layer . Mosaicing , Radiometric and Geometric errors and correction, Image classification. Spatial data and Non spatial data integration . Editing of data . Building topology , Image interpretation , Interpretation keys

Suggested Readings:

1. Jensen, J.R. 2006. Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Edition, Pearson Education.
2. Leuder, R.D.: Aerial Photographic Interpretation
3. Joseph, G. 2005. Fundamentals of Remote Sensing, Orient Blackswan.
4. Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. 2004. Remote Sensing and Image Interpretation, 5th Edition, Wiley.
5. Longley, P.A., Goodchild, M., Maguire, D.J. and Rhind, D.W. 2010. Geographic Information Systems and Science, 3rd Edition, Wiley.
6. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation, 3rd Edition, Waveland Press

Elective Subject: (DSE)

SEC: Field Training (2 credit, Max marks 100; 75 marks for External and 25 marks for Internal assessment)

Students will be required to do the survey in a predetermined location under the supervision of faculty members. The field work should be at least 2 to 3 weeks duration and the students will submit a report of the field training to the department for the evaluation purposes.

SEMESTER - III

GEC-601: Natural Hazards and Disaster Management (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-I: Definition and types of disaster, Hazards and Disasters, Risk and Vulnerability in Disasters, Natural disasters: earthquakes, floods, drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes, Social Economics and Environmental impact of disasters

Unit-II: Principles of disasters management – hazard assessment, vulnerability assessment, rescue and relief, Mitigation and Management techniques of Disaster, disaster preparedness, Disaster Management cycle, Disaster management policy, National and State Bodies for Disaster Management,

Unit-III: Prevention , Mitigation , Preparedness , Disaster and development , Disaster legislature , Counter disaster resources , Disaster management plans , Utilization of resources, Early Warning Systems

Unit-IV: Post disaster review and damage assessment , Relief , Rehabilitation and Restructuring.

Suggested Readings:

1. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.
2. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.
3. Sinha, A. (2001). Disaster Management: Lessons Drawn and Strategies for Future, New United Press, New Delhi.
4. Stoltman, J.P. et al. (2004) International Perspectives on Natural Disasters, Kluwer Academic Publications. Dordrecht.
5. Singh Jagbir (2007) "Disaster Management Future Challenges and Opportunities", U.K. International Pvt. Ltd, New Delhi

GGC-602: Urban Geography (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-1: Meaning , scope and significance of Urban Geography ; Approaches to the study of Urban Geography ; Theoretical and operational concepts of towns ; Historical evolution and spatial perspectives of urban settlements.

Unit-II: Urban site, situation, and stages of development; Urban morphology - Land use models ; Concentric zone , sector and multiple nuclei models ; Centripetal and centrifugal forces of urban growth, Urban land use and spatial dynamics.

Unit-III: Demographic structure and characteristics of urban population; age, gender, literacy, migration ; Concept of urban function and classification: qualitative and quantitative techniques; Structure and characteristics of Central Business District (C.B.D.). Central Place Theory. Rank size rule, primate city. Slums - nature , types and dimensions - Indian context.

Unit-IV: City - region interaction , Urban Fringe Characteristics , Umland: concept, characteristics, and delineation methods , Regional pattern of urbanization - World & India, Urban challenges and planning responses: Smart Cities, AMRUT, Master Plans of major Indian cities.

Suggested Readings:

1. Atkinson, A. et. al., 1999. The Challenges of Environmental Management in Urban Areas, Ashgate Pub. Co., Sydney.
2. Hardoy, J.E., Mitlin, D. and Satterthwaite, D. 1992. Environmental Problems in Third World Cities, Earthscan, London
3. Joss, Simon, 2015. Sustainable Cities: Governing for Urban Innovation, Palgrave, London
4. Singh, R. B. (ed) 2015. Urban Development Challenges, Risks and Resilience in Asian Mega Cities, Springer, Japan
5. Sivaramakrishnan, K.C. 2001. Problems of Governance in South Asia, Centre for Policy Research, New Delhi
6. S.C. Bansal (2010). *Urban Geography*. Meerut: Meenakshi Prakashan.

GEC-603: Oceanography (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment)

Unit-I: Meaning objectives , scope and significance of oceanography, Plate tectonics , Ocean floor spreading.

Unit-II: Submarine relief , Ocean bottom relief , Configuration of Pacific Indian and Atlantic ocean floor.

Unit-III: Physical and chemical properties of sea water Marine Sediments , Coral reef.

Unit-IV: Ocean motions horizontal and vertical , Waves Tide currents , Coastal beach and shoreline process.

Suggested Readings:

1. Garrison, T (2015). Oceanography: An Invitation to Marine Science. Cole Publications
2. Kershaw S., (2000). Oceanography: An Earth Science Perspective, Stanley Thornes, UK.
3. Pinet P. R., (2008). Invitation to Oceanography (Fifth Edition), Jones and Barlett Publishers, USA, UK and Canada.
4. Sharma R. C. and Vatal M., (1980). Oceanography for Geographers, Chaitanya Publishing House, Allahabad.
5. Sverdrup K. A. and Armbrust, E. V., (2008). An Introduction to the World Ocean, McGraw Hill, Boston.

GGC-604: Spatial Economics (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-I: Economic systems: capitalist, socialist and mixed economies. Economic grouping and typology of countries, stages of development of productive forces, the post colonial states and the geography of world economy.

Unit- II: Development in Marxist Thought: Factors of production, relations of production, historical materialism and dialectical materialism. Development in Capitalist Thought: Rostow's stages of development, and Non-Communist Manifesto. Industrial Development: location of industries, models of Weber and Losch.

Unit-III: Free market economy: Neo-liberalism, globalisation and post-colonial dependency. Critique of global capitalism: Regionalisation, new regional geography, and resistance movements.

Unit-IV: Environmental movements and critique of everlasting growth: Club of Rome, Limits to Growth, Sustainable Development, Rio Earth Summit, Conference of Parties. Human Development: HDI and inequality adjusted HDI.

Suggested Readings:

1. Beaud, M. 2004. A history of capitalism, 1500-2000, Aakar Books
2. Bery, B.J.L., Conkling, E.C. and Ray, D.M. 1993. The Global Economy: Resource Use, Locational Choice and International Trade, Englewood Cliffs, N.J.: Prentice Hall.
3. Bryson, J., et al, 1999: The Economic Geography Reader, John Wiley, Chichester
4. Dodson, R.A., 1998: Society in Time and Space, Cambridge University Press, Cambridge.
5. Gilpin, R. 2011. Global political economy: Understanding the international economic order, Princeton University Press

GGC-605: Advanced GIS and Remote Sensing (2 Credits, Max Marks 100 (Practical 50+File 30+Viva Voce 20))

Unit I: Understanding Remote sensing Data, Basic concepts of GIS ; Components & Elements of GIS . Geo - referencing , Scale , Map Resolution : Types of Information in Digital Map ; Attribute Information ; Display Information ; Functions of GIS ; **Remote Sensing** Data Capture and Acquisition ; GIS database, Discrete and Continuous data, Spatial and Non - spatial data; Typology creation and data Query, Layerstacking and Composite Attribute Data Management and representation. GIS Softwares.

Unit II: Spatial database raster analysis: Raster Data Formats, Raster Data classification and reclassification, Raster Data Analysis-Local, Focal, Zonal and Global , Raster Data Analysis-Arithmetic Operations and Decision Rule Based approaches, Digital elevation model (DEM), NDVI, NDWI Analysis; LULC analysis and Temporal change detection, Final Layout and map generation.

Unit III: Spatial database Vector Analysis: Vector data formats, Creating Vector data, Overlay Analysis- Union, Intersection, Proximity Analysis- Buffering, Networking Analysis: Optimal Path &

Neighborhood analysis, Linking and presenting Attribute data, Integrated watershed analysis, Multi Hazard zonation using Vector Analysis tools; Final data output, map layout and Map generation.

Unit IV: Recent trends in GIS. Web GIS . 3D mapping, Internet GIS , Digital Cartography , UAVs and drone applications and Lidar Terrain Mapping. Application of GIS in Geographical studies with special reference Natural Resource Planning, Urban Management , Environmental Management , Agricultural Planning . Emergency Response System and Decision Support System.

Suggested Readings:

7. Burrough, P.A. and McDonnell, R.A. 1998. Principles of Geographic Information Systems, Oxford University Press.
8. Chang, K-t. 2006. Introduction to Geographic Information Systems, Tata McGraw-Hill.
9. DeMers, M. 2009. Fundamentals of Geographic Information Systems, 4th Edition, John Wiley & Sons.
10. Gupta, R.P. 2018. Remote Sensing Geology, 3rd Edition, Springer.
11. Heywood, I., Cornelius, S., Carver, S. 2011. An Introduction to Geographic Information Systems, 4 th Edition, Pearson Education.
12. Jensen, J.R. 2006. Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Edition, Pearson Education.
13. Joseph, G. 2005. Fundamentals of Remote Sensing, Orient Blackswan.
14. Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. 2004. Remote Sensing and Image Interpretation, 5th Edition, Wiley.
15. Longley, P.A., Goodchild, M., Maguire, D.J. and Rhind, D.W. 2010. Geographic Information Systems and Science, 3rd Edition, Wiley.
16. Sabins, F.F. 2007. Remote Sensing: Principles and Interpretation, 3rd Edition, Waveland Press

Elective Subject: (DSE)

SEC Internship (2 credit, Max marks 100; 75 marks for External and 25 marks for Internal assessment)

Students will be required to do an internship with an academic, industrial, or public organisation. The internship should be completed in summer/winter vacation and the credit for the same will be added in the result of third semester.

GEC-651: DISSERTATION (22 credits, Max marks 100; 75 marks for External and 25 marks for Internal assessment)

The project-oriented dissertation must be submitted by the end of fourth semester. During the course of completion of dissertation work, the students will be required to complete various assignments given to them by their respective supervisors or the Head of Department for the purpose of their evaluation.

Beside classroom seminars, the students will have to present their dissertation work in the form of seminar before the board of examiners including the supervisors, which will be followed by viva Examination.

GGC-651: Research Methodology (4 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-I: Meaning , objectives , concept and significance of research in Geography . Scientific method , Method and Technique . Approaches (qualitative a quantitative) and methods of Geographical research. Types of research.

Unit- II: Steps in research process , formulation of research problem , review of literature . Geographical research problem : meaning , identification , selection techniques defining research problem.

Unit-III: Definition , characteristics , significance , formulation and testing of hypothesis . Geographical research problems , selection and techniques of the problem. Types of data , Methods of data collection ; primary and secondary data , schedule and questionnaire , observation and interview , audio - visual method and Tabulation of data.

Unit-IV: Meaning , methods and steps and design of spatial sampling Probability sampling and non - probability sampling. Research Design : Meaning , concept and types research design Process of research formulation of synopsis, Preparation of maps and diagrams.

GGC-652: Quantitative Techniques (2 Credits, Max Marks 100 (Practical 50+File 30+Viva Voce 20))

Unit I: Scales of Measurement Nominal, Ordinal, Interval, Ratio. Tabulation of data. Frequency distribution. Measures of central tendency-Mean, Media, Mode. Measure of Dispersion-mean deviation, quartile deviation and standard deviation.

Unit II: Correlation-Rank order and product moment correlation, Karl Pearson and Spearman method. Linear regression, multi-linear regression. Normal, Binomial and Poisson distributions

Unit III: Significance testing: Z-test, t-test. Hypothesis testing: Null and research hypothesis, F-Distributions, analysis of variance, one-way and two-way classification. Non-parametric Tests: Chi-Square, Kolmogorov-Smirnov, Mann-Whitney and Kruskal-Wallis. Factor analysis, cluster analysis, and discriminant analysis.

Unit IV: Nearest neighbor analysis, quadrant analysis, entropy analysis, trend surface analysis; Introduction to Flow Analysis Techniques.

Suggested Readings:

1. Bart James E. and Gerld M. Barber, 1996. Elementary Statistics for Geographers, The Guieford Press, London.
2. Briggs, W. 2016. Uncertainty: The soul of modeling, probability & statistics. Springer International Publishing. doi:10.1007/978-3-319-39756-6.
3. Eldon, D. 1983. Statistics in Geography: A Practical Approach, Blackwell, London.
4. Cressie, N.A.C. 1991. Statistics for Spatial Analysis, Wiley, New York.

5. Gregory, S. 1978. Statistical Methods and the Geographer (4th Edition), Longman, London.
6. Davis, John C. (2002). Statistics and Data Analysis in Geology (third edition), John Wiley & Sons.
7. Mathews, J.A. 1987. Quantitative and Statistical Approaches to Geography: A Practical Manual, Pergamon, Oxford.

GEC-653: DISSERTATION (22 credits, Max marks 100; 75 marks for External and 25 marks for Internal assessment)

The project-oriented dissertation must be submitted by the end of fourth semester. During the course of completion of dissertation work, the students will be required to complete various assignments given to them by their respective supervisors or the Head of Department for the purpose of their evaluation.

Beside classroom seminars, the students will have to present their dissertation work in the form of seminar before the board of examiners including the supervisors, which will be followed by viva Examination.

List of Elective Course (DSE)

GGE-121: Regional Geography of Uttarakhand (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit I: Location, extent and surroundings, Physical setting- geo - structural divisions , Physiographic regions . Drainage system , Climate , Natural vegetation.

Unit II: Glaciers , Fluvial , mass - wasting , Slope , and Relief , Landforms , Lakes , Natural Hazards and disaster . Natural regions of Uttarakhand . Hydro power Projects ..

Unit III: Distribution , growth density of population . sex ratio , occupational structure and literacy . Rural hill migration . Tribes . Rural Settlement types , Pattern of Urbanization and Transport network . Cultural regions of Uttarakhand.

Unit IV: Distribution of land use , types , Agricultural land use , Horticulture , Animal Husbandry , Natural recourse , Tourism , and Industrial development.

Suggested Readings:

1. Bose . S.C (1968). Land and People of the Himalaya. India Publishers. Kolkata
2. Hussain, Majid (2015) Geography of India, McGraw Hill Education, New Delhi.
3. Joshi, S.C. (2001): Uttaranchal: Environment & Development
4. Nand, Nitya and Kumar, Kamlesh (1989). The Holy Himalaya: A Geographical Interpretation of Garhwal. Daya Books. New Delhi
5. Singh O.P. (ed.). (1983): The Himalaya: Nature, Man and Culture

GGE-122: Himalayan climate change and sustainability (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Theory

Unit-I: Himalayas : Geography , origin , extent and classification of mountains . Mountain Systems of the Himalayas

Unit-II: Climate change in Himalayas : climate change concept and accuses, Himalayan climate hazards , historical data (precipitation, extreme events, Cloud burst, GLOF)

Unit-III: Agriculture and Livelihood : Types of farming and crops, sustainable agricultural practices and water management Indigenous Traditional Knowledge.

Unit-IV: disaster Risk adaptation and mitigation :Mitigation and early warning systems, community-based adaptation and examples case studies

Suggested Readings:

1. Ali , Aamir 2002. A Siachen peace park : The solution to a half - century of international conflict ? Mountain Research and Development , 22 (4) : 316-319 .
2. Bebbington , Anthony and Mark Williams 2008. Water and mining conflicts in Peru . Mountain Research and Development , 28 (3/4) : 190-195 .
3. Bernbaum , Edwin 1997. The spiritual and cultural significance of mountains . In Bruno
4. Messerli and Jack D. Ives (eds .) , Mountains of the World : A Global Priority (pp . 39-60) , New York : Parthenon Publishing Group .
5. Brown , Jessica and Nora Mitchell 2000 , Culture and nature in the protection of Andean landscapes . Mountain Research and Development , 20 (3) : 212-217 .
6. Wester, P., Mishra, A., Mukherji, A., & Shrestha, A. B. (2019). The Hindu Kush Himalaya assessment: mountains, climate change, sustainability, and people (p. 627).Springer Nature, <https://library.oapen.org/handle/20.500.12657/22932>
7. · Pant, G. B., Kumar, P. P., Revadekar, J. V., & Singh, N. (2018). Climate change in the Himalayas. Cham, Switzerland: Springer International Publishing, <https://link.springer.com/book/10.1007/978-3-319-61654-4>
8. · Dimri, A. P., Bookhagen, B., Stoffel, M., & Yasunari, T. (Eds.). (2020). Himalayan Weather and Climate and their Impact on the Environment. Cham: Springer,<https://link.springer.com/book/10.1007/978-3-030-29684-1>
9. · Hock, R., G. Rasul, C. Adler, B. Cáceres, S. Gruber, Y. Hirabayashi, M. Jackson, A.Kääb, S. Kang, S. Kutuzov, Al. Milner, U. Molau, S. Morin, B. Orlove, and H. Steltzer,2019: High Mountain Areas. In: IPCC Special Report on the Ocean and Cryosphere in aChanging Climate [H.-O. Pö rtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor,E. Poloczanska, K. Mintenbeck, A. Alegrí a, M. Nicolai, A. Okem, J. Petzold, B. Rama,N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY,USA, pp. 131-202. <https://doi.org/10.1017/9781009157964.004>.
10. · Sabin, T. P., Krishnan, R., Vellore, R., Priya, P., Borgaonkar, H. P., Singh, B. B., & Sagar, A. (2020). Climate change over the Himalayas. Assessment of climate change over the Indian region: A report of the Ministry of Earth Sciences (MoES), Government of India,207-222, https://doi.org/10.1007/978-981-15-4327-2_11

11. · Negi, V. S., Tiwari, D. C., Singh, L., Thakur, S., & Bhatt, I. D. (2022). Review and synthesis of climate change studies in the Himalayan region. *Environment, Development and Sustainability*, 24(9), 10471-10502, <https://doi.org/10.1007/s10668-021-01880-5>.
12. Dhimal, M., Bhandari, D., Dhimal, M. L., Kafle, N., Pyakurel, P., Mahotra, N., ... & Müller, R. (2021). Impact of climate change on health and well-being of people in Hindu Kush Himalayan region: A narrative review. *Frontiers in Physiology*, 12, 651189, <https://doi.org/10.3389/fphys.2021.651189>
13. · Romshoo, S. A., Murtaza, K. O., Shah, W., Ramzan, T., Ameen, U., & Bhat, M. H. (2022). Anthropogenic climate change drives melting of glaciers in the Himalaya. *Environmental Science and Pollution Research*, 29(35), 52732-52751, <https://doi.org/10.1007/s11356-022-19524-0>
14. · Shekhar, M. S., Chand, H., Kumar, S., Srinivasan, K., & Ganju, A. (2010). Climate-change studies in the western Himalaya. *Annals of Glaciology*, 51(54), 105-112, <https://doi.org/10.3189/172756410791386508>

GGE-123: Traditional Knowledge system and sustainability (2 credit, Max marks-100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: Introduction to Traditional Knowledge Systems (TKS): Definitions, scope, and global perspectives,

UNIT II: Indigenous ecological knowledge and sustainable practices (e.g., agroforestry, water management). Linkages between TKS and UN Sustainable Development Goals (SDGs). Case studies:

Unit III: Traditional knowledge in disaster preparedness and mitigation (e.g., flood management, earthquake resilience). Regional hazards and vulnerabilities: Integrating TKS with modern disaster risk reduction (DRR) strategies. Community-based resilience building using traditional practices.

UNIT IV: Global perspectives: TKS in international policy frameworks (e.g., IPCC, CBD).

Suggested Readings:

- Berkes, F. (2018). *Sacred Ecology: Traditional Ecological Knowledge and Resource Management*. Routledge.
- Menzies, C. R. (Ed.). (2006). *Traditional Ecological Knowledge and Natural Resource Management*. University of Nebraska Press.
- UNESCO. (2021). *Local and Indigenous Knowledge Systems (LINKS) Programme*. UNESCO Publishing.
- **Supplementary:**
 - Articles from *Journal of Ethnobiology and Ethnomedicine*.
 - Reports from IPCC and Convention on Biological Diversity (CBD) on indigenous knowledge.
 - Case studies from regional institutions (e.g., CIKS at University of KwaZulu-Natal).

GGE-124: Geography of the Himalayan Mountain (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit-1: Geo - physical identity of the Himalaya , Location and Extent, Himalayan orogeny and Neo-tectonic, Structural division of the Himalaya.

Unit-II: Physical divisions , Relief , Drainage , Glaciers , Lakes , Landforms the Himalaya . Climate , Vegetation , Bio - diversity , Natural Hazards , Environmental degradation in the Himalaya.

Unit-III: Regional divisions of the Himalaya , Regionalization III macro . meso and micro regions . Parameters and Characteristics . Salient Characteristics of each region.

Unit-IV: Population density , growth , and distribution , Settlement IV Urbanization . Tribal and Pastoral communities , Agriculture , Animal husbandry . Horticulture , Transport and Tourism , Power Projects , Implications of out - migration on the regional economy and problems of waste land expansion.

Suggested Readings:

1. Bose . S.C. : Land and People of the Himalaya ..
2. Kayastha , S.L.: The Himalayan Beas Basin
3. Valdiya , K.S. (ed .) : Kumaun - Land and People .
4. Singh . T.V. (ed .) : Mountain and Development
5. Singh . O. P. (ed .) : The Himalaya - Nature , Man & / Culture .

GGE-125: Regional geography of Migration (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: Introduction: Definition, Nature, Scope, Significance and Concepts.Theory, Typology (Fairchild, Peterson, Crane, Gonzalez, Gould and Prothero)

UNIT II: Consequences of Migration and Current Issues, Migration and Its Geographical and Demographic Significance

UNIT III: Internal Migration: Problems and Prospects, Pattern of Migration, Internal Displacement, issues at origin and destination, Environmental Issues and Migration, Health issues and Migration

UNIT IV: Refugee Migration: Regional Pattern in Refugee Migration , Migration Policies: International, National, regional Laws and Conventions

Suggested Readings

1. Bennett and Glasser (2022). Glacial Geology: Ice Sheets, Glaciers and Landforms. Wiley
2. Martini, Brookfield and Sadura (2011). Principles of Glacial Geomorphology and Geology. Prentice Hall
3. Singh, S. (2003). Physical Geography (English and Hindi Editions) Prayag Pustak Bhawan, Allahabad.
4. Singh, Savindra (2006). Geomorphology. Pravalika Publications. Allahabad
5. Summerfield, M. (2013). Global Geomorphology. Routledge. London

GGE-126: Regional Hazards and Disasters (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: Introduction to hazards and disasters, sudden and slow hazards, disaster risk reduction frameworks (Sendai and NDMA guidelines)

UNIT II: Definition and characteristics of slow-onset hazards, types of slow-onset hazards, climate change as a slow-onset hazard.

UNIT III: Livelihood issues in hazard and disaster studies, slow-onset hazards as agents of land degradation, slow-onset hazards and food security.

UNIT IV: Regional approaches and institutional frameworks, regional disparities and vulnerabilities in response, need of multi-scalar approaches to hazards and disasters.

Suggested Readings:

1. Blaikie, P., Cannon, T., Davis, I., & Wisner, B. (2014). *At risk: natural hazards, people's vulnerability and disasters*. Routledge.
2. Singh, R. B. (2012). *Natural Hazards & Disaster Management Vulnerability and Mitigation*. Rawat Publications.
3. Siddiqui, A. R., & Sahay, A. (2022). *Climate change, disaster and adaptations*. Springer International Publishing.
4. Sahay, A; Roy, N & Upreti, P (2025). Slow-onset hazards; issues, challenges, and risk reduction strategies. Taylor and Francis.
5. Hewitt, K. (2014). *Regions of risk: A geographical introduction to disasters*. Routledge.

GGE-127: Political Geography (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: Definition , Concept , Nature , Scope and Approaches of Political Geography ; historical development ; Political Geography Vs Geo - politics.

UNIT II: World geo - politics and geo - political regions of the world ; Colonization , Decolonization , Federalism , Strategic basics and Military alliance . Geopolitics of Indian ocean . Determinants of Sea power in Geo - strategic ideas of Haushofer , Mahan , Mackinder and Spykman.

UNIT III: Frontiers and boundaries and their laws ; international boundaries functions and classification ; Buffer zones ; problems of land locked states ; territorial waters . Concept of state and nation ; Spatial factors of state - Location , size and shape ; Core area , capital city.

UNIT IV: Concept , nature and scope of Electoral Geography . National and regional political parties and voting behaviours in India . Changing political nature of India . Legislative structure of Uttarakhand . Role and future of regional parties in Uttarakhand . Problem of re-delineation of constitutions in Uttarakhand and its effects.

Suggested Readings:

1. Agnew, J. (ed.), (1997). *Political Geography*, Arnold, London.
2. Blake, G. (ed.) (1987). *Maritime Boundaries and Ocean Resources*, Croom Helm, London
3. Dikshit, R. D., 1997: *Developments in Political Geography: A Century of Progress*, Sage Publications, New Delhi.
4. Parker, G. (1998). *Geopolitics: Past Present and Future*, Printer, London
5. Taylor, P.J. and Johnston, R.J., 1979: *Geography of Elections*, Croom Helm, London

GGE-128: Advanced Digital Image Processing (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

UNIT I: The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

UNIT II: Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothing and Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

UNIT III: Image Restoration, Image Compression, Coding, Interpixel and Psychovisual Redundancy.

UNIT IV: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Suggested Readings / Reference Books

1. Jensen, J. R., & Jensen, R. R. (2001). Remote sensing digital image processing system hardware and. *Manual of Geospatial Science and Technology*, 325.
2. Jensen, J. R. (1996). *Introductory digital image processing: a remote sensing perspective*.

3. Schowengerdt, R. A. (2006). *Remote sensing: models and methods for image processing*. Elsevier.
4. Chuvieco, E. (2020). *Fundamentals of satellite remote sensing: An environmental approach*. CRC press.
5. Lillesand, T. M., & Kiefer, R. W. (1994). *Remote sensing and image interpretation*.

GGE-129: Social Geography of India (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit I: Nature and Scope, Indian society - a study in unity and diversity; Centripetal and centrifugal forces.

Unit II: Historical development of Indian society. Elements in the development of socio cultural regions; continuity and change in the historically evolved regional structure.

Unit III: Religion, Caste, and Tribe in India. Hindus, Muslims, Christian, Buddhist, Jain and Sikh communities. Varna and jati-pan Indian structure and regional specificity, Caste Regions, caste and settlement morphology, Tribes in India, dominance and dispersion of Tribal population, penetration of tribal regions

Unit IV: Major Language families and their speech areas, linguistic diversity, the politics of stability and fluidity of language returns; language loss, language retention and language shift.

Suggested Readings

1. Ahmed, A. 1999. *Social Geography*, Rawat publications, Jaipur.
2. Ahmed, A. 1993. (ed) *Social Structure and Regional Development: A Social Geography Perspective*, Rawat Publications, Jaipur.
3. Singh, K.S. 1993. *People of India Vol I to XI*, Oxford University Press, New Delhi.
4. Raza, M. and Ahmed, A. 1990. *An Atlas of Tribal India*, Concept Publishing Co, Delhi.
5. Sopher, D. (ed.) 1980. *An Exploration of India: Geographical Perspectives on Society and Culture*, Cornell Press, New York.

GGE-130: Geography of Health (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit I: Nature, Scope and significance of Health and Medical Geography, Concepts of health, disease, and wellness, Classification and spatial distribution of diseases, Epidemiological transition. Public Health, Geography of Health vs Medical Geography, healthcare vs medicalcare

Unit II: Environmental determinants of health: climate, water, air, land. Disease ecology: host, agent, and environment. Environmental health issues in rural and urban India.

Unit III: Social determinants: poverty, literacy, gender, and occupation. Cultural beliefs and traditional health practices. Regional health disparities in India. Urbanization, slums, and public health challenges. Health status of women in general and reproductive health, maternal and child health problems of India

Unit IV: Distribution of healthcare facilities in India (rural vs. urban). Accessibility to healthcare: spatial and social dimensions. GIS and mapping in health studies. Health planning and policy initiatives in India. WHO and other bodies and their role in public health projects.

Suggested Readings

1. Akhtar Rais, Learmonth, A.T.A. (Ed.) (1988): Geographical Aspects of Health and Disease in India, Concept Publishing Co., New Delhi
2. Howe, G.M. & Loraine, J.A. (1973): Environmental Medicine, Heinemann, London.
3. Howe, G.M. Ed.) (1977): A World Geography of Human Diseases, Academic Press, London
4. Hazra, J. (2007). *Health Care Planning in Developing Countries*. University of Calcutta.
5. Ghosh, A. (2010). *Health Geography: A Spatio-temporal Perspective*. Rawat Publications.
6. Mohanty, S.K. & Kastor, A. (2020). *Health Inequality in India: Current Scenario and Policy Options*. Springer India.
7. Ministry of Health and Family Welfare (MoHFW), Government of India – National Health Policy Documents and NHM Reports.

GGE-131: Geo-Hydrology (2 credit, Max marks- 100 = (50 Mid Term+30 Mid Term+20 Internal Assessment))

Unit I: Definition, Concepts and scope of geo- hydrology, hydrology in relation to water resources development, Components of hydrological cycle, Hydrological cycle.

Unit II: Hydrological properties of rocks, Precipitation, Runoff process, Computation of runoff, Water Discharge and measurement, Hydrograph analysis.

Unit III: Structure of the underground hydrosphere, Vadose and phreatic Zones, Recharge and discharge of ground water, Types of aquifer. Underground water classification, Infiltration; capacity, rate, and methods of computation. Evaporation of runoff, Hydraulic conductivity, Darcy's law, Permeability, Transmissibility.

Unit IV: Water balance, Utilization of water resources, Conservation of water; present and future perspective, planning and programs. Concept of artificial recharge and water harvesting, Surface water Resources of India.

Suggested Readings

1. Chorley , R.J. (ed .) (1969) : Water Earth and Man , Methuen , London .

2. Dakshinamurthy , et.al. (1973) : Water , Resources of India and Their Utilization in Agriculture , IARI , New Delhi .
3. Govt . of India , Ministry of Agriculture (1972) , Report of the Irrigation Commission , Vol . I to IV , New Delhi .
4. Govt . of India , Ministry of Agriculture (1974) , Report of National Commission on Agriculture , Parts IV & V , New Delhi .
5. Jackson , P.J. (1977) : Climate , Water and Agriculture in the Tropics , London . Committee for Geography , Calcutta .
6. Law , B.C. (ed .) (1968) : Mountains and Rivers of India , 21 , G.C. National Linslay , R.K. et.al. (1958) : Hydrology for Engineers , Mc Graw Hill .
7. Rao , K.L .: India's Water Wealth , Orient Longman . 8. David Knighton (1984) : Fluvial Forms and Processes , Edward Arnold , London .