Department of Geography

School of Earth Science

Course Contents & Syllabus

Two Year Post Graduate (I and II Semesters)

Two Year Post Graduate Programme
Under NEP 2020

(for Students enrolled 2025-26 Academic Session and Onwards)

Hemvati Nandan Bahuguna Garhwal University

(A Central University)

Srinagar Garhwal-246174 (Uttarakhand)

Head
Department of Geography
School of Earth Science
H.N.B. Garhwal University
Srinagar (Uttarakhand)

2- Year PG Programme

First Semester for 2- Year PG Programme
(For Practical based subjects)

Entry requirement	3-year bachelor's degree (120 credits) and candidates who met the entrance requirement, including specified levels of attainment, in the program admission regulations				
Semester	**Course Category**	**Course Title**	**Credits**		**Total Credits**
			T	**P**	
I	**Discipline Specific Core (DSC)**	**DSC-1** Geomorphology	5	-	5
		DSC-2 Geography of Resources	5	-	5
		DSC-3 Geographical Thought	5	-	5
		DSC Practical- Surveying	-	3	3
	Discipline Specific Elective (DSE) (Any 1 out of Minimum 2 electives)	**DSE-1** 1.Geography of India 2. Locational Aspects India and World	4	-	4
		Elective Practical- Locational Mapping of India and World	-	2	2
Total			**19**	**5**	**24**

Second Semester for 2- Year PG Programme
(For Practical based subjects)

Entry requirement	3-year bachelor's degree (120 credits) and candidates who met the entrance requirement, including specified levels of attainment, in the program admission regulations				
Semester	**Course Category**	**Course Title**	**Credits**		**Total Credits**
			T	**P**	
II	**Discipline Specific Core (DSC)**	**DSC-1** Climatology	5	-	5
		DSC-2 Geography of Himalaya	5	-	5
		DSC-3 Geo-Environmental Studies	5	-	5
		DSC Practical- Quantitative Technique	-	3	3
	Discipline Specific Elective (DSE) (Any 1 out of Minimum 2 electives)	**DSE-1** Population Geography Introduction to GIS	4	-	4
		Elective Practical- GIS Application in Geographical Studies	-	2	2
Total			**19**	**5**	**24**
NHEQF Level-6	**Student on exit after successfully completing first year of 2-year PG (i.e., securing minimum required 48 credits will be awarded "Postgraduate Diploma" of one year, in related field/discipline/subject.**				

Note:

1. In lieu of Discipline Specific Elective (Theory and Practical=4+2 credits) the departments may offer any one course i.e., dissertation/project work of 6 credits.

2. In lieu of only Discipline Elective Practical (2 credits) the departments may offer 2 credit additional course (Field work/Project/ SWAYAM Course).

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Program Learning Outcomes (PLOs): PLO for M.A./M.Sc. Program

Program Learning Outcome (PLO) statement designed specifically for a **Master of Arts (M.A.)/ Master of Science (M.Sc.)** program, based on the 10 pointers. This version reflects the academic depth, interdisciplinary scope, and societal relevance typically expected from a postgraduate arts program aligned with your ten pointers and OBE principles (NAAC/UGC/NHEQF).

Graduates of the Master of Arts program will be able to:

1. **Demonstrate Advanced Conceptual and Procedural Knowledge:** Students will acquire an in-depth understanding of theories, frameworks, and methodologies within their discipline, and apply this knowledge to diverse academic and practical contexts.
2. **Apply Critical Thinking and Problem-Solving Abilities:** Students will evaluate complex ideas, construct well-reasoned arguments, and develop creative solutions to intellectual, cultural, and societal issues.
3. **Uphold Constitutional Values, Ethical Standards, and Social Responsibility:** Students will engage in academic and professional activities with integrity, equity, and a commitment to democratic and humanistic values, fostering inclusive and just societies.
4. **Exhibit Effective Teamwork and Leadership:** Students will collaborate with diverse social groups and communities, contribute meaningfully to collective goals, and demonstrate leadership in academic, cultural, or community-based projects.
5. **Develop and Apply Research and Analytical Skills:** Students will design and conduct independent or collaborative research projects using appropriate qualitative or quantitative methods, and critically interpret findings to contribute to scholarly discourse.
6. **Utilize Digital Learning and Communication Skills:** Students will harness digital tools for learning, research, and communication; articulate ideas effectively across platforms, audiences, and formats with clarity and coherence.
7. **Translate Knowledge into Practice:** Students will apply academic insights to real-world challenges in areas such as policy, education, media, development, culture, and advocacy, demonstrating contextual relevance and impact.
8. **Demonstrate Entrepreneurship and Employment Competencies:** Students will exhibit initiative, creativity, and professional competencies necessary for careers in academia, civil services, NGOs, media, cultural industries, and other employment sectors.
9. **Engage with Global and Local Communities:** Students will analyze and respond to global and local issues through informed, culturally sensitive, and socially engaged perspectives that reflect interdisciplinary understanding.
10. **Promote Environmental Consciousness and Sustainable Practices:** Students will reflect on environmental challenges from humanistic and ethical viewpoints, and advocate for sustainability and responsible citizenship through scholarship and action.

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Syllabus of M.A./M.Sc. in Geography as per Two Year Post Graduate Programme Under NEP 2020 for Students enrolled in 2025-26 Academic Session and onwards

Semester	Course Category	Course Title	Credit
I	**DSC -1**	Geomorphology	5
	DSC -2	Geography of Resources	5
	DSC -3	Geographical Thought	5
	DSC - Practical	Surveying	3
	DSE-1	1. Geography of India 2. Locational Aspects India and World	4
	DSE-Practical	Locational Mapping of India and World	2
	Total		**24**
Semester	**Course Category**	**Course Title**	**Credit**
II	**DSC -1**	Climatology	5
	DSC -2	Geography of Himalaya	5
	DSC -3	Geo-Environmental Studies	5
	DSC - Practical	Watershed Analysis	3
	DSE-1	1. Population Geography 2. Introduction to GIS	4
	DSE-Practical	GIS Application in Geographical Studies	2
	Total		**24**

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Detailed Syllabus

Geography-M.A./M.Sc.

Semester-I

DSC 1: GEOMORPHOLOGY			
Paper Code: SOES/GEOG/C001			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 05

Course Outcomes:

CO1 : Students will learn the fundamental concepts of geomorphology, methods of landform study, and classical theories of landscape development.

CO2 : Students will understand the processes of plate tectonics, mountain building, isostasy, and geological structures and rocks.

CO3 : Students will apply concepts of geomorphic processes with special reference to the Uttarakhand Himalaya.

CO4 : Students will analyse applied geomorphological knowledge for engineering works, anthropogenic processes, and landscape planning in diverse geomorphic settings.

CO5 : Students will evaluate the regional geomorphology of Uttarakhand and their implications for sustainable development.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Fundamental concepts of Geomorphology; Methods and Approaches of landforms study; Theories of landscape development by Gilbert, Davis, Penk and Hack and morphogenetic region.

UNIT II

Plate tectonics; Mountain building; Isostasy; Tectonic Geomorphology; Theories of slope development by Young and King; Peneplain and Pedi plains; Geological structure and rocks.

UNIT III

Geomorphic process – River, glacier, underground water: Mass movement and resultant landforms; Morphometry of drainage basin; Profile of equilibrium rejuvenation and polycyclic landscape. (With special reference to Uttarakhand Himalaya)

UNIT IV

Applied Geomorphology engineering works; Anthropogenic process and landscape planning; Regional Geomorphology of Uttarakhand -Great, Lesser and Siwalik Himalaya.

Books Recommended:

1. Bloom, A.L.: Geomorphology, Prentice Hall, New Jersey USA, 1979.
2. Goudie, A.: Geomorphological Techniques, George Allen and Unwin, London, 1981.
3. Washborn, A.L.: Periglacial Process and Environment, Edward Arnold, London, 1973.
4. Young, A.: Slopes, Oliver and Boyd, London, 1972.
5. King, C.A.M.: Techniques in Geomorphology, Edward Arnold, London, 1968.
6. Embleton, C. and Theories, J.: Processes in Geomorphology, Arnold Hienman, London, 1979.
7. Phodes, D.D. and William, G.P.: Adjustment of Fluvial Process, George Allen and Unwin, Boston, 1982.
8. Tricart, L. and Callam: Introduction to climate Geomorpholgy, Longman, London, 1972.
9. Derbyshrine, E. Gregory K.J. and Halls, J.R.: Geomorphological Processes, Butterworths, London, 1979.
10. Gregory, K.J. and Willing, D.E.: Drainage Basin Processes and Forms, Edward Arnold, London,
11. Gregory, K.J. and Willing, D.E.: Man and Environment Processes, Butter Worths, London, 1981.
12. Singh Savindra: Bhu- Akriti vigyan in Hindi

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DSC 2: GEOGRAPHY OF RESOURCES			
Paper Code: SOES/GEOG/C002			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 05

The Course will help the learner to:

CO1: To remember the core concepts and classifications of resources and recall key theories of resource use and management.

CO2: To understand the spatial distribution, utilization, and associated challenges (misuse, depletion) of major global and Indian resources.

CO3: To apply principles of conservation and sustainable management to analyse real-world case studies of resource exploitation.

CO4: To analyse the interrelationships between resource depletion, environmental issues, and socio-economic policies.

CO5: To evaluate the effectiveness of global initiatives (e.g., SDGs, Agenda 21) and national policies for sustainable resource governance and conservation.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Definition and concept of Resources, Classification of Resources; Nature and Scope of Resources Geography; Theories of Resource use and Management.

UNIT II

Land, Water, Energy, Biotic Resources, and Human Resource - distribution, use-misuse and conservation Global and Indian scenario.

UNIT III

Resources depletion and emerging issues -Deforestation, loss of bio-diversity, acid rain, energy crises, environmental problems

UNIT IV

Over Exploitation and Conservation of resources; Global initiatives (Agenda 21, SDGs) and national resource policies, Community base Natural Resource Management (CBNRM), Resource management practices in Uttarakhand.

Books Recommended:

1. Holechek. J.L. et al: Natural Resources- Ecology, Economics and Policy, Prentice Hall, New Jersey, 2000.
2. Kates, R.W. and Burton, I. (ed): Geography, Resources and Environment, Vol, II, University of Chicago Press, Chicago, 1986.
3. Mc Laren, D.J. and Sklnnet, B.J. (ed): Resources and World Development, Jogn Wiley and Sons, New York, 1986.
4. Newson, M.D.: Land, Water and Development, River Basin System and Management, Routledge, London, 1991.
5. Owen, S. and Owen, P.L.: Environment Resources and Conservation, Cambridge University Press, New York, 1991.
6. Rees, J.: Natural Resources, Allocation, Economics and Policy, Methuen, London, 1988.
7. Simmons, I.G.: Earth, Air and Water Resources and Environment in Late 20th Century, Edward, Arnold, 1991.

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DSC 3: GEOGRAPHICAL THOUGHT			
Paper Code: SOES/GEOG/C003			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 03

CO code	Course Outcome (CO)
CO1	To learn the nature and scope of Geographical thought, including the contributions of different scholars and schools of Geography
CO2	To Understand key geographical models, paradigms, system theory, and debates in Geography such as physical vs. human and regional vs. systematic Geography.
CO3	To Apply the various approaches and perspectives in analysing geographical problems.
CO4	To analyse importance of philosophical approaches in solving real world problems (like positivism, pragmatism, functionalism, idealism, existentialism, and behavioural approaches) and its relevance in Geography.
CO5	To evaluate the contributions of Indian Geographers in growth of the discipline, particularly with reference to Uttarakhand, in shaping modern Geography.

Note: The paper consists of three units. Two questions will be set from each unit. The candidate will be required to attempt three questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

The field of Geography: Definition, Nature and Scope; Its place in the classification of sciences; Geography as a discipline: Dualism; Physical vs Human Geography; Approaches to the study of Geography; Relevance of Geography.

UNIT II

Historical development of Geography: Contribution of Greeks and Romans, German School of Geography, French School of Geography. American School of Geography. British School of Geography.

UNIT III

Models and Paradigm shift, System Theory, Regional vs Systematic Geography; Quantitative Revolution, Positivism; Pragmatism; Functionalism; Idealism; Existentialism.

UNIT IV

Behavioral; Radical and Humanistic Geography; Post Modernism, Future of Geography; Contribution of Indian Geographers; Development of Geography in Uttarakhand.

Book Recommended:

1. Haggett, P.: Geography – A Modern Synthesis.
2. Chorley, R.J. and Hagget, P.: Model in Geography.
3. Johnston, R.J. and Claval, P.: Geography since the Second World War. An International Survey, Crown Halm, Sydney, 1984.
4. Johnston, R.J.: The Future of Geography, Methuen, London, 1988.
5. Adhkarl, S.: Fundamentals of Geographical Thought, Chaitanya Publishing House, Allahabad, 2006.
6. Marcus, D.: Post-Structuralism in Geography, The Diabolical Arts of Spatial Sciences Edinburgh University Press, Edinburgh, 1999.
7. Galle, G. and Wilmot, C. (ed.): Geography in America at the Down of the 21st Century, Oxford University Press, Oxford and New York 2003.
8. Hubbard, P., at al: Space, Theory and Contemporary Human Geography, Continuum, London, 2002.
9. Majid Hussain: Geography Thought (2007).
10. Dixit, R.D.: Geographical Thought: A Contextual History of Geographical Ideas, Prentice Hall of India, New Delhi, 2001.

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DSC PRACTICAL -1: SURVEYING			
Paper Code: SOES/GEOG/C001 (P)			
Credit: 03			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 03

The Course will help the learner to:

CO1: Remembering the components and recall the principles and procedures of various surveying instruments (Plane Table, Dumpy Level, Theodolite, Total Station, GPS, Altimeter)

CO2: Understanding the methodology for conducting specific surveying exercises like triangulation, contouring, and profile drawing.

CO3: Apply appropriate surveying techniques to execute field exercises such as the Two/Three Station Problem and GPS data acquisition.

CO4: Analyze collected survey data to interpret terrain profiles, contour maps, and weather map information.

CO5: Evaluate the accuracy and precision of survey data and critique the methodology used during field camp exercises.

Note: The syllabi for practical are divided into two sections: section A and B. A is related to field work. Candidate will have to attempt two exercises of surveying from section A of 2 hours' duration and two exercises of section B of 1-hour duration.

Distribution of Marks

(i)	Surveying (Two exercises)	30
(ii)	Survey Camp	20
(iii)	Sessional Record (min)	05
(iv)	Viva-voce	05

Section A: Field Work:

UNIT I

Plain Table Survey: Two and Three station Problem, Triangulation and determination of heights and contouring with clinometers.

UNIT II

Dumpy level survey: Contouring and profile drawing (Instrument based: Total station Survey and Theodolite)

UNIT III

Interpretation of Indian daily weather maps through the study of thermal & cloud condition and pressure system, Weather forecasting method.

Section B: Laboratory Work

(i) GPS: Handling usages, GPS based data acquisition, GPS system and application.

(ii) Altimeter (Hi-tech with precision): Handling and use.

Note: Examination: Departmental Committee Appointed by HoD for University Campuses. External Examiners will be Appointed by the University for Affiliated Colleges

Note:

1. In all 20 exercises from both the parts A and B shall constitute the sessional record covering all sub section.
2. Candidate shall attend (compulsory) field training (survey camp) of at least seven days' duration in a suitable area handling different instruments. They shall prepare minimum 05 exercise (survey camp) belonging to the original field survey.
3. Survey camp work will be evaluated at the time of the end semester practical exam.

Book Recommended:

1. Campbell, J., Introductory Cartography, Prentice Hall, Inc., Englewood Cliff, New Jersey, 1984.
2. Cuff, D.J., & Mattson, M.T., Thematic Maps, their Design and Production, Mathuen, New York., 1982.
3. Robinson, A.H. & others., Elements of Cartography, John Willey and Sons, New York (New edition).
4. Archer, J.E., & Dalton, T.H., Fieldwork in Geography, London.
5. National Atlas and Thematic Maps Organization (NATMO): National Atlas of India, Calcutta.
6. Monkhouse, F.J., Maps and Diagrams, Methuen & Co., London,1967

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DSE-1: GEOGRAPHY OF INDIA			
Paper Code: SOES/GEOG/E001			
Credit: 04			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 03

Course Outcomes (COs)

CO1: Students will learn the fundamental physical and social aspects of India, including federalism, unity in diversity, physiography and a social geography perspective.

CO2: Students will understand the dynamics of population, human development, urbanization trends, and spatial distribution patterns of settlements (rural and urban) across India.

CO3: Students will apply their knowledge to assess agro-climatic regions, energy challenges, and food security strategies in the Indian context.

CO4: Students will analyze economic and infrastructural development, including the role of ports, five-year plans, multi-level planning, community participation, governance, and contemporary planning issues.

CO5: Students will evaluate the impact of economic reforms, multinational corporations, and liberalization on India's socio-economic and spatial development.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Indian federalism; India unity in diversity (view points from Social Geography); Physiography; Drainage (volume); Climate mechanism of Indian monsoon (recent theories); Soil and natural vegetation

UNIT II

Human development index and its components; Growth distribution and density of population; Trends of Urbanization; Special distribution pattern of settlement (rural & urban).

UNIT III

Agro-climate region; Rainbow revolution, Industrial Complex and Industrial regions; Major River valley projects; Energy crises and food security.

UNIT IV

Growing importance of ports; Last five years plans; Experience of Rural Planning; Integrated R.D.P; Multi level planning; Community participation & governance and planning contemporary issues; Economic reforms – Multinationals and liberalization.

Books Recommended:

1. Mishra, R.P. et al: Regional Development Planning in India, Vikas Publishers, New Delhi, 1978.
2. Mishra, R.P. (ed): Local Level Planning and Development, Sterling Publication New Delhi.
3. Diamond, D. (ed): Regional Disparities and Regional Policies, Program Press, Oxford, 1982.
4. Subrahmayam, K.N. (ed): Economic Development and Planning in India, Pub. New Delhi, 1985.
5. Sundaram, K.V., Mishra, R.P. and Rao, V.L.S.P.: Spatial Planning for a Tribal Region, inst. Of Development Studies, Mysore, 1971.
6. Regional Science Association: Regional Planning in India, IIT, Kharagpur, 1995.
7. Prasad, K.V.: Planning at the Grass Roots, Sterling Pub, Pvt. Ltd, New Delhi.
8. Chand, Mahesh and Puri, V.K.: Regional Planning in India, Allied, New Delhi, 1983.
9. Chandna, R.C.: Regional Planning: A comprehensive Text, Kalyani Publication, New Delhi.
10. Tiwari, R.C.: Geography of India, Prayag Pushtak Bhawan, Allahabad, 2008.
11. Tiwari, R.C.: Bharat ka Bhoogal, Prayag Pushtak Bhawan, Allahabad, 2008.
12. Mishra, R.P.: Regional Planning and National Development, Vikas Publications, New Delhi.

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DSE-2: LOCATIONAL ASPECTS INDIA & WORLD			
Paper Code: SOES/GEOG/E002			
Credit: 04			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 04

Course Outcomes: Students will be able to understand-

CO code Course Outcome (CO)

CO1: Students will learn the physio-cultural, economic, and environmental features of India and the world.

CO2: Students will understand mountains, rivers, deserts, glaciers, lakes, earthquakes, volcanoes, ocean currents, and waterfalls.

CO3: Students will apply knowledge to locate countries, capitals, cities, tribal areas, and major cultural regions on maps.

CO4: Students will analyze economic features, including agricultural belts, industrial regions, power and atomic plants, ports, railways, roads, and fisheries.

CO5: Students will evaluate environmental and contemporary issues such as biodiversity, national parks, wildlife sanctuaries, biomes, vegetation types, and international organization headquarters.

The paper is designed to acquaint the students with the importance of location as one of the important aspects of geographical studies. The aim is to promote awareness among students about Atlas.

An outline map of India and world will be prepared by the students and they will have to mark locations on it. 20 locations will be inserted on it and one mark for each correct location.

Distribution of Marks:

(A) **World-** (i) Preparing the outline Maps -10
(ii) Inserting the given Locations - 20

(B) **India** - (i) Preparing the outline Maps -10
(ii) Inserting the given Locations - 20

UNIT I

Physical –Mountain and Range, Major Rivers, Deserts, Glacier and lakes, Straits, Island, Earthquake Zones, Volcanic, Ocean Currents, Major Water fall,

UNIT II

Cultural – Country**,** State and Capitals, Important Cities, Tribal Areas, Planning Region and major Cultural Realms

UNIT III

Economic – Agricultural region/belts, Industrial region and complexes, Power plants, Atomic Plants, Important ports and Mineral Resources**,** Fisheries banks; rail way line, Roads; Sea roles

UNIT IV

Others – Bio-diversity, National Parks, Wildlife sanctuary, Biomes, Grassland, Vegetation Types, Contemporary issues, UN and Headquarters of International agencies

Books Recommended:

- India & the World – NATMO, School Atlas, Oxford-Atlas & Time UK Print World Atlas and Uttarakhand Atlas.

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DSE PRACTICAL -1: Locational Mapping of India and World			
Paper Code: SOES/GEOG/E001 (P)			
Credit: 02			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 02

Course Outcomes (CO):

CO1: construct the map projections.
CO2: apply critical thinking in the interpretation of weather maps.
CO3: create and generate digital maps.

Note: The syllabus for practical is related to laboratory work on cartographic mapping. The practical exam will be of three hours' duration. The division of marks in practical shall be as given below.

Laboratory work (Cartography) - 40
Session Record Work - 10
Viva-voce - 10

The laboratory work is divided into four units. Two exercises are to be set from each unit with internal choice and candidates will be required to attempt four exercises in all. The cartographic mapping work examination will be of three hours' duration in which exercises will be given on cartographic. All questions carry equal marks.

UNIT I

Physical –Mountain and Range, Major Rivers, Deserts, Glacier and lakes, Straits, Island, Earthquake Zones, Volcanic, Ocean Currents, Major Water fall,

UNIT II

Cultural –Tribal Areas, Planning Region and major Cultural Realms

UNIT III

Economic – Agricultural region/belts, Industrial region and complexes, Power plants, Atomic Plants, Important ports and Mineral Resources**,** Fisheries banks; rail way line, Roads; Sea roles

UNIT IV

Others – Bio-diversity, National Parks, Wildlife sanctuary, Biomes, Grassland, Vegetation Types, Contemporary issues, UN and Headquarters of International agencies

Books Recommended:

- India & the World – NATMO, School Atlas, Oxford-Atlas & Time UK Print World Atlas and Uttarakhand Atlas.

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Detailed Syllabus

Geography-M.A./M.Sc.
Semester-II

DSC 4: CLIMATOLOGY			
Paper Code: SOES/GEOG/C004			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 05

Course Outcomes (COs)

CO1: Students will learn and recall the meaning, scope, and development of climatology, jet streams, El Niño, La Niña, Walker circulation, precipitation, and humidity.

CO2: Students will understand and explain the origin, growth, classification, and distribution of air masses, and the genesis and characteristics of fronts, cyclones, and anticyclones in temperate and tropical regions.

CO3: Students will apply climate classification methods and atmospheric hazards and cloudbursts.

CO4: Students will analyze climatic change processes and by distinguishing between natural and anthropogenic factors affecting global climate.

CO5: Students will evaluate issues of global warming, artificial climate creation, and acid precipitation to propose informed perspectives and sustainable solutions to contemporary climatic challenges.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Meaning, scope and development of Climatology; Atmospheric Equilibrium; Adiabatic Temperature Change; Jet Stream; El-Nino; La-Nina; Walker Circulation; Precipitation and Humidity.

UNIT II

Air Masses - Origin, growth, classification and distribution; Horizontal and vertical motion of winds; Fronts and Fronts Genesis; Cyclones and Anti- cyclones; Temperate and Tropical Cyclones

UNIT III

Climate Classification of Koppen and Thornthwaite; Major climate types; Weather analysis - weather forecasting- methods, types and accuracy; Weather and human behavior; Weather modification; Atmospheric hazards - Cloud Bursts.

UNIT IV

Climatic Changes – Definition and detection; Tree rings; Solar variability; Human impact on global climate; Global Warming; Artificial climate and acid precipitation.

Books Recommended:

1. Chorley, R.J. and Barry, R.G.: Atmosphere, Weather and Climate Methuen & Co. Ltd. London, 1995.
2. Critchfield, H.J.: General Climatology, Prentice Hall of India, New Delhi, 2002.
3. Hidoore, J.J.: Global Environment Change, Prentice Hall, New Jersey, 1996.
4. Lockwood, J.G.: World Climatology, Elbs and Edward Arnold (Pub.) Ltd., 1979.
5. Miller, A. et al: Elements of Meteorology, Merrill and Columbus.
6. Oliver, J.E. & Hiddore J.J.: Climatology: An Atmosphere Science, Pearson Edu., India, 2003.
7. Thomson, R.D. and Perry, A.: Applied Climatology, Routledge, London and New York, 1997.
8. Trewartha, G.T.: An introduction to climate, McGraw Hill Series in Geography, 1954.
9. Lal, D.S.: Climatology, Sharda Pushtak Bhawan, Allahabad.
10. Singh, Savindra: Climatology, Prayag Pushtak Bhawan, Allahabad, 2005.
11. Lal, D.S.: Jalvayu Vigyan, Sharda Pushtak Bhawan, Allahabad.
12. Singh, Savindra: Jalvayu Vigyan, Prayag Pushtak Bhawan, Allahabad.

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DSC-5: GEOGRAPHY OF THE HIMALAYA			
Paper Code: SOES/GEOG/C005			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 05

Course Outcomes (COs)

CO1: Students will learn the geo-physical identity, origin, and structural features of the Himalaya, including its regional significance, and the diversity of Himalayan people and tribes.

CO2: Students will understand the physiographic structure, and geo-ecological problems of the Himalaya arising from natural processes and anthropogenic activities.

CO3: Students will apply geographical concepts and methods to examine demographic patterns, and development issues such as power projects within the Himalayan region.

CO4: Students will analyze the geographical characteristics of the Western, Central, and Eastern Himalaya, Ladakh, Lahul and Spiti, Kathmandu Valley, and Teesta Valley.

CO5: Students will evaluate mountain development planning and policy frameworks, assessing their effectiveness in addressing sustainability, future challenges of the Himalayan region.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Geo-physical identity, Origin of Himalaya and its structure; Himalaya as regional entity; Geo-political issues; Cultural Appraisal; Himalayan people and tribes; Geo-sensitivity of Himalaya; Future of Himalaya.

UNIT II

Physiographic Structure; Landforms, Drainage System; Himalaya as water tower; Glaciers; Lakes; Passes; Climate; Natural Vegetation; Natural Hazards; Geo-Ecological Problems of Himalaya created by anthropogenic activities.

UNIT III

Demography and Economy – Distribution, density and growth of population; Migration; Urbanization; Rural and Urban Population; Agriculture; Industry; Animal Husbandry; Horticulture; Tourism; Developing problems of Himalaya; Power projects.

UNIT IV

Geographical account of Western, Central and Eastern Himalaya; Regional analysis of Kashmir Valley; Ladakh; Lahul and Spiti; Kathmandu Valley and Teesta Valley; Mountain Development Planning and Policy.

Books Recommende:

1. Lal, J.S. &Moddie: The Himalaya – Aspect of Change A.D. (ed).
2. Bose, S.C.: Land and people of the Himalaya.
3. Singh, O.P. (ed): The Himalaya – Nature, Man and Culture.
4. Joshi, S.C. and Others: Kumaun Himalaya.
5. Nityanand and Kumar, K.: The Holy Himalaya – Geographical Interpretation of Garhwal Himalaya.
6. Kharkwal, S.C.: Uttarakhandm – Physio-Culture Complex.
7. Maithani, D.D.: Central Himalaya: Ecology, Environmental Resources & Development.
8. Rawat, M.S.S. (ed): Central Himalaya- Evironment Development Vol. I & II.
9. Valdiya, K.S. (ed): Kumaun: Land and People (1988).
10. Bhatt, H.P. & Bhatt Sangita: Environmetal Dimensions of Rural Settlements in the Himalaya in 1993.

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DSC-6: GEO-ENVIRONMENTAL STUDIES			
Paper Code: SOES/GEOG/C006			
Credit: 05			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 05

Course Outcomes:

CO1: Students will learn the meaning, scope, and basic concepts of Environmental Geography, including components of environment, ecology, ecological succession, and the man–environment relationship.

CO2: Students will understand the structure and functioning of ecosystems, including their components, trophic levels, food chains, food webs, energy flow, stability, and productivity.

CO3: Students will apply their knowledge to identify and explain various forms of environmental degradation and pollution, as well as major global environmental problems such as climate change, ozone depletion, greenhouse effect, and acid rain.

CO4: Students will analyze environmental management concepts, approaches, and strategies, along with the integration of environmental dimensions in planning and sustainable development.

CO5: Students will evaluate national and international environmental policies, programs, and agreements and assess their implications through environmental impact assessments.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Meaning and scope of Environmental Geography; Basic concept of Environmental Geography; Component and types of environments; Ecology; Principles, types and ecological secession; Man-environment relationship.

UNIT II

Ecosystem - Concept and components; Trophic levels; Food Chain and Food Webs; Energy flow in the ecosystem; Ecosystem stability, and productivity.

UNIT III

Environmental degradation; Environmental Pollution (Air, Water and Solid Waste); Environmental Problems- Global Warming, Ozone depletion and Green House effect; Acid rain and climate change.

UNIT IV

Environmental Management: Concepts, approaches and management strategies; Environmental dimension in planning and sustainable development; Limits to growth - Rio Summit, Kyoto Protocol; Environment impact assessment; National environment policy and programs.

Books Recommended:

1. Sing. L.R. et al.: Environmental Management, Allahabad Geographical Society, Allahabad.
2. National Academy of Sciences: Understanding Climate Changes, Washington, D.C.
3. Furley, P.A. and Neway, W.W.: Man, and the Biosphere, Butterworth, London.
4. Arvil, R.: Man, and Environment, Penguin.
5. Bennet, R.J. and Chorley, R.J.: Environmental System- Philosophy, Analysis and Control, Methuen, London.
6. Singh, Savindra: Environmental Geography, Prayag Pushtak Bhawan, Allahabad.
7. Detwler, T.R.: Man's impact on the Environment, McGraw Hill, New York.
8. Sing, Savindra: Paryavaran Bhoogal, Prayag Pushtak Bhawan, Allahabad.
9. Odum, E.P.: Fundamentals of Ecology, W.B. Sounders Co. Philadelphia, 1971.
10. Mather, A.S. and Chapman, K.: Environmental Resources, Longman Group Ltd. U.K., 1995.

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DSC PRACTICAL-2: QUANTITATIVE TECHNIQUES			
Paper Code: SOES/GEOG/MN01 (P)			
Credit: 03			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 03

CO code	Course Outcome (CO)
CO1	To learn the types of data (spatial and non-spatial), and levels of measurement with suitable methods of diagrammatic representation.
CO2	To understand the measures of spatial inequality, and distribution using statistical tools.
CO3	To apply different cartographic principles in the construction of maps and diagrams and its interpretation.
CO4	To analyse various measures of concentration, and correlation for understanding spatial patterns and relationships.
CO5	To evaluate the appropriateness, strengths and limitations of statistical techniques in estimating the relationship of different variables of interest.

The syllabus for practical is related to laboratory work on quantitative techniques and mapping. Eight questions will be set selecting at least two questions from each unit. Candidate will have to attempt four questions selecting one question from each unit. It will be of three-hour duration.

Distribution of Marks:

Laboratory Work	-40
Sessional Record	-10
Viva Voce	-10

UNIT I

Types of data- spatial and non-spatial data; Levels of their measurement- Nominal, ordinal, interval and ratio; Diagrammatic representation of data, proportional circles, dot-spheres, cubes.

UNIT II

Measures of spatial inequality, Location quotient; Lorenz curve, Gini's Co-efficient; Concept of Spatial Distribution-Nearest Neighbour Analysis (NNA); Rank Size Rule;

UNIT III

Elements of Maps: Generalization, Symbolization and classification; choropleth and isopleths, Basics of topographical map and OSM, Elements of Weather map.

UNIT IV

Scatter plots and its types; Measures of central tendencies and dispersion, Correlation: Spearman's Rank and Karl Pearson's method, Simple linear regression: basic concepts and construction of regression line.

Books Recommended:

1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman (2015). Remote Sensing and Image Interpretation, 7th Edition, Wiley, New York
2. Partha Basu (2023). Advanced Practical Geography, 4th Edition, Books and Allied Private Limited, India
3. Aslam Mahmood (2020). Statistical Methods in Geographical Studies, Rajesh Publications, India
4. S. P. Gupta (2021). Statistica Methods, 46th Edition, Sultan Chand and Sons, New Delhi
5. D. N. Gujrati, D.C. Porter and S. Gunasekar (2017), Basic Econometrics, 5th Edition, McGraw Hill Education
6. Ashis Sarkar (2015). Practical Geography: A Systematic Approach, 3rd Edition, Orient BlackSwan,
7. Mishra, R.P. & Ramesh A (1989). Fundamentals of Cartography, 2nd Edition, South Aisa Books,
8. Singh, R. L. and R. P. B. Singh (2015). Elements of Practical Geography (English/Hindi), Kalyani Publishers
9. eGyanKosh, IGNOU Self Learning Material (SLM), Master of Science in Geography (MSCGG), https://egyankosh.ac.in/handle/123456789/98159
10. Kali Charan Sahu (2024), Textbook Of Remote Sensing and Geographical Information Systems, Atlantic Publishers & Distributors (P) Ltd, India.

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DSE 3: POPULATION GEOGRAPHY			
Paper Code: SOES/GEOG/E003			
Credit: 04			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 04

CO code	Course Outcome (CO)
CO1	To learn the nature, scope, and significance of Population Geography and its relationship with other disciplines.
CO2	To understand the patterns of population composition, growth, density, and distribution across the world.
CO3	To apply demographic concepts such as fertility, mortality, migration, and demographic transition theories to analyze population changes.
CO4	To analyse the different dynamics of population such fertility, mortality, migration, population-resource dynamics and measures.
CO5	To evaluate the effectiveness of population policies, planning strategies, and human development indices at national and international levels, to achieve the goals of sustainable development.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Nature, scope and significance of Population Geography and its relationship with demography, Relevance of Population Geography; Recent approaches and methods to study population geography.

UNIT II

Population composition; Population growth, density, distribution patterns and their determinants; Concepts of under, over and optimum Population.

UNIT III

Concepts and measurements of fertility, mortality and migrations; major theories of fertility, mortality and migration, demographic transition theory, demographic dividend.

UNIT IV

Concept of Human Resource and Management; Population resource regions; Population planning and policies in under-developed and developed countries, Human development index; National Population Policies in India.

Books Recommended:

1. Asha A. Bhende and Tata Kanitkar (2024). Principles of Population Studies, 19th Edition, Himalaya Publishing House Pvt. Ltd., India
2. Chandna, R.C. (2000). A Geography of Population; Concept, Determinants and Patterns, Kalyani Pub. New Delhi
3. Beaujeu-Garnier, Jacqueline (1978). Geography of Population, Longman, London 1970.
4. Srinivasan, K. (1997). Basic Demographic Techniques and Applications, Sage Pub. New Delhi,
5. Clarke, J.I. (1972). Population Geography, Pergamon. Oxford
6. Bhagat, R. B. and Rajan, S. I. (2023). Researching Internal Migration, Routledge, London
7. Bhagat, R. B. (2008). Assessing the measurement of internal migration in India , Asian and Pacific Migration Journal, 17(1), 91-102
8. Md Izhaar Hassan (2020): Population Geography-A Systematic Exposition, Routledge, London
9. United Nations Demographic Manuals: https://www.unpopulation.org/en/development/desa/population/publications/manual/index.html

ORGI, UNFPA (2014), Training Manual on Demographic Techniques, https://india.unfpa.org/en/publications/training-manual-demographic-techniques

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DSE- 4: INTRODUCTION TO GIS			
Paper Code: SOES/GEOG/E004			
Credit: 04			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 04

Course Outcomes (COs)

CO1: Students will learn the definition, scope, development, and specific characteristics of GIS, and its relationship with Cartography, Remote Sensing, Computer Science, and Geography.

CO2: Students will understand the basic concepts and essential elements of GIS, including map concepts, and components of GIS with methods of data input.

CO3: Students will apply their knowledge to operate different GIS software integrate remote sensing data with GIS, perform digital terrain modeling, and carry out spatial analyses.

CO4: Students will analyze and manage databases (DBMS), including shapefiles (point, line, polygon), geo-referencing, and preparation of maps by extracting and integrating GPS data.

CO5: Students will evaluate GIS outputs, select appropriate tools/techniques for specific spatial problems, and design effective GIS-based solutions for real-world applications.

Note: The paper consists of four units. Two questions will be set from each unit. The candidate will be required to attempt four questions in all. Answer should be precise. All questions carry equal marks.

UNIT I

Geographical Information System (GIS): Definition, scope and specific characteristics; development in the world and in India, Relation of GIS with other collateral subjects like Cartography, Remote Sensing, Computer Science and Geography.

UNIT II

Basic concepts and essential elements of GIS-Map concepts; Data types involved in GIS; types of data structures, their characteristics, and merits-demerits, Components of GIS. Methods of inputting data in GIS.

UNIT III

GIS softwares: paid and open. Integration of remote sensing data with GIS; Digital terrain modelling and its application in GIS; Spatial analysis in GIS.

UNIT IV

Generation Date Base Management System (DBMS), shapefile; point, line, polygon. Geo-referencing and preparation of maps, Components of GPS; Data Extraction from GPS to GIS and mapping.

Books Recommended:

1. Lillesand, Thomas M. *Remote Sensing and Image Interpretation*. Wiley India, New Delhi. 2016. Michael, N. Demers. *Fundamentals of Geographic Information System*, Wiley India. New Delhi. 2015.
2. Nag, P., *Introduction to GIS,* Concept India, New Delhi, 2008.
3. Lo C.P. & Yeung A.K.W., *An Introduction to GIS*, P.H.I/Pearson Edu., Asia, 2002
4. Haywood I., Cornelius I. & Carver S., *An introduction to GIS*, Longman/Pearson Education Asia, 1998/2000.
5. Martin D. *GIS and their Socio-economic Applications,* Routledge, 2nd ed., 1997.
6. Goutam, N.C., *Fundamentals of GIS*, Pink Pubs. 1993.
7. Heywoods, I., Cornelius, S and Carver, S., *An Introduction to Geographical Information system*. Prentice Hall,2006.
8. Kraak M.J. & Ormeling F., *Cartography: visualization of Geo-spatial Data,* Pearson Education Asia., 2nd Ed., 2004.
9. Burrough P.A. & McDonnell R.A., *Principles of GIS for Land Resource Assessment,* OUP, 2nd ed. 1998.
10. Chrisman N., *Exploring Geographic Information Systems*, Wiley, 1997.

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DSE PRACTICAL-2: INTRODUCTION TO GIS			
Paper Code: SOES/GEOG/E002 (P)			
Credit: 02			
Total Marks: 100	Internal Assessment: 40	End Semester: 60	Contact Hour per Week: 02

Course Outcomes (COs)

CO1: Students will learn the fundamentals of computer-based GIS, map concepts, coordinate systems, projections types of GIS files, and layer stacking of multispectral imagery.

CO2: Students will understand the concepts of geo-referencing, sub-setting using AOI layers, mosaicking, and correction of radiometric and geometric errors in satellite imagery.

CO3: Students will apply spatial data integration techniques, digitization of point, line, and polygon features, and integration of non-spatial data for building geospatial databases.

CO4: Students will analyze spatial and non-spatial data through editing, topology building, and evaluation of data consistency to prepare meaningful geographic outputs.

CO5: Students will evaluate and interpret land use/land cover patterns of a selected area and compile a comprehensive project report integrating GIS and remote sensing techniques.

Note: The syllabus for practical is related to laboratory work on cartographic mapping. The practical exam will be of three hours' duration. The division of marks in practical shall be as given below.

Laboratory work (Cartography) - 40
Session Record Work - 10
Viva-voce - 10

The laboratory work is divided into four units. Two exercises are to be set from each unit with internal choice and candidates will be required to attempt four exercises in all. This paper examination will be of three hours' duration in which exercises will be given on cartographic. All questions carry equal marks.

UNIT I

Basic of Computer; Concept of maps; Coordinates System; Projection (WGS84 and Everest); Types of files, Export/Import file; Layer Stacking of Multispectral Imagery.

UNIT II

Concept of Geo-referencing (maps to image, image to image), sub-setting with the help of AOI layer; Mosaicking; Radiometric and Geometric errors and correction; Image classification.

UNIT III

Spatial data integration; Digitization (Point, Line, Polygon); Non-Spatial Data Integration; Editing of Spatial and Non-Spatial data; Building Topology.

UNIT IV

Preparation of land use/land cover map of a selected area and final project report.

Books Recommended:

1. Pratt, W.K.: Digital Image Processing, John Wiley & Sons, New York, 1995.
2. Hord, R.M.: Digital Image Processing of Remotely sensed data, Academic Press, New York, 1989.
3. Nag, P.: Thematic cartography and Remote Sensing Concept, Publishing House, New Delhi.
4. Blackwell, B.: Statistics in Geography, Basil Blackwell Ltd., 1988.
5. Sinha, P.K. & Sinha, P.: Computer Fundamentals, 3rd Ed. B.P.B. Publishing.
6. Lo, C.P.: Applied Remote Sensing, Longman Scientific and Technical, Harlow, ESSEX.
7. PEUQUET, D.J. & Marble, D.F.: Introductory Readings in Geographic Information Systems, Taylor & Francis, Washington, 1990.
8. Spurr, R.: Photogrammetry and Photo Interpretation, The Rolland Press, Co. London, 1960.
9. Cole, J.P. and King, C.A.M.: Quantitative Geography, John Wiley, London, 1968.

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