

# Syllabus

**Curriculum and Credit Framework**  
*for*  
**Undergraduate Course in Geography**  
*(as per UGC Guidelines for NEP 2020)*

*(To be Effective From the Academic Session 2024-2025)*



**Department of Geography**  
**Faculty of Science**

**Diamond Harbour Women's University**  
DH Road Sarisha South 24 Parganas, West Bengal- 743368. India

**OUTLINE OF THE SYLLABUS (UNDERGRADUATE COURSES IN GEOGRAPHY)**

| Year                 | Semester             | Course code | Course Type         | Title  | Credit    | Marks | Paper type | Total Credit (Marks) |
|----------------------|----------------------|-------------|---------------------|--|-----------|-------|------------|----------------------|
| 1 <sup>st</sup> Year | I                    | GEOG-C1101  | Core Course         | Geotectonics and Geomorphology                           | 4         | 50    | Th.        | 23<br>(350)          |
|                      |                      | GEOG-C1102  | Core Course         | Cartographic Techniques and Thematic Mapping             | 4         | 50    | Pr.        |                      |
|                      |                      | GEOG-G1103  | Minor               | Geotectonics and Geomorphology                           | 4         | 50    | Th.        |                      |
|                      |                      | GEOG-MDC1   | Multi-Disciplinary  | Rural Development  | 3         | 50    | Th.        |                      |
|                      |                      | AEC1        | Ability Enhancement | Bengali  | 2         | 50    | Th.        |                      |
|                      |                      | GEOG-SEC1   | Skill Enhancement   | Basics of Computer and Programming Language              | 4         | 50    | Th./Pr.    |                      |
|                      |                      | VAC1        | Value Added Course  | Environmental Studies                                    | 2         | 50    |            |                      |
|                      | II                   | GEOG-C1201  | Core Course         | Population and Settlement Geography                      | 4         | 50    | Th.        | 29<br>(400)          |
|                      |                      | GEOG-C1202  | Core Course         | Maps and Surveying                                       | 4         | 50    | Pr.        |                      |
|                      |                      | GEOG-G1203  | Minor               | Population and Settlement Geography                      | 4         | 50    | Th.        |                      |
|                      |                      | GEOG-MDC2   | Multi-Disciplinary  | Environmental Hazard and Disaster                        | 3         | 50    | Th.        |                      |
|                      |                      | AEC2        | Ability Enhancement | English  | 2         | 50    | Th.        |                      |
|                      |                      | GEOG-SEC2   | Skill Enhancement   | Basic Geoinformatics                                     | 4         | 50    | Th./Pr.    |                      |
|                      |                      | VAC2        | Value Added Course  | Environmental Studies                                    | 2         | 50    | Th.        |                      |
| VOC1                 | Vocational           | VOC -1      | 6                   | 50   | Training  |       |            |                      |
| 2 <sup>nd</sup> Year | III                  | GEOG-C2101  | Core Course         | Climatology  | 4         | 50    | Th.        | 21<br>(300)          |
|                      |                      | GEOG-C2102  | Core Course         | Weather and Climate Analysis Techniques                  | 4         | 50    | Pr.        |                      |
|                      |                      | GEOG-G1203  | Minor               | Climatology  | 4         | 50    | Th.        |                      |
|                      |                      | GEOG-MDC3   | Multi-Disciplinary  | EIA/EMP  | 3         | 50    | Th.        |                      |
|                      |                      | AEC3        | Ability Enhancement | Bengali  | 2         | 50    | Th.        |                      |
|                      |                      | GEOG-SEC3   | Skill Enhancement   | Fieldwork and Survey Techniques                          | 4         | 50    | Th./Pr.    |                      |
|                      | IV                   | GEOG-C2201  | Core Course         | Soil and Bio Geography                                   | 4         | 50    | Th.        | 28<br>(350)          |
|                      |                      | GEOG-C2202  | Core Course         | Economic Geography                                       | 4         | 50    | Th.        |                      |
|                      |                      | GEOG-C2203  | Core Course         | Social and Cultural Geography                            | 4         | 50    | Th.        |                      |
|                      |                      | GEOG-C2204  | Core Course         | Quantitative Techniques in Agriculture and Soil Analysis | 4         | 50    | Pr.        |                      |
|                      |                      | GEOG-G2205  | Minor               | Economic Geography                                       | 4         | 50    | Th.        |                      |
|                      |                      | AEC4        | Ability Enhancement | English  | 2         | 50    | Th.        |                      |
|                      |                      | VOC2        | Vocational          | VOC-2  | 6         | 50    | Training   |                      |
|                      | 3 <sup>rd</sup> Year | V           | GEOG-C3101          | Core Course  | Hydrology | 4     | 50         | Th.                  |
| GEOG-C3102           |                      |             | Core Course         | Regional Planning and Development                        | 4         | 50    | Th.        |                      |
| GEOG-C3103           |                      |             | Core Course         | Geography of India                                       | 4         | 50    | Th.        |                      |
| GEOG-C3104           |                      |             | Core Course         | Statistical Techniques                                   | 4         | 50    | Pr.        |                      |
| GEOG-G3105           |                      |             | Minor               | Geography of India                                       | 4         | 50    | Th.        |                      |
| GEOG-INT             |                      |             | Internship          | Summer Internship  | 3         | 50    | Th.        |                      |
|                      |                      |             |                     |  |           |       |            |                      |
| VI                   |                      | GEOG-C3201  | Core Course         | Philosophy of Geography                                  | 4         | 50    | Th.        | 20<br>(250)          |
|                      |                      | GEOG-C3202  | Core Course         | Oceanography   | 4         | 50    | Th.        |                      |
|                      |                      |             |                     |  |           |       |            |                      |

|  |      |               |              |  |   |    |         |             |
|--|------|---------------|--------------|--|---|----|---------|-------------|
|  |      | GEOG-C3203    | Core Course  | Historical and Political Geography                                   | 4 | 50 | Th.     |             |
|  |      | GEOG-G3204    | Core Course  | Geospatial Techniques  | 4 | 50 | Pr.     |             |
|  |      | GEOG-G3205    | Minor        | Geospatial Techniques  | 4 | 50 | Th.     |             |
| 4 <sup>th</sup> Year                     | VII  | GEOG-C4101    | Core         | River Basin Management   | 4 | 50 | Th.     | 24<br>(300) |
|  |      | GEOG-C4102    | Core         | Advanced Geomorphology/<br>Welfare Geography                         | 4 | 50 | Th.     |             |
|  |      | GEOG-C4103    | Core         | Research Methodology   | 4 | 50 | Th.     |             |
|  |      | GEOG-C4104    | Core         | Geospatial Application and Modelling                                 | 4 | 50 | Pr.     |             |
|  |      | ** GEOG-C4106 | Core         | Geography of Tourism   | 4 | 50 | Th.     |             |
|  |      | GEOG-G4105    | Minor        | Geography of Tourism   | 4 | 50 | Th.     |             |
|  |      | * GEOG-DIS1   | Dissertation | Dissertation – Part -1   | 4 | 50 | Project |             |
|  | VIII | GEOG-C4201:   | Core         | Fluvial Geomorphology/ Rural and Urban Geography                     | 4 | 50 | Th.     | 20<br>(240) |
|  |      | GEOG-C4202    | Core         | Fluvial Geomorphology Practical/ Rural and Urban Geography Practical | 4 | 50 | Pr.     |             |
|  |      | ** GEOG-C4204 | Core         | Water and Water Resources  | 4 | 50 | Th.     |             |
|  |      | ** GEOG-C4205 | Core         | Sustainable development  | 4 | 50 | Th.     |             |
|  |      | GEOG-G4203    | Minor        | Sustainable Development  | 4 | 50 | Th.     |             |
|  |      | * GEOG-DIS2   | Dissertation | Dissertation – Part -2   | 8 | 50 | Project |             |
|  |      |               |              |  |   |    |         |             |
| *With research, ** Without research only |      |               |              |  |   |    |         |             |

### Credit Distribution across Courses (With research)

| Course Type                      | Number of Papers | Credits<br>(Theory + Practical) |
|----------------------------------|------------------|---------------------------------|
| Major/Core (CC)                  | 22               | 14×04 = 56                      |
| Theory/ Practical (Th./Pr.)      |                  | 8×04 = 32                       |
| Minor course (MC)                | 08               | 08×04 = 32                      |
| Skill Enhancement Course (SEC)   | 03               | 03×04 = 12                      |
| Ability Enhancement Course (AEC) | 04               | 04×02 = 08                      |
| Multidisciplinary Course (MDC)   | 03               | 03×03 = 09                      |
| Value Added Course (VAC)         | 02               | 02×02 = 04                      |
| Vocational Course (VOC)          | 02               | 02×06 = 12                      |
| Summer Internship (INT)          | 01               | 01×03 = 03                      |
| Dissertation                     | 01               | 01×12 = 12                      |
| <b>Grand Total</b>               | <b>46</b>        | <b>188</b>                      |

### Credit Distribution across Courses (Without research)

| Course Type                      | Number of Papers | Credits<br>(Theory + Practical) |
|----------------------------------|------------------|---------------------------------|
| Major/Core (CC)                  | 25               | 17×04 = 68                      |
| Theory/ Practical (Th./Pr.)      |                  | 8×04 = 32                       |
| Minor course (MC)                | 08               | 08×04 = 32                      |
| Skill Enhancement Course (SEC)   | 03               | 03×04 = 12                      |
| Ability Enhancement Course (AEC) | 04               | 04×02 = 08                      |
| Multidisciplinary Course (MDC)   | 03               | 03×03 = 09                      |
| Value Added Course (VAC)         | 02               | 02×02 = 04                      |

|                         |           |            |
|-------------------------|-----------|------------|
| Vocational Course (VOC) | 02        | 02×06 = 12 |
| Summer Internship (INT) | 01        | 01×03 = 03 |
| <b>Grand Total</b>      | <b>48</b> | <b>188</b> |

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSES:**

| Course Code | Semester | Course Name  |
|-------------|----------|--|
| C1101       | I        | Geotectonics and Geomorphology                           |
| C1102       |          | Cartographic Techniques and Thematic Mapping             |
| C1201       | II       | Population and Settlement Geography                      |
| C1202       |          | Maps and Surveying                                       |
| C2101       | III      | Climatology  |
| C2102       |          | Weather and Climate Analysis Techniques                  |
| C2201       | IV       | Soil and Bio Geography                                   |
| C2202       |          | Economic Geography                                       |
| C2203       |          | Social and Cultural Geography                            |
| C2204       |          | Quantitative Techniques in Agriculture and Soil Analysis |
| C3101       | V        | Hydrology  |
| C3102       |          | Regional Planning and Development                        |
| C3103       |          | Geography of India                                       |
| C3104       |          | Statistical Techniques                                   |
| C3201       | VI       | Philosophy of Geography                                  |
| C3202       |          | Oceanography   |
| C3203       |          | Historical and Political Geography                       |
| C3204       |          | Geospatial Techniques                                    |
| C4101       | VII      | River Basin Management                                   |
| C4102A      |          | Advanced Geomorphology                                   |
| C4102B      |          | Welfare Geography  |
| C4103       |          | Research Methodology                                     |
| C4104       |          | Geospatial Application and Modelling                     |
| C4106       |          | Geography of Tourism                                     |
| C4201A      | VIII     | Fluvial Geomorphology/                                   |
| C4201B      |          | Rural and Urban Geography                                |
| C4202A      |          | Fluvial Geomorphology Practical/                         |
| C4202B      |          | Rural and Urban Geography Practical                      |
| C4204       |          | Water and Water Resources                                |
| C4205       |          | Sustainable development                                  |

**DISCIPLINE-SPECIFIC MINOR COURSES:**

| Course Code | Semester | Course Name                         |
|-------------|----------|-------------------------------------|
| G1103       | I        | Geotectonics and Geomorphology      |
| G2103       | II       | Population and Settlement Geography |
| G1203       | III      | Climatology                         |
| G2205       | IV       | Economic Geography                  |
| G3105       | V        | Geography of India                  |
| G3205       | VI       | Geospatial Techniques               |
| G4105       | VII      | Geography of Tourism                |
| G4203       | VIII     | Sustainable Development             |

**DISCIPLINE-SPECIFIC SKILL ENHANCEMENT COURSES:**

| Course Code | Semester | Course Name                                 |
|-------------|----------|---|
| SEC1        | I        | Basics of Computer and Programming Language |
| SEC2        | II       | Basic Geoinformatics                        |
| SEC3        | II       | Fieldwork and Survey Techniques             |

**MULTIDISCIPLINARY COURSES:**

| Course Code | Semester | Course Name                       |
|-------------|----------|-----------------------------------|
| MDC1        | I        | Rural Development                 |
| MDC2        | II       | Environmental Hazard and Disaster |
| MDC3        | II       | EIA/EMP                           |

**VALUE-ADDED COURSES:**

| Course Code | Semester | Course Name             |
|-------------|----------|-------------------------|
| VAC1        | I        | Environmental Studies 1 |
| VAC2        | II       | Environmental Studies 2 |

**VOCATIONAL COURSES:**

| Course Code | Semester | Course Name                     |
|-------------|----------|---------------------------------|
| VOC1        | II       | Vocational Course -1 (Training) |
| VOC2        | II       | Vocational Course -2 (Training) |

**1<sup>st</sup> Year, Semester I**

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C1101 – Geo-tectonics and Geomorphology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

To train basic knowledge of the different aspects of Geo-tectonic and Geomorphology. To inculcate the different earth surface processes that have influenced its evolution, their typical behaviour, landscape expressions, and landform assemblages.

***Learning Outcome:***

The students shall gather an idea of the various endogenic and exogenic processes that shape the planet, their behavioral characteristics, and resultant topography, and identify the causative factors of its creation and evolution.

**Geo-tectonics and Geomorphology (Theory)**

**Unit I: Key Ideas of Geotectonics and Geomorphology:** Spatial and temporal scale; The geological time scale, Earth's interior with special reference to seismology

**Unit II: Geotectonics and Landforms:** Isostasy - models of Airy and Pratt; Plate tectonics; Folds and faults—origin and types; Genetic classification of mountains.

**Unit III: Theories of Geomorphology:** Basic concepts of Geomorphology; Models on landscape evolution: Views of Davis, Penck, and Hack; Development of the river network and landforms on horizontal, uniclinal, folded, and faulted structures

**Unit IV: Geomorphological Processes and Landforms:** Weathering and mass wasting, erosion, and deposition; Process and landforms in fluvial, coastal, glacial, and arid environments.

***Suggested Reading:***

Bierman, P.R., Montgomery, D.R., 2019. Key Concepts in Geomorphology, 2nd ed, W. H. Freeman.

Billings, M.P. 1971. Structural Geology, Pearson India.

Burbank, D.W. 2011. Tectonic Geomorphology, 2nd ed, Wiley India.

Fossen, H. 2016. Structural Geology, 2nd ed, Cambridge University Press.

Frisch, W., Meschede, M., Blakey, R.C. 2022. Plate Tectonics: Continental Drift and Mountain Building, 2nd ed, Springer.

Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.

Gregory, K.J., Lewin, J. 2014. The Basics of Geomorphology: Key Concepts, Sage.

Gupta, A. 2011. Tropical Geomorphology, Cambridge University Press.

- Harvey, A. 2022. *Introducing Geomorphology: A Guide to Landforms and Processes*, 2nd ed, Dunedin Academic Press.
- Huggett, R., Shuttleworth, E., 2022. *Fundamentals of Geomorphology*, 5th ed, Routledge.
- Kale, V.S., Gupta, A. 2001. *Introduction to Geomorphology*, Orient Blackswan (2018 reprint).
- Kearey, P., Klepeis, K.A., Vine, F.J. 2011. *Global Tectonics*, 3rd ed, Wiley-India
- Knighton, A.D. 1998. *Fluvial Forms and Processes: A New Perspective*, Edward Arnold.
- McCullagh, P. 1978. *Modern Concepts in Geomorphology*, Oxford University Press.
- Schumm, S.A., Dumont, J.F., Holbrook, J.M. 2002. *Active Tectonics and Alluvial Rivers*, Cambridge University Press.
- Selby, M.J. 1986. *Earth's Changing Surface*, Oxford University Press.
- Strahler, A. 2016. *Introducing Physical Geography*, 6th ed, Wiley.
- Summerfield, M.J. 2003. *Global Geomorphology: An Introduction to the Study of Landforms*, Longman.
- Thornbury, W.D. 1969. *Principles of Geomorphology*, 2nd ed, Wiley-India / CBS.

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C1102: Cartographic Techniques and Thematic Mapping (Practical)**

**Total Marks: 50 (Credits: 4)**

***Course objectives:***

The prime aims of the course are to provide knowledge on scales, proportional diagrams, map projections, and methods of thematic map generation. The course also aims to understand the role of cartographic techniques and thematic maps in geographical data analysis and interpretation and its role in regional planning and development.

***Course specific outcome:***

The students will learn about the scales and their applications in every field of geographical research. The course will extend greater ideas on the preparation map on suitable map projections. After completion of the course the students will be able to prepare and analyse, choropleth map, isopleth maps, dots and sphere maps, proportional circles, bar graphs, etc.

**Cartographic Techniques and Thematic Mapping (Practical)**

**Unit I: Map Scale:** Linear, Comparative, Diagonal, Vernier scales; Map enlargement and reduction; Cartesian and polar systems of measurement

**Unit II: Map Projection:** Concept of generating globe and grids; Classification of projections; Planar (Polar Zenithal Orthographic), Conical (Simple Conic, One standard parallel), Cylindrical (Equal area) Projections; Bonne's projection, Mercator's projection; UTM grid system

**Unit III: Maps and Diagrams:** Map - Isopleths, Choropleth; Diagram - dots and spheres, Divided proportional circles

***Suggested readings:***

Anson R. and Ormelling F. J., 1994: International Cartographic Association: Basic Cartographic Vol. Pregmen Press.

Gupta K.K. and Tyagi, V. C., 1992: Working with Map, Survey of India, DST, New Delhi.

Mishra R.P. and Ramesh, A., 1989: Fundamentals of Cartography, Concept, New Delhi.

Monkhouse F. J. and Wilkinson H. R., 1973: Maps and Diagrams, Methuen, London.

Rhind D. W. and Taylor D. R. F., (eds.), 1989: Cartography: Past, Present and Future, Elsevier, International Cartographic Association.

Robinson A. H., 2009: Elements of Cartography, John Wiley and Sons, New York.

Sharma J. P., 2010: Prayogic Bhugol, Rastogi Publishers, Meerut.

Singh R. L. and Singh R. P. B., 1999: Elements of Practical Geography, Kalyani Publishers.

Sarkar, A. (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd.

Singh R L & Rana P B Singh(1991) Prayogtmak Bhugol ke Mool Tatva, Kalyani Publishers.

**MULTI-DISCIPLINARY COURSE (MDC)**  
**Paper Code: GEOG-MDC 1 – Rural Development**  
**Total Marks: 50 (Credits: 3)**

***Course Objective:***

The main objective of this course is to give the students a basic idea about rural development. This course has been designed to introduce key concepts in rural and urban geography to the students. One of the course objectives is to acquaint the learners with the Indian experience of rural development

***Learning Outcome:***

The learners are expected to develop a sound idea about the basics of rural development and planning. Students will also gain an understanding of the planning for rural development. The pupils are expected to acquire an in-depth knowledge about Indian experiences in the field of rural development.

**Rural Development**

**Unit-I: Introduction to Rural Development:** The evolving concept of rural development, theories related to rural development: Dependency theory of Marxist School, Gandhian Model of rural development, Concept of developmental planning and multi-level planning in India

**Unit-II: Components and Actors of Rural Development:** Natural resource base and technology in rural development, Rural connectivity, rural electrification, and drinking water. Institutions for rural development: Role of Panchayati Raj Institutions; district, block, gram panchayat & village level planning.

**Unit-III: Sectoral Linkages and Initiatives for Rural Development:** Agriculture and allied sectors with special reference to the dairying & fishery sectors, Rural industries: Agro-based, village and cottage industries, Flagship programmes for rural development: MGNREGA, NRHM

**Unit-IV: Emerging Issues in Rural Planning and Development:** Land reforms and land acquisition in rural areas, Women empowerment through rural planning, role of ICT in rural planning and governance.

***Suggested Reading:***

C.N (1994). Politics of rural development: The case of anti-Poverty programme in West Bengal and Gujarat, Rawat Publications, Jaipur.

Harris, Hohn (2017): Rural Development: Theories of peasant economy and agrarian change, Rawat Publications, Jaipur, (Indian Reprint).

Kar, Samit (1991). Rural development in West Bengal: a quest, Sarat Book House, Kolkata Ray,

Riley, John M (2002). Stakeholders in rural development: critical collaboration in state-NGO partnerships, Sage Publications India, New Delhi

Seminar (2016): CHANGING COUNTRYSIDE: a symposium on the shifting contours of the rural landscape, Vol. - 682, June - 2016 Singh, Katar (1986). Rural development: principles, policies and management, Sage Publications India New Delhi.

Upadhyay, H.C (1991). Modernization and rural development, Anmol Publications, New Delhi.

Vijay, Chand Mal (1989). Rural development administration in India, Akashdeep Publishing House, New Delhi.

Yugandhar, B.N., Mukherjee, Neela (1991). Studies in village India: Issues in rural development, Concept Publishing, New Delhi.

**SKILL ENHANCEMENT COURSE (SEC)**

**Paper Code: GEOG-SEC1 – Basics of Computer and Programming Language**

**Total Marks: 50 (Credits: 4)**

***Course objective:***

The course is designed to cover the fundamental concepts of computer system organization, programming, and efficient mechanisms for storing and retrieving data along with data management and visualization techniques.

***Course outcome:***

To be able to use the computer for basic purposes. Develop an understanding of how the computer system works; the components of computer systems and how they interrelate, including software, data, hardware, communications, and users. To use efficient data storing and retrieval techniques along with basic programming skills.

**Basics of Computer and Programming Language**

**Unit - I: Introduction :** Computer: Input, CPU, output; Concepts of Software: Definition and types of software; Operating System, Concept of Internet - WWW and Web Browsers. Program flowchart; programming language – low level, high level, Generations; algorithm, Syntax; Programming Environment: text editor, compiler

**Unit – II: Data structure:** Data types: class, String, number – integer, float, long and small number, array, list. Variables: Declaration, Integration, Modification, accessing: keywords, Operators and Operands; arithmetic, relational, and logical operators.

**Unit – III: Programming components:** Control Flow Statements: if, if-else, if-elif-else, and nested if statements, while Loop, for Loop, Nested Loops, continue and break statements. Functions: Modules, Built-in and user-defined;

**Unit -IV: Application:** Office Suit Handling – Word processing; spreadsheet handling and presentation creating. Basic programming in any language involves the above topic (Python Editor Installation; basic scripting; elementary code writing; mapping and data visualization with Python)

**VALUE ADDED COURSE (VAC)**  
**Paper Code: GEOG-VAC1 – Environmental Studies**  
**Total Marks: 50 (Credits: 2)**

***Course objective***

The course is designed to impart a basic understanding of the environment including its concerning issues.

***Course outcome:***

After completing the course, the students will be able to understand the various aspects of the environment

**Environmental Studies**

**Unit 1: Introduction to Environmental Studies:** Scope and content of Environmental Science, Environmental ethics, Natural resources: Renewable and non-renewable; conservation strategies, Concepts of biodiversity and sustainability, Human community, and environment: Population ecology-population growth model, factors affecting population size and age structure

**Unit II: Ecology and Ecosystems:** Concept of ecology and ecosystem, Structure, and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology. Characteristic features of the following: a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, wetlands, rivers, oceans, estuaries), e) Mangrove ecosystem

**Unit -III: Environmental Pollution and Management:** Environmental pollution: concepts and types, Air, water, soil, noise and marine pollution- causes, effects, controls and management, Concept of hazards waste and human health risks, Solid waste: sources, control measures and management

***Suggested Reading:***

Asthana, D. K. (2006). Text Book of Environmental Studies. S. Chand Publishing.

Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

Basu, R. N., (Ed.) (2000). Environment. University of Calcutta, Kolkata

A.K., (2006). Environmental Chemistry, 6th Edition, New Age International, New Delhi.

Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications.

**DISCIPLINE-SPECIFIC MINOR COURSE (CC)**

**Paper Code: GEOG-G1103 – Geo-tectonics and Geomorphology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

To train basic knowledge of the different aspects of Geo-tectonic and Geomorphology. To inculcate the different earth surface processes that have influenced its evolution, their typical behaviour, landscape expressions, and landform assemblages.

***Learning Outcome:***

The students shall gather an idea of the various endogenic and exogenic processes that shape the planet, their behavioral characteristics, and resultant topography, and identify the causative factors of its creation and evolution.

**Geo-tectonics and Geomorphology (Theory)**

**Unit-I: Key Ideas of Geotectonics and Geomorphology:** Spatial and temporal scale; The geological time scale, Earth's interior with special reference to seismology

**Unit II: Geotectonics and Landforms:** Isostasy - models of Airy and Pratt; Plate tectonics; Folds and faults—origin and types; Genetic classification of mountains.

**Unit III: Theories of Geomorphology:** Basic concepts of Geomorphology; Models on landscape evolution: Views of Davis, Penck, and Hack; Development of the river network and landforms on horizontal, uniclinal, folded, and faulted structures

**Unit -IV: Geomorphological Processes and Landforms:** Weathering and mass wasting, erosion, and deposition; Process and landforms in fluvial, coastal, glacial, and arid environments.

***Suggested Reading:***

Bierman, P.R., Montgomery, D.R., 2019. Key Concepts in Geomorphology, 2nd ed, W. H. Freeman.

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Fossen, H. 2016. Structural Geology, 2nd ed, Cambridge University Press.

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Goudie, A.S. (Ed) 2004. Encyclopaedia of Geomorphology, vol. 1 & 2, Routledge.

Gregory, K.J., Lewin, J. 2014. The Basics of Geomorphology: Key Concepts, Sage.

Gupta, A. 2011. Tropical Geomorphology, Cambridge University Press.

Harvey, A. 2022. Introducing Geomorphology: A Guide to Landforms and Processes, 2nd ed, Dunedin Academic Press.

- Huggett, R., Shuttleworth, E., 2022. Fundamentals of Geomorphology, 5th ed, Routledge.
- Kale, V.S., Gupta, A. 2001. Introduction to Geomorphology, Orient Blackswan (2018 reprint).
- Kearey, P., Klepeis, K.A., Vine, F.J. 2011. Global Tectonics, 3rd ed, Wiley-India
- Knighton, A.D. 1998. Fluvial Forms and Processes: A New Perspective, Edward Arnold.
- McCullagh, P. 1978. Modern Concepts in Geomorphology, Oxford University Press.
- Schumm, S.A., Dumont, J.F., Holbrook, J.M. 2002. Active Tectonics and Alluvial Rivers, Cambridge University Press.
- Selby, M.J. 1986. Earth's Changing Surface, Oxford University Press.
- Strahler, A. 2016. Introducing Physical Geography, 6th ed, Wiley.
- Summerfield, M.J. 2003. Global Geomorphology: An Introduction to the Study of Landforms, Longman.
- Thornbury, W.D. 1969. Principles of Geomorphology, 2nd ed, Wiley-India / CBS.

**1<sup>st</sup> Year, Semester -II**

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C1201 - Population and Settlement Geography**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To inculcate fundamental knowledge about Population Geography and Settlement Geography; To study population dynamics, theories, and policies regarding population growth; To study the nature, morphology, and evolution of rural and urban settlements

***Course Learning Outcomes:***

After the completion of the course, the students shall: familiarise themselves with fundamental concepts of Population and Settlement Geography; Understand population dynamics, the nature of population growth and migration; acquire knowledge about the nature and morphology of rural and urban settlements

**Population and Settlement Geography**

**Unit I: Introduction to Population Geography:** Nature, scope, and content of Population Geography; Relation between Population Geography and other social sciences; Idea of demography; Sources of population data: Census, vital statistics and national sample survey; Trends of population growth in the world; Population composition (Age-sex and occupational structure)

**Unit II: Population Dynamics:** Determinants of population dynamics: Fertility, mortality, and Migration; Measures of fertility and mortality; Theories of population growth: Malthus and Marx; Demographic transition theory (Thompson and Notestein); Migration: types, causes and theories (Ravenstein and Lee); Population policies (India and Sweden)

**Unit III: Geography of Rural Settlement:** Rural settlement: Definition, nature, types, and characteristics; Rural settlement: Site, situation, pattern and morphology; Rural house types with reference to India, social segregation in rural areas. Census of India categories of rural settlements; Geographies of ruralization; ruralopolis; desakota; rural hollowing

**Unit IV: Geography of Urban Settlement:** Urban settlement: Census of India definition and categories; Urban agglomeration; Urban sprawl, Rural-urban continuum, Rurban and peri-urban; City-region and conurbation. Functional classification of cities: Schemes of Harris, Nelson, and McKenzie; Issues and challenges of third world urbanization: hidden urbanization; non-recognized urbanization; peripheral urbanization; agrarian urbanism

***Suggested Readings:***

Barrett, H. R. 1995. Population Geography, Oliver and Boyd, Edinburgh.

Bhende, A.S. and Kanitkar, T. 2015. Principles of Population Studies, Himalaya Publishing House.

Beaujeu- Garnier, J. 1966. Geography of Population, Longman, London.

- Chandana, R.C. and Sidhu, M.S. 1996. *Geography of Population: Concepts Determinants and Pattern*, Kalyani Publishers, New Delhi.
- Chisholm, M. 1967. *Rural Settlement and Land use*, John Wiley, New York.
- Clarke J. I. 1972. *Population Geography*, Pergamon Press, Oxford.
- Denis, E., Zérah, M. H., & Mukhopadhyay, P. 2017. *Subaltern urbanisation in India*. Springer, Switzerland.
- Doniel, P. and Hopkinson, M. 1986. *The Geography of Settlement*, Oliver & Boyd, Edinburgh.
- Garnier J.B. 1978. *Geography of Population*, Longman, London.
- Ghosh, S. 1998. *Introduction to Settlement Geography*, Orient Longman Ltd., Kolkata.
- Gottdiener, M., Budd, M. Lehtovuori, P. 2016. *Key Concepts in Urban Studies*, 2nd ed, Sage, London.
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds) 2009. *The Dictionary of Human Geography*, 5th ed, Wiley, New Jersey.
- Hassan, M.I. 2007. *Population Geography*, Rawat Publications, Jaipur.
- Hudson, F.S. 1970. *Geography of Settlements*, Macdonald and Evans Ltd, New York.
- Hussain, M. 2007. *Models in Geography*, Rawat Publication, New Delhi.
- Jones, H. R. 2000. *Population Geography*, 3rd edition, Paul Chapman, London.
- Pacione M.(ed) 1986. *Population Geography: Progress & Prospect*, Routledge, London.
- Mandal, R.B. 2001. *Introduction to Rural Settlement*, 2nd ed, Concept Publishing Company, New Delhi.
- Ramachandran, R. 2010. *Urbanisation and Urban Systems of India*. Oxford University Press, New Delhi.
- Singh, R.Y. 2002. *Geography of Settlements*, Rawat Publications, Jaipur.
- Tiwari, R.C. 2020. *Settlement Geography – Rural and Urban Settlement*, Pravalika Publications, Allahabad.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C1202: Maps and Surveying (Practical)**

**Total Marks: 50 (Credits: 4)**

***Course objectives:***

The students will be able to calculate Map scales. Toposheet will educate the student about the ground relief (landforms and terrain), drainage (lakes and rivers), forest cover, administrative areas, population areas, transportation routes, and amenities (including roads and railroads), The geological map's purpose is to investigate the geological structure as well as the evolution of landforms and drainage in various geological structures.

***Course-specific outcomes:***

Toposheet can be used to plan a building complex, an industrial plant, a railway, and an irrigation project, among other things. Bridges, tunnels, and dams can all be planned using Toposheet After studying the geological map, a candidate should be able to perceive the interrelations between structure and relief which is the basis of physical geography.

**Maps and Surveying (Practical)**

**Unit II: Topographical Map:** Reference scheme of Survey of India maps (old and open series); Map margin information; Construction and interpretation of relief profiles (serial, superimposed, projected and composite); Application of morphometric techniques (relative relief, average slope, drainage density, stream ordering); Correlating physical and cultural attributes (transect chart and scatter plots).

**Unit II: Geological Map:** Interpretation of geological maps with different lithologies, structures, and discontinuities; Drawing of cross sections and mapping horizontal, vertical, uniclinal, folded, and faulted structures; Determining strike and dip attributes, bed succession, and thickness; Correlating topography with geologic structures.

**Unit III: Surveying:** Traverse survey using prismatic compass, Profile survey using dumpy level

***Suggested readings:***

- Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.
- Gokhale N. W. Manual of Geological Maps. CBS Publishers and Distributors
- Kanan, M. & Yadav, S. 2022. Practical Geography. Rawat Books.
- Monkhouse F.J., Wilkinson H.R. 1971. Maps and Diagrams, their compilation and construction, 3rd ed (2017 reprint), Alphaneumera.
- Pradhan, N. 2016. Basic Geological Mapping. Scitus Academics
- Saha, P.K., Basu, P. 2021, Advanced Practical Geography.
- Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.
- Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.
- Vaidyanadhan, R., Subbarao, K.V. 2014. Landforms of India from Topomaps and Images, Geological Society of India.

**MULTI-DISCIPLINARY COURSE (MDC)**

**Paper Code: GEOG-MDC2 – Environmental Hazard and Disaster**

**Total Marks: 50 (Credits: 3)**

***Course objectives:***

The prime aim of the course is to provide knowledge of fundamental concepts of environmental hazards. The course also aims to understand the data and techniques of disaster mapping. The student will get an overview of the major hazards in India.

***Course-specific outcome:***

The students will learn the hazard mapping data and techniques. They will be familiar with Assessment methods of hazards and their management. The course will provide knowledge of community-based disaster response systems.

**Environmental Hazard and Disaster**

**Unit I: Concepts of Hazard and Disaster:** Definition, classification of hazard and disaster; Approaches to hazard study; Hazard paradigms; Risk perception and vulnerability

**Unit II: Disaster Responses:** Preparedness and risk assessment; Resilience and mitigation; Capacity building: Social Response to hazards; Community adaptability; Hazard and development paradoxes; Brown and green technology

**Unit III: Assessment and Management of Hazards:** Hazard mapping: Data and geospatial techniques; Impact assessment of hazards; Techniques of risk and vulnerability assessment and mapping; Disaster management cycle

**Unit IV: Management Disaster in India:** Earthquake, landslide, tsunami, flood – Causes, mechanism and management; Role of NDMA and NIDM in disaster management; Indigenous knowledge and community-based disaster management.

***Suggested Readings:***

Government of India (1997) Vulnerability Atlas of India, New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.

Modh S (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Singh RB (2005) Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi.

Singh RB (Ed.) (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

Sinha A (2001) Disaster Management: Lessons Drawn and Strategies for Future, New United Press,

Stoltman JP et al (2004) International Perspectives on Natural Disasters, Kluwer Academic Publications, Dordrecht.

Alexander D (1993) Natural Disasters. London: ULC Press Ltd.

Bryant EA (1991) Natural Hazards. Cambridge: Cambridge University Press.

Chapman D (1994). Natural Hazard. Melbourne: Oxford University Press.

Collins LR, Scheind TD (2000) Disaster Management and Preparedness. UK: Taylor and Francis.

Sharma RK, Sharma G (2005) Natural Disaster. New Delhi: APH Publishing Corporation.

Smith K (1996) Environmental Hazards: Assessing Risk and Reducing Disaster. London: Routledge

**SKILL ENHANCEMENT COURSE (SEC)**

**Paper Code: GEOG-SEC2 – Basic Geoinformatics**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

To impart basics of geospatial data and geospatial techniques.

***Learning Outcome:***

Ability to understand digital data in different formats and work Extract and map geospatial information.

**Basic Geoinformatics**

**Unit I: Concept of Geographical Information System:** Definition and Key Components; Advantages, Limitations, Functions and Uses of GIS; Concept of Spatial and Attribute Information;

**Unit II: GIS Data Analysis:** Spatial, Thematic, and Temporal Dimensions of Geographical Data; Spatial Data Model, Georeferencing, Overlay Operations, Geoprocessing; buffer, clip, intersect, merge, dissolve, erase.

**Unit III: Principles of remote sensing (RS).** Types of RS satellites and sensors with reference to IRS and Landsat missions. preparing standard false colour composites (FCCs) and image classification

**Unit III: Global Positioning System (GPS):** Principles and Uses; Hand-held GPS/DGPS; Application of hand-held GPS to map local streets.

***Suggested Reading:***

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Bhatta, B. 2020. Remote Sensing and GIS, 3rd ed, Oxford University Press.

Bolstad, P. 2016. GIS Fundamentals: A First Text on Geographic Information Systems, 5th ed, XanEdu Publishing.

Joseph, G., Jagannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Orient Blackswan.

Kennedy, M., Kopp, S. 2001. Understanding Map Projections, Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis, Interpretation, 7th ed, Esri Press.

Lillesand, T.M., Kiefer, R.W., Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed, Wiley. Monkhouse, F.J., Wilkinson, H.R. 1971.

Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata. Pearson II, F. 1990. Map Projections: Theory and Applications 2nd ed, CRC Press.

**VALUE ADDED COURSE (VAC)**

**Paper Code: GEOG-VAC2 – Environmental Studies**

**Total Marks: 50 (Credits: 2)**

**Unit I: Conservation:** Different types of in situ and ex-situ conservation; IUCN, Red Data Book; Different types of biotic interactions; ecad, ecotype, ecocline; Afforestation and reforestation; ecological restoration; Habitat and Niche concept; fundamental & realized niche

**Unit II: Introduction to Environmental Physics:** Climate Change: Impacts, Adaptation and Mitigation; Pollution and its analysis: Basic Concepts of Air Pollution, Air Pollution-Control Technology, Basic Concepts of Noise Pollution, Basic Concepts of Water Pollution, Water Pollutants, Thermal Pollution; Global Warming: Weather, Climate and Society; Waste Management: Solid and Hazardous Waste, Hazardous Waste, Hazardous; Waste Treatment & Management, Wastewater Treatment, Nuclear waste and E-waste, Methodology, Limitations of the study, Post-consumer e-waste recovery and recycle; Renewable Energy: Principles of Solar Radiation, Solar Energy Collection, Solar, Energy Storage and Applications, Solar PV, Wind Energy, Geothermal Energy, Ocean Energy

**Unit III: Introduction to Environmental Mathematics:** Role of Mathematics in Environmental Studies; Concept of chance factor (Probability); Definition of Statistics, Scope and Limitation of Statistics; Collection, Classification and Presentation of statistical data: Primary and secondary data; Method of data collection, Tabulation of data, Graphs and charts, Interpolation and; extrapolation data analysis; Common measures – mean, median and mode.

***Suggested Reading:***

Elements of Ecology 8th Edition, by Thomas M. Smith & Robert Leo Smith. Pearson Education, India.

Basic Ecology: Fundamentals of Ecology by Eugene P. Odum. Cengage Learning

Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.

Business Mathematics and Statistics- N G Das & J K Das (Tata McGraw Hill)

Statistical Methods in Business and Social Science – G. V. Shenoy and M. Pant (Macmillan)

Business Statistics – R. S. Bhardwaj (Excel Books)

Statistics for Management – Levin, Rubin, and Rastogi (Pearson Education)

Statistics for Management, Srivastava and Rego, McGraw Hill

Hazarika Padmalochan, A Text Book of Business Statistics, S.Chand

Business Mathematics & Statistics – Dr. S N De (Chhaya Prakashani)

Business Mathematics & Statistics – N K Nag & S K Nag (Kalyani Publisher)

**DISCIPLINE-SPECIFIC MINOR COURSE (CC)**

**Paper Code: GEOG-G1203 - Population and Settlement Geography**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To inculcate fundamental knowledge about Population Geography and Settlement Geography; To study population dynamics, theories, and policies regarding population growth; To study the nature, morphology, and evolution of rural and urban settlements

***Course Learning Outcomes:***

After the completion of the course, the students shall: familiarise themselves with fundamental concepts of Population and Settlement Geography; Understand population dynamics, the nature of population growth and migration; acquire knowledge about the nature and morphology of rural and urban settlements

**Population and Settlement Geography**

**Unit I: Introduction to Population Geography:** Nature, scope, and content of Population Geography; Relation between Population Geography and other social sciences; Idea of demography; Sources of population data: Census, vital statistics and national sample survey; Trends of population growth in the world; Population composition (Age-sex and occupational structure)

**Unit II: Population Dynamics:** Determinants of population dynamics: Fertility, mortality, and Migration; Measures of fertility and mortality; Theories of population growth: Malthus and Marx; Demographic transition theory (Thompson and Notestein); Migration: types, causes and theories (Ravenstein and Lee); Population policies (India and Sweden)

**Unit III: Geography of Rural Settlement:** Rural settlement: Definition, nature, types, and characteristics; Rural settlement: Site, situation, pattern and morphology; Rural house types with reference to India, social segregation in rural areas. Census of India categories of rural settlements; Geographies of ruralization; ruralopolis; desakota; rural hollowing

**Unit IV: Geography of Urban Settlement:** Urban settlement: Census of India definition and categories; Urban agglomeration; Urban sprawl, Rural-urban continuum, Rurban and peri-urban; City-region and conurbation. Functional classification of cities: Schemes of Harris, Nelson, and McKenzie; Issues and challenges of third world urbanization: hidden urbanization; non-recognized urbanization; peripheral urbanization; agrarian urbanism

***Suggested Readings:***

Barrett, H. R. 1995. Population Geography, Oliver and Boyd, Edinburgh.

Bhende, A.S. and Kanitkar, T. 2015. Principles of Population Studies, Himalaya Publishing House.

Beaujeu- Garnier, J. 1966. Geography of Population, Longman, London.

Chandana, R.C. and Sidhu, M.S. 1996. Geography of Population: Concepts Determinants and Pattern, Kalyani Publishers, New Delhi.

- Chisholm, M. 1967. Rural Settlement and Land use, John Wiley, New York.
- Clarke J. I. 1972. Population Geography, Pergamon Press, Oxford.
- Denis, E., Zérah, M. H., & Mukhopadhyay, P. 2017. Subaltern urbanisation in India. Springer, Switzerland.
- Doniel, P. and Hopkinson, M. 1986. The Geography of Settlement, Oliver & Boyd, Edinburgh.
- Garnier J.B. 1978. Geography of Population, Longman, London.
- Ghosh, S. 1998. Introduction to Settlement Geography, Orient Longman Ltd., Kolkata.
- Gottdiener, M., Budd, M. Lehtovuori, P. 2016. Key Concepts in Urban Studies, 2nd ed, Sage, London.
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley, New Jersey.
- Hassan, M.I. 2007. Population Geography, Rawat Publications, Jaipur.
- Hudson, F.S. 1970. Geography of Settlements, Macdonald and Evans Ltd, New York.
- Hussain, M. 2007. Models in Geography, Rawat Publication, New Delhi.
- Jones, H. R. 2000. Population Geography, 3rd edition, Paul Chapman, London.
- Pacione M.(ed) 1986. Population Geography: Progress & Prospect, Routledge, London.
- Mandal, R.B. 2001. Introduction to Rural Settlement, 2nd ed, Concept Publishing Company, New Delhi.
- Ramachandran, R. 2010. Urbanization and Urban Systems of India. Oxford University Press, New Delhi.
- Singh, R.Y. 2002. Geography of Settlements, Rawat Publications, Jaipur.
- Tiwari, R.C. 2020. Settlement Geography – Rural and Urban Settlement, Pravalika Publications, Allahabad.

**2<sup>nd</sup> Year, Semester III**

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C2101 – Climatology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To provide students with a comprehensive understanding of the various components of the climate system, including the atmosphere, hydrosphere, lithosphere, and biosphere.

To teach students about the different climate types and classification systems,

To explore the concept of climate change, its historical context, and the contemporary issues related to anthropogenic influences on climate, including global warming, greenhouse gas emissions, and their impacts.

***Course Learning Outcomes:***

After the completion of the course, the students shall:

Gain a comprehensive understanding of the various components of the climate system, including the atmosphere, oceans, and land surface, and how they interact.

Be able to classify and identify different climate types and understand the factors influencing their distribution.

Be aware of the concept of climate change, including its historical context, contemporary issues, and the human impact on climate.

**Climatology**

**Unit I: Elements of Atmosphere:** The atmosphere; Nature, Composition and Layering. Insolation; controlling factors, Heat budget of the atmosphere. Temperature; Horizontal and Vertical distribution, Inversion of Temperature.

**UNIT II: Atmospheric dynamics:** Condensation; Process and forms. Mechanism of Precipitation; Bergeron- Findeisen theory, Collision and Coalescence Theory. Air mass; Origin, Characteristics, Classification, Modification. Fronts; Warm and Cold; frontogenesis and frontolysis, impact of different fronts on the atmosphere. Tropical cyclones, Geostrophic and gradient winds, Centripetal and Coriolis forces ELNO and ENSO phenomena,

**UNIT III: Atmospheric Pressure and Global Circulation of Winds:** Atmospheric pressure; Pressure belts of the earth, Tricellular model. Global wind patterns; planetary, periodical, and local winds. Jet Stream; Impact on surface weather. Asian Monsoon; Concepts of origin, Climatic significance, Recent trends.

**UNIT IV: Climatic Classification and Climate Change:** Climatic Classification; World and special reference to India after Köppen and Thornthwaite. Green House Effect and Importance of Ozone Layer. Evidence of Climate Change. Climate Change; causes and consequences.

***Suggested Reading:***

Ahrens, C.D. 2012. Essentials of Meteorology: An Invitation to the Atmosphere. 9th ed, Cengage Learning.

Barry, R.G., Chorley R.J. 2009. Atmosphere Weather and Climate. 9th ed, Routledge.

Critchfield, H. J. 1983. General Climatology. Prentice Hall India (2010 Reprint).

Dessler, A.E. 2021. Introduction to Modern Climate Change, 3rd ed, Cambridge University Press.

Hidore, J.J., Oliver, J.E., Snow, M., Snow, R. 2020. Climatology: An Atmospheric Science, 3rd ed, Pearson.

Lal, D.S. 2012. Climatology. Sharda Pustak Bhawan.

Lutgens, F.K., Tarbuck, E.J. 1998. The Atmosphere: An Introduction to Meteorology, 9th ed, Prentice-Hall.

Oliver, J.E., Hidore J.J. 2002. Climatology: An Atmospheric Science, Pearson Education India.

Rohli, R.V., Vega, A.J., 2017. Climatology, 4th ed, Jones & Bartlett Learning.

Websites:

India Meteorological Department: <https://mausam.imd.gov.in>

Intergovernmental Panel on Climate Change: <https://www.ipcc.ch>

World Bank Climate Change Knowledge Portal: <https://climateknowledgeportal.worldbank.org>

World Meteorological Organization: <https://public.wmo.int/en>

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C2102– Weather and Climate Analysis Techniques (Practical)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

The course objective of weather and climate analysis techniques typically involves teaching students how to interpret and analyze atmospheric data, including temperature, pressure, wind, humidity, and precipitation patterns. Students learn to use various tools and methods to understand weather and climate phenomena, predict future weather patterns, and assess the impacts of climate change.

***Learning Outcome:***

The learning outcomes involve, an understanding of fundamental meteorological concepts and principles. Proficiency in interpreting weather maps and other meteorological data.

**Weather and Climate Analysis Techniques (Practical)**

**UNIT-I Measurement of Weather Elements (Analog/Digital Instruments):** Measurement and record of Mean daily temperature, Air pressure, Relative humidity, and Rainfall.

**UNIT- II Interpretation of Weather Maps of India:** Weather map of Pre-Monsoon, Monsoon and Post-Monsoon periods.

**UNIT- III Construction and Interpretation of Monthly Rainfall Dispersion Diagram:** Quartile method, Climatic Water Budget.

**UNIT- IV Construction and Interpretation of Hythergraph and Climograph:** Referencing Taylor's method, Comparison and analysis of temperature and humidity variations over time, Interpretation of climatic conditions based on the constructed graphs (Climograph, Hydrography, Ombrothermic chart, station model.

***Suggested Reading:***

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata.

Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd ed, Orient Blackswan.

Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers

**MULTI-DISCIPLINARY COURSE (MDC)**

**Paper Code: GEOG-MDC3 – Environmental Impact Assessment and Environmental Management Planning (Theory)**

**Total Marks: 50 (Credits: 3)**

**Course Objectives:**

the primary aims of the course are to provide knowledge on the necessity of Environmental impact assessment and management planning. The course is designed to identify environmental issues, knowing the legal framework to protect the environment.

**Learning outcome:**

The student will learn the environmental protection framework. They will be capable of conducting the EIA on various developmental projects.

**Environmental Impact Assessment and Environmental Management Planning**

**Unit I: Conceptual Framework:** Definition and scope of Environmental Impact Assessment (EIA) and Environmental; Management Planning (EMP); Legal and Policy Framework for Management: Air, Water, Forest. Environment; Protection Act (EPA); Structure of governance and implementation strategies

**Unit II: Processes:** Environmental appraisal: Concept and objectives; Stages of conducting EIA: Scoping and screening using Environmental Information; System (EIS); Preparation of inventory and matrices [4]

**Unit III: Methods:** Methodologies for EIA: Impact assessment, risk assessment, cost-benefit analysis; Stakeholders' participation: Local bodies, citizens, relevant experts; Prediction scenarios and mitigation, assessing alternatives

**Unit IV: Case Studies:** Environmental Impact (EI) reporting; EI monitoring and review; Environmental audit: Relevance and process; EIA/EMP case study of a metro rail project; EIA/EMP case study of a highway project. Water sample analysis, Sound intensity measurement, Ecology survey

**Suggested Reading:**

Gilpin, A. 1994. Environmental Impact Assessment: Cutting Edge for the 21st Century, Cambridge University Press

Khandeshwar, S.R., Raman, N.S., Gajbhiye, A.R. 2019. Environmental Impact Assessment, Dreamtech Press

Tinsley, S. 2001. Environmental Management Plans Demystified, Rutledge.

Yerramilli, A., Manickam, V. 2020. Environmental Impact Assessment Methodologies, 3rd ed, BS Publication.

**Websites:**

National Accreditation Board for Education & Training- EIA Accreditation:  
[https://nabet.qci.org.in/eia\\_consultant](https://nabet.qci.org.in/eia_consultant)

Example of an EIA report: Bengaluru Metro Rail Project:

<https://www.adb.org/sites/default/files/project-documents/53326/53326-001-eia-en.pdf>

Example of an EIA report: Vadodara–Mumbai Expressway Project:

[https://www.mpcb.gov.in/sites/default/files/public\\_hearing/exe\\_summary/202101/nationalhighwayexe\\_summaryeng21012021.pdf](https://www.mpcb.gov.in/sites/default/files/public_hearing/exe_summary/202101/nationalhighwayexe_summaryeng21012021.pdf)

**SKILL ENHANCEMENT COURSE (SEC)**  
**Paper Code: SEC3 – Fieldwork and Survey Techniques**  
**Total Marks: 50 (Credits: 4)**

***Course Objective:***

Inculcate the ability to undertake fieldwork in geography and explore the physical and human components of a landscape and its linkages.

***Learning Outcome:***

Ability to conduct a range of surveys in both physical and human geography, which shall allow assessment of landforms and their inherent formative processes, existing socioeconomic and demographic aspects of a region, and the understanding of how these attributes are linked.

**Fieldwork and Survey Techniques**

**Fieldwork**

Fieldwork in Geographical studies: Role and significance; Selection of study area and objectives. Pre-field academic preparations, Ethics of fieldwork; Field techniques and tools: Observation (participant, non-participant), questionnaires (open, closed, structured, non-structured), Interview; Field techniques and tools: Landscape survey using transects and quadrants, constructing a sketch, photo and video recording; Positioning and collection of samples. Preparation of inventory from field data; Post-field tabulation, processing and analysis of quantitative and qualitative data; Fieldwork: logistics and handling of emergencies.

Students are required to carry out comprehensive fieldwork in a village/mouza/town/C.D. Block/ drainage basin selecting a particular research problem. There should be a clear-cut Problem background, major Objectives, Methodology and Findings. The text of the fieldwork should not exceed 5000 words and 15-20 pages of illustrations (A4 Pages). The fieldwork along with the diagrams and illustrations should be prepared in a computer using the standard (Using MS Word for typing and Excel for calculation and graphs). The cartographic and statistical techniques used in the fieldwork should be at par with the syllabus of the UG Course. Guidelines for Fieldwork: The following methods are to be followed for fieldwork: 1) Preparation of a questionnaire for assessing the physical/cultural/environment/socioeconomic components. A filled-in questionnaire used in the survey should be attached with the report signed by the concerned teacher and the student 2) Preparation of maps (hand-drawn) with suitable scale and latitude and longitude

3) Preparation of charts/graphs in MS Excel and duly labeled

4) The report should be typed in MS Word. The font size is fixed at 12 in Times New Roman and the line spacing is 1.5

5) Each fieldwork should have a certificate of authenticity duly signed by the project supervisor

***Suggested Reading:***

Evans M., 1988: "Participant Observation: The Researcher as Research Tool" in *Qualitative Methods in Human Geography*, eds. J. Eyles and D. Smith, Polity.

Mukherjee, Neela 2002. *Participatory Learning and Action: with 100 Field Methods*. Concept Publs. Co., New Delhi

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

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

Stoddard R. H., 1982: *Field Techniques and Research Methods in Geography*, Kendall Kothari, C. R. and Garg, G., 2018, *Research Methodology, Methods and Techniques*, New Age International Publication, New Delhi

**DISCIPLINE-MINOR COURSE (MC)**

**Paper Code: GEOG-G2103 – Climatology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To provide students with a comprehensive understanding of the various components of the climate system, including the atmosphere, hydrosphere, lithosphere, and biosphere.

To teach students about the different climate types and classification systems,

To explore the concept of climate change, its historical context, and the contemporary issues related to anthropogenic influences on climate, including global warming, greenhouse gas emissions, and their impacts.

***Course Learning Outcomes:***

After the completion of the course, the students shall:

Gain a comprehensive understanding of the various components of the climate system, including the atmosphere, oceans, and land surface, and how they interact.

Be able to classify and identify different climate types and understand the factors influencing their distribution.

Be aware of the concept of climate change, including its historical context, contemporary issues, and the human impact on climate.

**Climatology**

**Unit I: Elements of Atmosphere:** The atmosphere; Nature, Composition and Layering. Insolation; controlling factors, Heat budget of the atmosphere. Temperature; Horizontal and Vertical distribution, Inversion of Temperature.

**UNIT II: Atmospheric dynamics:** Condensation; Process and forms. Mechanism of Precipitation; Bergeron- Findeisen theory, Collision and Coalescence Theory. Air mass; Origin, Characteristics, Classification, Modification. Fronts; Warm and Cold; frontogenesis and frontolysis, impact of different fronts on the atmosphere. Tropical cyclones, Geostrophic and gradient winds, Centripetal and Coriolis forces ELNO and ENSO phenomena,

**UNIT III: Atmospheric Pressure and Global Circulation of Winds:** Atmospheric pressure; Pressure belts of the earth, Tricellular model. Global wind patterns; planetary, periodical, and local winds. Jet Stream; Impact on surface weather. Asian Monsoon; Concepts of origin, Climatic significance, Recent trends.

**UNIT IV: Climatic Classification and Climate Change:** Climatic Classification; World and special reference to India after Köppen and Thornthwaite. Green House Effect and Importance of Ozone Layer. Evidence of Climate Change. Climate Change; causes and consequences.

***Suggested Reading:***

Ahrens, C.D. 2012. Essentials of Meteorology: An Invitation to the Atmosphere. 9th ed, Cengage Learning.

Barry, R.G., Chorley R.J. 2009. Atmosphere Weather and Climate. 9th ed, Routledge.

Critchfield, H. J. 1983. General Climatology. Prentice Hall India (2010 Reprint).

Dessler, A.E. 2021. Introduction to Modern Climate Change, 3rd ed, Cambridge University Press.

Hidore, J.J., Oliver, J.E., Snow, M., Snow, R. 2020. Climatology: An Atmospheric Science, 3rd ed, Pearson.

Lal, D.S. 2012. Climatology. Sharda Pustak Bhawan.

Lutgens, F.K., Tarbuck, E.J. 1998. The Atmosphere: An Introduction to Meteorology, 9th ed, Prentice-Hall.

Oliver, J.E., Hidore J.J. 2002. Climatology: An Atmospheric Science, Pearson Education India.

Rohli, R.V., Vega, A.J., 2017. Climatology, 4th ed, Jones & Bartlett Learning.

Websites:

India Meteorological Department: <https://mausam.imd.gov.in>

Intergovernmental Panel on Climate Change: <https://www.ipcc.ch>

World Bank Climate Change Knowledge Portal: <https://climateknowledgeportal.worldbank.org>

World Meteorological Organization: <https://public.wmo.int/en>

**2<sup>nd</sup> Year, Semester IV**

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C2201 – Soil and Bio Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To develop skills to analyse and interpret soil across different spatial scales, from local to regional levels. To examine the impacts of human activities (e.g., agriculture, urbanization, deforestation) on soil properties and land degradation processes, and evaluate sustainable land management practices to conserve soil resources

To gain knowledge of the components of ecosystems, including biotic (living organisms) and abiotic components. To Investigate the cycling of nutrients (e.g., carbon, nitrogen, phosphorus) and other elements within ecosystems,

***Course Learning Outcomes:***

After the completion of the course, the students shall gain a comprehensive understanding of soil properties. Be able to examine the impacts of human activities on soil properties and land degradation processes, and evaluate sustainable land management practices

**Soil and Bio Geography**

**Unit I: Soil Geography:** Soil and its properties; Definition and significance of soil physical & chemical properties. Soil Fertility Factors; pH, organic matter, moisture, NPK availability. Soil Types; Origin and characteristics of laterite, alluvial, soils of Sundarbans. Soil Classification; Overview of genetic and USDA soil classification systems.

**Unit II: Soil Hazards:** Soil Erosion, Degradation and Desertification. Causes and Consequences contributing to soil hazards. Problematic soils; Indian context. Management measures of problematic soils.

**Unit III: Biogeography Concepts:** Understanding Biogeography Concepts; Definitions and significance of biosphere, ecosystem, biome, ecotone, community, and ecology. Trophic Structure and Energy Flow; Concepts of trophic structure, food chain, and food web. Energy flow in ecosystems, Bio-Geochemical Cycles. World Biomes; Whittaker's biome classification system, Geographical extent and characteristics of tropical rainforest, savanna, hot desert, taiga, and coral reef biomes.

**Unit IV: Conservation:** Biodiversity, Hotspot, Biosphere reserve, United Nations Environmental Programme (UNEP), Man and Biosphere Programme (MBP) Management strategies to mitigate deforestation and its impact. Role of Indigenous people to check deforestation problem.

***Suggested Reading:***

- Chapman J.L., Reiz, M.J. 1993. Ecology: Principle and Applications, Cambridge University Press.
- Chiras, D.D., Reganold, J.P. 2009. Natural Resource Conservation: Management for a Sustainable Future, 10th ed, Pearson.
- Cox, B., Moore, P.D., Ladle, R. 2016. Biogeography: An Ecological and Evolutionary Approach, 9th ed, WileyBlackwell.
- Daji, J.A., Kadam, J.R., Patil, N.D. 1996. A Textbook of Soil Science, Media Promoters and Publishers.
- Dash, M.C. 2001. Fundamental of Ecology, 2nd ed, Tata McGrawHill.
- De, N. K., Ghosh. P. 1993. India: A Study in Soil Geography, Sribhumi Pub Co.
- Franzmeier, D.P., McFee, W.W., Gravel, J.G., Kohnke, H. 2016. Soil Science Simplified, 5th ed, Waveland Press. Gerrard, J. 2000. Fundamentals of Soils, Routledge.
- Huggett, R. 1998. Fundamentals of Biogeography, Routledge.
- Lomolino, M.V., Riddle, B.R., Whittaker, R.J. 2016. Biogeography, 5th ed, Oxford University Press.
- MacDonald, G. 2001. Biogeography: Introduction to Space, Time and Life, Wiley.
- Morgan, R.P.C. 2005. Soil Erosion and Conservation, 3rd ed, Wiley-Blackwell.
- Santra. A. 2006. Handbook on Wild and Zoo Animals, International Book Distributing Co.
- Sharma, P.D. 2011. Ecology and Environment, Rastogi Publications.
- Singer, M., Munns, D.N. 2005. Soils: An Introduction, 6th ed, Pearson.
- Weil, R.R. and Brady, N.C. 2022. The Nature and Properties of Soil, 15th ed, Pearson.
- White, R. 2006. Principles and Practice of Soil Science: The Soil as a Natural Resource, Blackwell.
- Whittaker, R.H. 1975. Communities and Ecosystems, McMillan.

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C2202 – Economic Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

This course intends to impart knowledge on basic concepts of economic geography.

This course has been designed to provide detailed knowledge of agricultural geography and industrial geography.

Another course objective is to acquaint the learners with elementary knowledge of the geography of trade and transport. Geography

***Learning Outcome:***

The learners are expected to gain a sound knowledge of fundamental concepts of economic geography.

Students also like to acquire command over various dimensions and issues of agricultural and economic geography.

Students are expected to acquire an overview of the geography of trade and transport.

**Economic Geography**

**Unit I: Fundamentals of Economic Geography:** Basics of Economic Geography: Nature, Scope & Content of Economic Geography, New Economic Geography (NEG); Evolving concept of Resource and its classification, Concept of Stock & Reserve. Scarcity of resources; Resource Crisis: Global resource crisis with special reference to forest, water & energy resources; Resources and sustainability: Limits to Growth, Sustainable development with special reference to developing countries.

**Unit-II: Agricultural Geography:** Nature, scope & content of agricultural geography; World Agricultural Systems: Agricultural systems of the world. Agricultural regionalization: methods and techniques; Green Revolution and its impacts, the concept of agribusiness and contract farming; Agricultural marketing in India, India's international trade in agricultural commodities: Trends, pattern & challenges.

**Unit -III: Industrial Geography:** Factors of Industrial location, Global Division of Labour; Concept of industrial clusters, complexes and regions: India and world; Industrial Location Theories: Weber, Losch, & Hoover. New Industrial Policy and its Impacts: Policy of Liberalisation-Privatisation & Globalisation (LPG) and its impact on India's industrial sector.

**Unit IV: Geography of Transport & Trade:** Nature of Different Modes of Transport and their Significance. Green Transport: Prospects & Challenges; Major Projects in the Transport Sector: Golden Quadrilateral Project, Dedicated Freight Corridor, Sagarmala Project; International Trade: Trade barriers, Regional Trade Blocs with special reference to ASEAN, RCEP. GATT -WTO: Evolution, role, and impacts on international trade; India and International Trade: Changing trend & pattern of international trade of India

***Suggested reading:***

Alexander J. W., 1963: Economic Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey.

Andrew Leyshon, Roger Lee, Linda McDowell, Peter Sunley (eds.) (2011): The SAGE Handbook of Economic Geography, Sage Publications Ltd.

Bagchi-Sen S. and Smith H. L., 2006: Economic Geography: Past, Present and Future, Taylor and Francis.

Coe N. M., Kelly P. F. and Yeung H. W., 2007: Economic Geography: A Contemporary Introduction, Wiley-Blackwell.

Combes P., Mayer T. and Thisse J. F., 2008: Economic Geography: The Integration of Regions and Nations, Princeton University Press

Durand L., 1961: Economic Geography, Crowell Hodder B. W. and Lee Roger, 1974: Economic Geography, Taylor and Francis.

Jones, C F., and Darkenwald C G. (1965) Economic Geography, Collier Macmillan Ltd; London  
Wheeler J. O., 1998: Economic Geography, Wiley..

Krugman, Paul R., Fujita, Masahisa, Venables, Anthony J (2001 ):\_The Spatial Economy: Cities, Regions, and International Trade (MIT Press), [MIT press](#)

Leong Goh Cheh and Gillian C.Morgan (1982): Human and Economic Geography, Oxford University Press

Pierre-Philippe Combes, Thierry Mayer, and Jacques-François Thisse (2008): Economic Geography : The Integration of Regions and Nations, Oxford University Press

Saxena, H M (2013): Economic Geography, Rawat Publishers.

Gautam, Alka (2022): Advanced Economic Geography, Sharda Pustak Bhavan

[Steven Brakman](#), [Harry Garretsen](#), [Charles van Marrewijk](#) (2009): The New Introduction to Geographical Economics, 2nd Edn. Cambridge University Press

Vertova Giovanna, (2006): The changing economic geography of globalization: reinventing space, / Routledge

Willington D. E., 2008: Economic Geography, Husband Press

[Yuko Aoyama](#), [James T Murphy](#), [Susan Hanson](#) (2010): Key Concepts in Economic Geography, SAGE Publications Ltd.

**DISCIPLINE- MAJOR/CORE COURSE (CC)**  
**Paper Code: C2203 – Social and Cultural Geography (Theory)**  
**Total Marks: 50 (Credits: 4)**

***Course Objective:***

To acquaint students with the unique social geography of India. To provide an analytical understanding of the socio-geographical elements. To provide an analytical understanding of social-geographical processes under various theoretical frameworks. To provide the basic concepts of cultural geography and the process of cultural diffusion along with global cultural trend

***Learning Outcome:***

Knowledge of the geographic basis of socio-cultural regionalization in India. Understanding of elements of Indian society at the pan-Indian level. Knowledge of essential theories and application of social issues in India.

**Social and Cultural Geography**

**Unit: 1: Social Geography: Nature and Scope:** Social Geography: Nature, Scope and Content; Concept of Social Structure and Process; Elements of Social Structure: Caste, Class, Religion, Race; Contemporary Social Issues in India: Gender and old age

**Unit:2: Social Well-being and Analysis:** Concept and Indicators of Social Well-being (after Knox and Smith), Quality of Life; Social Pathology: Crime and Violence; Social Area Analysis after Shevky and Bell; Social Impact Assessment (SIA): Concept and Importance

**Unit 3: Cultural Geography:** Definition, Scope and Content of Cultural Geography; Development of Cultural Geography; Concept of Cultural Hearth, Realm; Major Cultural Regions of the World; Culture, Technology and Development. Cultural system, Cultural Landscape; Cultural Segregation, Cultural Diversity, and Acculturation

**Unit 4: Cultural Diffusion:** Cultural Innovation and Diffusion; Types of Diffusion; Diffusion of Major World Religions and languages; Races and racial groups of the world; Globalisation of Culture

***Suggested Reading:***

Ahmed A., 1999: Social Geography, Rawat Publications.

Casino V. J. D., Jr., 2009) Social Geography: A Critical Introduction, Wiley Blackwell.

Cater J. and Jones T., 2000: Social Geography: An Introduction to Contemporary Issues, Hodder Arnold. Holt L., 2011: Geographies of Children, Youth and Families: An International Perspective, Taylor & Francis.

Panelli R., 2004: Social Geographies: From Difference to Action, Sage.

- Rachel P., Burke M., Fuller D., Gough J., Macfarlane R. and Mowl G., 2001: *Introducing Social Geographies*, Oxford University Press.
- Smith D. M., 1977: *Human geography: A Welfare Approach*, Edward Arnold, and London.
- Smith D. M., 1994: *Geography and Social Justice*, Blackwell, Oxford
- Sopher, David (1980): *An Exploration of India*, Cornell University Press, Ithaca
- Valentine G., 2001: *Social Geographies: Space and Society*, Prentice Hall.
- Bergman, E.F (1995): *Human Geography-Culture, Connections and Landscape*, Prentice Hall, New Jersey
- Chisholm. (1975): *Human Geography*, Penguin Books, Hermondsworth.
- Johnston R; Gregory D, Pratt G. et al. (2008) *The Dictionary of Human Geography*, Blackwell Publication.
- Jordan-Bychkov et al. (2006) *The Human Mosaic: A Thematic Introduction to Cultural Geography*.
- W. H. Freeman and Company, New York.
- Raw, M. (1986): *Understanding Human Geography: A Practical Approach*, Bell and Hyman. London
- Rubenstein, J.M. (2002), *The Cultural Landscape*, 7th edition, Prentice Hall, Englewood Cliffs

**DISCIPLINE- MAJOR/CORE COURSE (CC)**

**Paper Code: C2204 – Quantitative Techniques in Agriculture and Soil Analysis  
(Practical)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

The main objective of this course is to equip the learners with essential techniques to deal with the demands of discipline.

One of the course objectives of this paper is to impart training on analysing inequality, crop concentration & diversification & diversification, etc.,

This course aims to prepare the students to be able to delineate agricultural regions.

This course has been designed to impart skills & techniques on analyzing the physical and chemical properties of soil.

***Learning Outcome:***

The learners are expected to be able to analyse data inequality, crop concentration & diversification & diversification, etc.

The students are expected to acquire essential skills & techniques required for agricultural regionalization.

After going through this course students will be able to analyse basic physical and chemical soil properties.

**Quantitative Techniques in Agriculture and Soil Analysis**

**Unit -I Quantitative Techniques in Agricultural Geography:** Crop Concentration Index (Bhatia's method), Measures of Cropping Intensity: Method adopted by the Department of Agriculture, Government of India, Measures of diversification: Simpson Index of Diversification (SID).

**Unit-II Methods of Agricultural Regionalisation:** Regionalisation Based on Cropping Patterns: NDVI (Remote Sensing Based Method), Regionalisation Based on Crop Combination: Weaver's Method; Regionalization Based on Agricultural Productivity: Cobb-Douglas Production Function Approach, Md. Shafi's Method (1972)

**UNIT-III: Determination of Physical soil properties: Laboratory analysis:** Soil samples: Techniques of collection, preparation, and preservation, Measurement of Hygroscopic moisture, Munsell's Soil Colour Analysis, Mechanical Analysis (Robinson's International Method).

**UNIT- IV: Determination of Chemical soil properties: Laboratory analysis:** Kit Box analysis (N.P.K., Organic Matter, and pH): Determination of Organic Matter (Walkley & Black's Rapid Titration method), Determination of Organic Carbon, Soil pH (Kuhn's Colourimetric method).

***Suggested reading:***

Carter, M R & Gregorich, E G, Eds. (2008) : Canadian Society of Soil Science, 2<sup>nd</sup> Edn. CRC Press-Taylor & Francis Group, Boca Raton, Florida.

Hussain, Maijd (2021): Agriculture Geography, 2<sup>nd</sup> Edn. Rawat Publications, Jaipur

Kumar, Uttam (2018): Methods of Soil Analysis, Kalyani Publishers, Allahabad

Sarkar, A. (2015): Practical Geography : A Systemic Approach, Orient Blackswan, New Delhi

Sarkar, A.(2013): Quantitative Geography: Techniques and Presentations, Orient Blackswan, New Delhi

Singh, Jasbir and Dhillon (1984): Agriculture Geography, Tata- McGraw Hill Publications, New Delhi

**DISCIPLINE-SPECIFIC MINOR COURSE (MC)**

**Paper Code: GEOG-C2202 – Economic Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

This course intends to impart knowledge on basic concepts of economic geography. This course has been designed to provide detailed knowledge of agricultural geography and industrial geography. Another course objective is to acquaint the learners with elementary knowledge of the geography of trade and transport. Geography

***Learning Outcome:***

The learners are expected to gain a sound knowledge of fundamental concepts of economic geography. Students also like to acquire command over various dimensions and issues of agricultural and economic geography. Students are expected to acquire an overview of the geography of trade and transport.

**Economic Geography**

**Unit I: Fundamentals of Economic Geography:** Basics of Economic Geography: Nature, Scope & Content of Economic Geography, New Economic Geography (NEG); Evolving concept of Resource and its classification, Concept of Stock & Reserve. Scarcity of resources; Resource Crisis: Global resource crisis with special reference to forest, water & energy resources; Resources and sustainability: Limits to Growth, Sustainable development with special reference to developing countries.

**Unit-II: Agricultural Geography:** Nature, scope & content of agricultural geography; World Agricultural Systems: Agricultural systems of the world. Agricultural regionalization: methods and techniques; Green Revolution and its impacts, the concept of agribusiness and contract farming; Agricultural marketing in India, India's international trade in agricultural commodities: Trends, pattern & challenges.

**Unit -III: Industrial Geography:** Factors of Industrial location, Global Division of Labour; Concept of industrial clusters, complexes and regions: India and world; Industrial Location Theories: Weber, Losch, & Hoover. New Industrial Policy and its Impacts: Policy of Liberalisation-Privatisation & Globalisation (LPG) and its impact on India's industrial sector.

**Unit IV: Geography of Transport & Trade:** Nature of Different Modes of Transport and their Significance. Green Transport: Prospects & Challenges; Major Projects in the Transport Sector: Golden Quadrilateral Project, Dedicated Freight Corridor, Sagarmala Project; International Trade: Trade barriers, Regional Trade Blocs with special reference to ASEAN, RCEP. GATT -WTO: Evolution, role, and impacts on international trade; India and International Trade: Changing trend & pattern of international trade of India

***Suggested reading:***

Alexander J. W., 1963: Economic Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey.

Andrew Leyshon, Roger Lee, Linda McDowell, Peter Sunley (eds.) (2011): The SAGE Handbook of Economic Geography, Sage Publications Ltd.

Bagchi-Sen S. and Smith H. L., 2006: Economic Geography: Past, Present and Future, Taylor and Francis.

Coe N. M., Kelly P. F. and Yeung H. W., 2007: Economic Geography: A Contemporary Introduction, Wiley-Blackwell.

Combes P., Mayer T. and Thisse J. F., 2008: Economic Geography: The Integration of Regions and Nations, Princeton University Press

Durand L., 1961: Economic Geography, Crowell Hodder B. W. and Lee Roger, 1974: Economic Geography, Taylor and Francis.

Jones, C F., and Darkenwald C G. (1965) Economic Geography, Collier Macmillan Ltd; London  
Wheeler J. O., 1998: Economic Geography, Wiley..

Krugman, Paul R., Fujita, Masahisa, Venables, Anthony J (2001 ):\_The Spatial Economy: Cities, Regions, and International Trade (MIT Press), [MIT press](#)

Leong Goh Cheh and Gillian C.Morgan (1982): Human and Economic Geography, Oxford University Press

Pierre-Philippe Combes, Thierry Mayer, and Jacques-François Thisse (2008): Economic Geography: The Integration of Regions and Nations, Oxford University Press

Saxena, H M (2013): Economic Geography, Rawat Publishers.

Gautam, Alka (2022): Advanced Economic Geography, Sharda Pustak Bhavan

[Steven Brakman](#), [Harry Garretsen](#), [Charles van Marrewijk](#) (2009): The New Introduction to Geographical Economics, 2nd Edn. Cambridge University Press

Vertova Giovanna, (2006): The changing economic geography of globalization: reinventing space, / Routledge

Willington D. E., 2008: Economic Geography, Husband Press

[Yuko Aoyama](#), [James T Murphy](#), [Susan Hanson](#) (2010): Key Concepts in Economic Geography, SAGE Publications Ltd.

**3<sup>rd</sup> year, Semester V**

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C3101 – Hydrology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

Introduce students to the principles of the water cycle, its measurement, and management for sustainable use. To inculcate the students with a basic understanding of groundwater resources.

***Course Outcomes:***

Develop an understanding of hydrological systems and processes and assess Groundwater storage and flow mechanisms

**Hydrology**

**Unit I: Hydrological Systems:** Scope and content of Hydrology; Water budget of the earth; Basin hydrological system - methods and challenges of delineation; Hydrological cycle; Water Balance: deficit and surplus

**Unit II: Components of Hydrological System:** Interception: causes and effects; Runoff: factors and measurement; Infiltration: factors and measurements; Evapotranspiration: factors and estimation; Groundwater Recharge: concept and estimation

**Unit III: Groundwater Hydrology:** Groundwater occurrence and storage; Concept of porosity, permeability, viscosity, conductivity, transmissivity; Concept of water table and piezometric surface; Theory of groundwater flow: Darcy's law and its applications; Stage of groundwater development: recharge and discharge

**Unit IV: Hydrologic Analysis:** unit hydrograph, flood routing and frequency analysis; Drought: Types and Indices; Renewable freshwater resources (RFWR); Effect of climate change on RFWR

***Suggested Readings:***

Box, G. E. P., G. M. Jenkins, and G. C. Reinsel (2003), "Time Series Analysis, Forecasting and Control", Pearson Education, Singapore

Chow, V T., D. R. Maidment and L. W. Mays (1988), "Applied Hydrology", McGraw-Hill, Inc., New York.

Dingman L. S. (2002), "Physical Hydrology", 2nd Ed. Waveland Press, Inc., USA

Garrison TS (2015) Oceanography: An Invitation to Marine Science. Massachusetts: Cengage Learning.

Hann C.T. (1995), "Statistical Methods in Hydrology", First East-West Press Edition, New Delhi.

Pethick JS (1984) An Introduction to Coastal Geomorphology. London: Department of Geography, University of Hull.

Petts GE, Amoros C (1996) Fluvial Hydrosystems. London: Chapman and Hall.

Raghunath HM (2006) Hydrology: Principles, Analysis and Design. New Delhi: New Age International (P) Limited Publishers.

Sharma RC, Vatal M (1962) Oceanography for Geographers. Allahabad: Chaitanya Publishing.

Talley LD (2011) Descriptive Physical Oceanography: An Introduction. Massachusetts: Academic Press.

Todd DK (1959) Ground Water Hydrology. New York: John Wiley and Sons.

Viessman, W. Jr. and G. L. Lewis (2003), Introduction to Hydrology, 5th Edition, Pearson Education, Inc., New Jersey.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C3102 – Regional Planning and Development (Theory)**

**Total Marks: 50 (Credits: 4)**

**Unit-I: Fundamentals of Regional Planning and Development:** Concept of Regions, Formal, functional, & planning regions, Delineation of Regions: Methods & Techniques; Types of planning, multi-level planning in India; Need for regional planning, Basic principles and objectives of regional planning. Delineation of planning regions in India: Schemes of Nath, Bhat & Rao and TCPO.

**Unit-II: Theoretical Understanding of Regional Planning and Development:** Debates in Development Thinking: Balanced vs Unbalanced development, Rural-Urban dichotomy; Indicators of Development: Indicators of development: Economic, social and environmental/technological development; Theories and Models: Models of regional development: Perroux and Mishra, Friedmann and Myrdal; Polarization and the Development of Underdevelopment: World Capitalist System by Frank; Colonialism and Spatial Structure of Underdevelopment by Slater; Shared Space by Santos.

**Unit-III: Problem Areas and Target Areas:** Backward Regions: Identification issues, problems of backward regions and policy responses; Concept of Problem Area Approach: Case studies of Hill Area Development Program (HADP) and Drought Prone Area Programme (DPAP); Regional planning in India: Case studies of DVC and Indira Gandhi Nahar Pariyojana (IGNP); Industrial Corridors: Delhi-Mumbai Industrial Corridor and Amritsar -Kolkata Industrial Corridor

**Unit-IV: Regional Planning in India:** Changing Approach in Regional Policies: Five Year Plans; NITI Ayog; Micro-regional planning; Micro-Watershed Planning, Aspirational districts; Strategies of Zonal Planning: Export Processing Zones, Special Economic Zone; Metropolitan Area/Region Planning: Concept, objectives and challenges of mega-urban region Planning: Case studies of Kolkata Metropolitan Area and Delhi National Capital Region (NCR)

**Selected References :**

- Bhat L.S. (1972): Regional Planning In India, Statistical Publishing Society
- Blij H. J. De, 1971: Geography: Regions and Concepts, John Wiley and Sons.
- Chand , M and Puri V.K. ( 1983): Regional planning In India, allied publishers, New Delhi
- Dickinson, R.E. (1964): City and Region, Rutledge, London.
- Friedmann J. and Alonso W. (1975): Regional Policy - Readings in Theory and Applications, MIT Press, Massachusetts
- Gore, Richard (1984) Regions in Question: Space, Development Theory and Regional Policy (Routledge Revivals) Routledge, London
- Hall, P. (1992): Urban and Regional Planning, Routledge, London.

- Kulshetra, S.K,( 2012): Urban and Regional Planning in India: A Handbook for Professional Practitioners, Sage Publication, New Delhi
- Kundu, A. (1992): Urban Development Urban Research in India, Khanna Publ. New Delhi
- Misra, R.P, Sundaram K.V, Prakash Rao, VLS( 1974): Regional Development Planning in India, Vikas Publication, New Delhi
- Misra, R.P (1992): Regional Planning: Concepts, techniques, Policies and Case Studies, Concept, New Delhi
- Peet R., 1999: Theories of Development, The Guilford Press, New York.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**  
**Paper Code: GEOG-C3103 – Geography of India (Theory)**  
**Total Marks: 50 (Credits: 4)**

**Course Objectives:**

- To provide basic knowledge about various aspects of India
- To study the physical aspects like physiography, drainage, climate, soil and natural vegetation
- To deliver information about the demographic, economic and cultural aspects of the country
- To acquire a comprehensive idea about the state of West Bengal specifically

**Course Learning Outcomes:**

After the completion of the course, the students shall:

- have a conceptual clarity about various aspects of India
- understand the existing physical diversity of the country
- familiarise with demographic, economic, and socio-cultural spheres of Indian regions

**Geography of India**

**Unit I: Physical Perspectives:** Physiographic divisions with reference to tectonic provinces; Drainage regimes of Himalayan and Peninsular Drainage Systems; India's climatic classification (Koppen); Mechanism of the Indian monsoon; Soil – Distribution and types; Vegetation - Distribution and classification (Champion); Agro-Climatic Regions of India

**Unit II: Demography and Social Aspects:** Population: Distribution, growth, density and policy; Population Composition: Sex ratio, Rural and Urban population, Literacy, Urbanization; Social structure of population: Distribution by race/tribe, caste, religion and language; Population problems: Overpopulation; Poverty; Gender disparity; Unemployment

**Unit III: Economic Facets:** Agricultural regions (ICAR 1972); Impacts of phases of Green Revolution; Production and distribution of major food and cash crops; Agro-Ecological regions; Energy resources: Conventional and Non-Conventional; Mineral resources - distribution and utilization of iron ore, coal, petroleum and natural gas; Industrial development: Mineral-based and Agro-based; Automobile and information technology; SEZ; Industrial Policies; Transport system: Railways, Roadways, Airways and Waterways

**Unit IV: Geography of West Bengal;** Physical setup: Physiographic divisions, drainage characteristics, soil types and forest resources; Resources: Agriculture (tea, jute), mining (coal), and industry (iron and steel, petrochemicals, tourism, IT); Population: Growth, distribution and human development programmes; Regional issues: Darjeeling Himalayas, Rarh Bengal and Sundarban

***Suggested Readings:***

- Husain, M. 2014. Geography of India, Tata McGraw-Hill Education, New Delhi.
- Kale, V.S. 2014. Landscapes and Landforms of India, Springer, Switzerland.
- Johnson, B.L.C. (Ed) 2001. Geographical Dictionary of India, Vision Books, New Delhi.
- Khullar, D.R. 2011. India: A Comprehensive Geography, Kalyani Publishers, New Delhi.
- Mandal, H., Mukherjee, S., Datta, A. 2002. India: An Illustrated Atlas of Tribal World, Anthropological Survey of India, Kolkata.
- Pal, S.K. 1998. Physical Geography of India, Sangam Books Ltd., New Delhi.
- Sharma, T.C. 2012. Economic Geography of India, Rawat Publications, Jaipur.
- Singh, J. 2003. India-A Comprehensive & Systematic Geography, Gyanodaya Prakashan, Allahabad.
- Singh, J. and Dhillon, S.S. 2004. Agricultural Geography, Tata McGraw-Hill Education, New Delhi.
- Singh, R.L. 1993. India: A Regional Geography, UBS Publishers Distributors, New Delhi.
- Spate, O.H.K., Learmonth, A.T.A. 1967. India and Pakistan: A General and Regional Geography, Methuen, New Delhi.
- Tiwari, R.C. 2007. Geography of India, Prayag Pustak Bhawan, Allahabad.
- Valdiya, K.S. 2010. The Making of India - Geodynamic Evolution, Macmillan Publishers India Ltd., New Delhi.
- Valdiya, K.S. 2013. Environmental Geology: Indian Context, Tata McGraw-Hill, New Delhi.
- Wadia, D.N. 1919 Geology of India, Macmillan & Co. Ltd., London.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**  
**Paper Code: GEOG-C3104 – Statistical Techniques (Practical)**  
**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

- To provide an understanding of basic features and representation of a data set.
- To focus on concepts in probability theory, random variables, mathematical expectation, different types of distributions, sampling theory, and estimation theory.
- To understand building and testing statistical hypotheses.
- To provide a conceptual understanding of regression analysis.

***Learning Outcome:***

- Ability to describe and visualize statistical data.
- Explain probability including laws for unions, intersections, and compensations and use them in problem-solving situations.
- Design statistical hypotheses about real-world problems and conduct appropriate tests for drawing valid inferences about the population.
- Produce simple linear regression equations and evaluate regression models.

**Statistical Techniques**

**Unit I: Frequency Distribution and Sampling:** Importance and significance of statistics in Geography. Discrete and continuous data, population and samples, scales of measurement (nominal, ordinal, interval, and ratio), sources of data; Collection of data and formation of statistical tables; Sampling: need, types, and significance and methods of random sampling; Theoretical distribution: frequency, cumulative frequency.

**Unit II: Numerical Data Analysis:** Central tendency: Mean, median, mode, partition values; Measures of dispersion range, mean deviation, standard deviation, coefficient of variation; Association and correlation: Rank correlation, product moment correlation; Linear Regression and time series analysis, Moving Average.

**Unit III: Statistical Methods in Geography:** Construction of data matrix with each row representing an aerial unit (districts/blocks / mouzas / towns) and corresponding columns of relevant attributes; Based on the above, a frequency table, measures of central tendency and dispersion would be computed and interpreted; Histograms and frequency curve would be prepared on the dataset; Based on of the sample set and using two relevant attributes, a scatter diagram and regression line would be plotted and residual from regression would be mapped with a short interpretation.

\*A Project File, comprising one exercise each is to be submitted

***Suggested Reading:***

Berry B. J. L. and Marble D. F. (eds.): Spatial Analysis – A Reader in Geography.  
Ebdon D., 1977: Statistics in Geography: A Practical Approach.

Hammond P. and McCullagh P. S., 1978: Quantitative Techniques in Geography: An Introduction, Oxford University Press.

King L. S., 1969: Statistical Analysis in Geography, Prentice-Hall.

Mahmood A., 1977: Statistical Methods in Geographical Studies, Concept.

Pal S. K., 1998: Statistics for Geoscientists, Tata McGraw Hill, New Delhi.

Sarkar, A. (2013) Quantitative geography: techniques and presentations. Orient Black Swan Private Ltd., New Delhi

Silk J., 1979: Statistical Concepts in Geography, Allen and Unwin, London.

Spiegel M. R.: Statistics, Schaum's Outline Series.

Yeats M., 1974: An Introduction to Quantitative Analysis in Human Geography, McGraw Hill, New York.

**SUMMER INTERNSHIP (INT)**  
**Paper Code: GEOG-INT – Summer Internship**  
**Total Marks: 50 (Credits: 3)**

**MINOR COURSE (CC)**

**Paper Code: GEOG-G3105 – Geography of India (Theory)**

**Total Marks: 50 (Credits: 4)**

**Course Objectives:**

- To provide basic knowledge about various aspects of India.
- To study the physical aspects like physiography, drainage, climate, soil, and natural vegetation.
- To deliver information about the demographic, economic, and cultural aspects of the country .
- To acquire a comprehensive idea about the state of West Bengal specifically.

**Course Learning Outcomes:**

After the completion of the course, the students shall:

- have a conceptual clarity about various aspects of India.
- understand the existing physical diversity of the country.
- familiarise with demographic, economic, and socio-cultural spheres of Indian regions.

**Geography of India**

**Unit I: Physical Perspectives:** Physiographic divisions with reference to tectonic provinces; Drainage regimes of Himalayan and Peninsular Drainage Systems; India's climatic classification (Koppen); Mechanism of the Indian monsoon; Soil – Distribution and types; Vegetation - Distribution and classification (Champion); Agro-Climatic Regions of India.

**Unit II: Demography and Social Aspects:** Population: Distribution, growth, density and policy; Population Composition: Sex ratio, Rural and Urban population, Literacy, Urbanization; Social structure of population: Distribution by race/tribe, caste, religion and language; Population problems: Overpopulation; Poverty; Gender disparity; Unemployment.

**Unit III: Economic Facets:** Agricultural regions (ICAR 1972); Impacts of phases of Green Revolution; Production and distribution of major food and cash crops; Agro-Ecological regions; Energy resources: Conventional and Non-Conventional; Mineral resources - distribution and utilization of iron ore, coal, petroleum and natural gas; Industrial development: Mineral-based and Agro-based; Automobile and information technology; SEZ; Industrial Policies; Transport system: Railways, Roadways, Airways and Waterways.

**Unit IV: Geography of West Bengal;** Physical setup: Physiographic divisions, drainage characteristics, soil types and forest resources; Resources: Agriculture (tea, jute), mining (coal), and industry (iron and steel, petrochemicals, tourism, IT); Population: Growth, distribution and human development programmes; Regional issues: Darjeeling Himalayas, Rarh Bengal and Sundarban.

***Suggested Readings:***

- Husain, M. 2014. Geography of India, Tata McGraw-Hill Education, New Delhi.
- Kale, V.S. 2014. Landscapes and Landforms of India, Springer, Switzerland.
- Johnson, B.L.C. (Ed) 2001. Geographical Dictionary of India, Vision Books, New Delhi.
- Khullar, D.R. 2011. India: A Comprehensive Geography, Kalyani Publishers, New Delhi.
- Mandal, H., Mukherjee, S., Datta, A. 2002. India: An Illustrated Atlas of Tribal World, Anthropological Survey of India, Kolkata.
- Pal, S.K. 1998. Physical Geography of India, Sangam Books Ltd., New Delhi.
- Sharma, T.C. 2012. Economic Geography of India, Rawat Publications, Jaipur.
- Singh, J. 2003. India-A Comprehensive & Systematic Geography, Gyanodaya Prakashan, Allahabad.
- Singh, J. and Dhillon, S.S. 2004. Agricultural Geography, Tata McGraw-Hill Education, New Delhi.
- Singh, R.L. 1993. India: A Regional Geography, UBS Publishers Distributors, New Delhi.
- Spate, O.H.K., Learmonth, A.T.A. 1967. India and Pakistan: A General and Regional Geography, Methuen, New Delhi.
- Tiwari, R.C. 2007. Geography of India, Prayag Pustak Bhawan, Allahabad.
- Valdiya, K.S. 2010. The Making of India - Geodynamic Evolution, Macmillan Publishers India Ltd., New Delhi.
- Valdiya, K.S. 2013. Environmental Geology: Indian Context, Tata McGraw-Hill, New Delhi.
- Wadia, D.N. 1919 Geology of India, Macmillan & Co. Ltd., London.

**3<sup>rd</sup> Year, Semester VI**

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C3201 – Philosophy of Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

- To develop the philosophical and historical aptitude among students.
- To inculcate ideas about philosophers from different schools of thought contributing in the development of geography as a branch of knowledge.
- To study the evolution and development of various geographical ideas, themes, and approaches.

***Course Learning Outcomes:***

After the completion of the course, the students shall:

- relate the evolution of geographical knowledge with historical incidents.
- familiarise with various schools of thought.
- understand geography as a spatial science.

**Philosophy of Geography**

**Unit I: Early Phase of Geographical Thought:** Contributions of Greek, Roman, Chinese, and Indian geographers; Impact of 'Dark Age' in geography and Arab contributions; Age of exploration and discoveries; Transition from cosmography to scientific geography (contributions of Bernard Varenus and Immanuel Kant); Impact of Darwinism in Geography

**Unit II: Nature of Geographical Thought:** Contributions of Humboldt and Ritter; Contributions of German and French schools of geography with special reference to Ratzel and Vidal De La Blache; Contributions of British and American schools of geography with special reference to Mackinder and Huntington; Contributions of Richthofen, Ratzel, La Blaché

**Unit III: Dualism and Dichotomies in Geography:** Development of Dualism in geography: General versus Particular, Physical versus Human Geography, Regional versus Systematic Geography, Ideographic versus Nomothetic; Environmental Determinism, Possibilism and Neo-determinism; Hartshorne and Schafer's debate: Geography as Regional Science; Regional approach in geography

**Unit IV: Recent Trends in Geography:** Trends of geography in the post World War-II period: Positivism; Quantitative revolution; Systems approach; Evolution of Critical Geography: Behavioural, humanistic, radical, welfare and gender geographies; Structuralism and historical materialism; Changing concept of space with special reference to Harvey; Post modernism and post-modern geography

***Suggested Readings:***

- Adhikari, S. 2015. Fundamentals of Geographical Thought, Orient Blackswan, Allahabad
- Bonnett A. 2008. What is Geography?, Sage, London.
- Clifford, N. Holloway S.L., Rice, S.P., Valentine, G. 2009. Key Concepts in Geography, 2nd ed, Sage, London.
- Couper, P. 2015. A Student's Introduction to Geographical Thought: Theories, Philosophies, Methodologies, Sage, London.
- Cresswell, T. 2013. Geographic Thought: A Critical Introduction, Wiley-Blackwell, Chichester.
- Dikshit, R.D. 2004. Geographical Thought: A Contextual History of Ideas, Prentice Hall India, New Delhi.
- Hartshorn R. 1959. Perspectives of Nature of Geography, Rand MacNally and Co., USA
- Holt-Jensen, A. 2011. Geography: History and Concepts: A Student's Guide, Sage, London.
- Husain, M. 2015. Evolution of Geographical Thought, 6th ed, Rawat Publications, Jaipur
- Gregory, D., Johnston, R., Pratt, G., Watts, M., Whatmore, S. (Eds) 2009. The Dictionary of Human Geography, 5th ed, Wiley, Oxford.
- Pete, P. 1998. Modern Geographical Thought, Wiley-Blackwell, Oxford.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**  
**Paper Code: GEOG-C3202 – Oceanography (Theory)**  
**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

To provide a systematic understanding of oceanic processes and a quantitative description of the oceanic movements using observations and modeling.

***Learning Outcomes:***

Students will acquire a broad knowledge of the field of Physical Oceanography. Students will learn about ocean measurements, seawater properties, and the importance of ocean resources.

**Oceanography**

**Unit I: General Introduction to Oceanography:** Ocean Floor Topography– Continental Shelf, Continental Slope, Continental Margin, Continental Rise, Submarine Canyons, Mid Ocean Ridges, Trenches, Abyssal Plains, Plate tectonics, Triple junction.

**Unit II: Ocean Waves and Tides and Currents:** Wave theories, Classification; Seismic Sea waves (Tsunami), Tides and tide generating forces, type of tides, tidal currents, rip currents. Ocean circulation, Thermohaline circulation, Conveyor belt.

**Unit III: Water Mass and Properties of Seawater:** Identification of water masses; Formation and classification of water masses, General distribution of temperature, salinity, and density in seawater, T-S diagram.

**Unit IV: Ocean Deposits and Resources:** Classification of sediments - Lithogenic sediment, biogenic sediments, hydrogenic sediment, Manganese nodules. Coral Reefs: types and theories of origin; Marine resources: Classification and sustainable utilization. Issues related to the pollution of the ocean.

**Unit V: Biological Oceanography:** Classification of the marine environment and marine organisms, vertical distribution of temperature and its biological significance, Biological significance of salinity and ocean current, diatoms, and primary productivity.

***Suggested Reading:***

Garrison, T., Ellis, R. 2021. Oceanography: An Invitation to Marine Science, 10th ed, Cengage Learning.

Karant, K.R., 1988: Ground Water: Exploration, Assessment and Development, Tata- McGraw Hill.

Nicolas, R. 2020. Introducing Hydrogeology, 2nd ed, Dunedin Academic Press. Pinet, P.R. 2019. Invitation to Oceanography. 8th ed, Jones and Barlett Learning.

Pinneker, E.V. 2010. General Hydrogeology, Cambridge University Press. Pugh, D., Woodworth, P. 2014. Sea-Level Science: Understanding Tides, Surges, Tsunamis and Mean Sea-Level Changes, 2nd ed, Cambridge University press

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C3203 – Historical and Political Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

**Course Objectives:**

- To get knowledge about the nature and scope of historical geography as a discipline.
- To understand the geographical past of India
- To impart knowledge about political processes, and electoral processes operating in society among students
- To inculcate ideas about how governance and power politics have shaped up over time globally.

**Course Learning Outcomes:**

After the completion of the course, the students shall:

- Gain knowledge about the nature and scope of historical geography as a discipline.
- Understand the geographical past of India.
- relate world power structure against the theoretical settings .
- familiarise Indian political system.

**Historical and Political Geography**

**Unit-I: Historical Geography-Conceptual Issues:** Nature and scope of historical geography as a discipline; Historical geography: Source materials; Major approaches to historical geography; Trends and issues in historical geography

**Unit-II: Historical Geography of India:** Development of the identity of India in ancient periods: Mythology and sacred space; Travel literature: Hiuen Tsang, Ibn–E–Batuta, Barnier; Mughal period: Social Fabric; Territorial Administration and Revenue Collection; Colonial India: Plantation Farming; Social and Educational Reforms; Industrial Policies; Land and Forest Policies; Famines; Trade and Transport

**Unit III: Political Geography-Conceptual Issues:** Political Geography: Definition, nature and scope; Evolution of Political Geography: Theoretical influences of Ratzel, Taylor and Harvey; Geopolitical Perspective: State, Nation and Nation-State; border, frontiers and boundaries; buffer zones; core and periphery; capitals; Geopolitics; Geo-strategic views of Ratzel, Mackinder and Spykman; World Wars and strategic relations: Colonialism, Expansionism, Cold War, North-South Divide, Unipolar world, Emergence of superpowers, contemporary conflicts

**Unit IV: Issues in Political Geography and the Indian Polity:** Indian State Formation - Reorganization of states in India, regional aspirations; Federalism; 4.2 Voting and electoral processes in India; Election Commission; Gerrymandering; India and its neighbors: border issues, water disputes and enclaves; Political Blocks - SAARC, BRICS, BIMSTEC, G-20, G-77

### ***Suggested Readings***

- Adhikari, S. 2002. Political Geography, Rawat Publications, New Delhi.
- Agnew, J. (ed.) 1997 Political Geography: A Reader, Arnold, London.
- Agnew J., Mitchell K. and Toal G. 2003. A Companion to Political Geography, Blackwell, London.
- Ali, S.M. 1966. The Geography of the Puranas, People's Publishing House, Delhi.
- Baker, A.R.H (ed.) 1972. Progress in Historical Geography, David and Charles, Exeter.
- Baker, A.R.H., Hamshere, J.D., Langton, J. 1972. Geographical Interpretation of Historical Sources, David and Charles, Exeter.
- Bharadwaj, O.P. 1986. Studies in the Historical Geography of Ancient India, Sundeep Prakashan, Delhi.
- Blake, G. (ed.), 1987. Maritime Boundaries and Ocean Resources, Croom Helm, London.
- Bryant, R. L. and Bailey, S. 1997. Third World Political Ecology, Routledge, London.
- Cohen, S. 1964. Geography and Politics in a World Divided, Random House, New York.
- Cox K. 2002. Political Geography: Territory, State and Society, Wiley-Blackwell, Oxford.
- Cox K. R., Low M. and Robinson J., 2008. The Sage Handbook of Political Geography, Sage Publications, London.
- de Blij, H.J. and Glassner, M. 1968. Systematic Political Geography, John Wiley & Sons, New York.
- Dikshit, R.D. 1987. Political Geography and Geopolitics, Tata McGraw Hill, New Delhi.
- Dikshit, R. D. 1997. Developments in Political Geography: A Century of Progress, Sage Publications, New Delhi.
- Dikshit, R.D. 2000. Political Geography: A Contemporary Perspective, Prentice-Hall, New Delhi.
- Dwivedi, R.L. 2004. Fundamentals of Political Geography, Chaitanya, Allahabad.
- Dodds, K. 2000. Geopolitics in a Changing World, Prentice Hall, Essex.
- Gallaher, C., Dahlman, C.T., Gilmartin, M., Mountz, A. and Shirlow, P. 2009. Key Concepts in Political Geography, SAGE Publications Ltd., London.
- Glassner, M. 1993. Political Geography, John Wiley & Sons, New York.
- Gottman, J. (ed.) 1980. Centre and Periphery: Spatial Variations in Politics, Sage, London.
- Guelke, L. (1982): Historical Understanding in Geography: An idealist approach, Cambridge University Press, Cambridge.
- Habib, I. 1986. An Atlas of Mughal Empire, Oxford University Press, Delhi.
- Husain M. 1994. Political Geography, Anmol Publications Pvt. Ltd., Delhi
- Johnston, R.J., Taylor, P.J. and Watts, M.J. (ed.). 1995. Geographies of Global Change: Remapping the World in the Late Twentieth Century, Blackwell, Oxford.
- Jones, M. 2004. An Introduction to Political Geography: Space, Place and Politics, Routledge, London.
- O'Tuathail, G. and Simon, D. 1998. Rethinking Geopolitics, Routledge, London.
- Painter, J. and Jeffrey, A. 2009. Political Geography, SAGE Publications Ltd., London.
- Parker, G. 1998. Geopolitics: Past Present and Future, Printer, London.
- Pounds, Norman J.G. 1963. Political Geography, Mc Graw Hill Book Company, New York.
- Prescott, J.R.V. 1972. The Political Geography, Methuen, London.
- Roberts, P.E. 1995. Historical Geography of India, Vol. I & II, Printwell, Jaipur.
- Roy, S & Mukhopadhyay, M. 2013. Geography Behind Myth, acb Publisher, Kolkata
- Taylor, P.J. 2000. Political Geography: World Economy, Nation-State and Locality, Longman, London.
- Taylor, P. and Flint, C. 2000. Political Geography, Pearson Education, Harlow, Essex.
- Taylor, P.J. and Johnston, R.J. 1979. Geography of Elections, Croom Helm, London.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C3204 – Geospatial Techniques (Practical)**

**Total Marks: 50 (Credits: 4)**

**Unit III Geospatial Data analysis:** Vectorization of spatial data; Principles of preparing attribute tables, Attribute data input and management; metadata; Data manipulation and overlay analysis; Data retrieval and compression; NSDI, GSDI; Raster data and structure, Vector database; Topological relationships

**Unit II: GIS-based Modelling:** Modelling the Decision-Making Process; Visualization Model – TIN, TRN; Neighborhood Functions; Network Analyses; MCDA (AHP, ANN); Accessibility mapping; Components of Web GIS, Case study using Web Map Server (WMS) and Web Feature server (WFS) etc., Geoportals; National Geospatial Policy; Digital twin concept

**Unit III: GNSS Application:** Principles of GNSS positioning and waypoint collection; Representation of GNSS-derived data in GIS interface; Area and length calculations from GNSS data; CORS network, RTK, PPK

**Suggested Readings:**

- Campbell JB (2007) Introduction to Remote Sensing, Guildford Press.
- Jensen JR (2004) Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall.
- Joseph G (2005) Fundamentals of Remote Sensing, United Press India.
- Lillesand TM, Kiefer RW, Chipman JW (2004) Remote Sensing and Image Interpretation, Wiley.
- Nag P, Kudra M (1998) Digital Remote Sensing, Concept, New Delhi.
- Rees WG (2001) Physical Principles of Remote Sensing, Cambridge University Press.
- Singh RB, Murai S (1998) Space-informatics for Sustainable Development, Oxford and IBH.
- Sarkar A (2015) Practical Geography: A Systematic Approach. Orient Black Swan Private Ltd., New Delhi.

**DISCIPLINE-SPECIFIC MINOR COURSE (MC)**  
**Paper Code: GEOG-G3205 – Geospatial Techniques (Theory)**  
**Total Marks: 50 (Credits: 4)**

**Unit I: Cartography:** Concept and applications of scales and projections. Components and classification of maps; Bearing: Magnetic and true, whole-circle and reduced. Concept of geoid and spheroid with special reference to WGS-84; Map projections: Classification, properties and uses with special reference to simple conical projection and Universal Transverse Mercator (UTM)

**Unit II: Surveying:** Basic concepts of surveying, survey equipment, and their capabilities: Dumpy level, theodolite, total station, and Global Navigation Satellite System (GNSS)

**Unit III: Remote Sensing and Geographical Information System:** Principles of Remote Sensing (RS). Types of RS satellites and sensors with reference to IRS and Landsat missions Principles of preparing standard false colour composites (FCCs) and supervised image classification; GIS data types: Spatial and non-spatial (attribute table and metadata), raster and vector.

***Suggested Reading:***

Basu, P. 2021. Advanced Practical Geography — a Laboratory Manual, 4 ed, Books and Allied.

Bhatta, B. 2011. Global Navigation Satellite Systems: Insights into GPS, GLONASS, Galileo, Compass and Others, CRC Press.

Bhatta, B. 2020. Remote Sensing and GIS, 3rd ed, Oxford University Press.

Bolstad, P. 2016. GIS Fundamentals: A First Text on Geographic Information Systems, 5th ed, XanEdu Publishing.

Joseph, G., Jagannathan, C. 2018. Fundamentals of Remote Sensing, 3rd ed, Orient Blackswan.

Kennedy, M., Kopp, S. 2001. Understanding Map Projections, Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis, Interpretation, 7th ed, Esri Press.

Lillesand, T.M., Kiefer, R.W., Chipman, J.W., 2015. Remote Sensing and Image Interpretation, 7th ed, Wiley.

Monkhouse, F.J., Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, 3rd ed (2017 reprint), Alphaneumera-Kolkata.

Pearson II, F. 1990. Map Projections: Theory and Applications 2nd ed, CRC Press

**4<sup>th</sup> Year, Semester VII**

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C4101 – River Basin Management (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives:***

Acquire knowledge about the delineation and hierarchy of river basins and watersheds. Assessing problems of river basin/watershed management and analyzing the impact of dams on fluvial systems. Investigating the techniques of watershed management. Formulate plans and design strategies for watershed management

***Course Outcomes:***

Students will be acquainted with the knowledge of watershed characteristics and their mapping techniques. They will learn the techniques of watershed management and will know the river basin management plans in India

**River Basin Management**

**Unit I: River basin principles:** Definition; Scope and necessity; Concept of scale and hierarchy; Delineation of a watershed; Utility-based classification of water. Principles and components of Integrated Watershed Management (IWM)

**Unit III: Techniques of Watershed Management:** Farming and irrigation techniques; Micro-watersheds and check dams; Rainwater harvesting- architecture/design, computation of potentiality and applications; Artificial groundwater recharge; Stormwater management; Mitigation of flood and drought

**Unit III: Sustainable Watershed Management Initiatives:** Roles of stakeholders; Water policies, schemes and legislations in India; Indigenous and traditional knowledge in watershed management; Perspective planning and development

**Unit IV: Case studies on River Basin Management:** Impact of dams and barrages over a fluvial system- Farakka barrage and Tista barrage; Case studies of IWM- Kangsabati command area and Damodar valley corporation

***Suggested Readings:***

Black PE (1991) Watershed Hydrology. London: Prentice Hall.

Charlton R (2007) Fundamentals of Fluvial Geomorphology. London: Routledge.

Leopold LB, Wolman, MG, Miller P (1954) Fluvial Processes in Geomorphology. San Francisco: Freeman and Co.

Murty JVS (1998) Watershed Management. New Delhi: New Age International.

Petts G, Foster I (1985) Rivers and Landscapes. London: Edward Arnold.

Purandare AP, Jaiswal AK (1995) Watershed Development in India. Hyderabad: National Institute of Rural Development.

Raghunath HM (2006) Hydrology: Principles, Analysis and Design. New Delhi: New Age International (P) Limited Publishers.

Singh RV (2000) Watershed Planning and Management. Bikaner: Yash Publishing House.

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C4102A– Advanced Geomorphology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course objective:***

This course aims to instruct the learner about applied geomorphology i.e. role of geomorphology in EIA and military intelligence, rainwater harvesting, drainage basin management and coastal zone management. This course will provide knowledge of geomorphology about badlands, Himalayan foothills, floodplains and delta. The course aims to the management of various geomorphic problems e.g. mining-induced subsidence, river discharge, urban water supply and disposal, landslide hazards, flood hazards, river bank erosion, and coastal erosion.

***Learning outcome:***

They will know how the geomorphological processes work and vary spatially and temporarily in a geographical region for the occurrences of various geomorphic hazards such as landslides, floods, coastal erosion, river bank erosion. The students will gather ideas and knowledge in regard to the techniques and methods of hazards and disasters management in badlands, floodplains, mountains and coasts at river basin scale.

**Advanced Geomorphology**

**Unit I: Applied Geomorphology:** Geomorphology in Environmental impact assessment and defense sectors; Geomorphology in search for resources; Methods and uses of rainwater harvesting and check dams; Principles of Integrated Drainage Basin Management and Integrated Coast Zone Management.

**Unit II: Case Studies of Landforms and Landuse:** Badlands on laterite duricrusts: Garhbeta and Santiniketan, West Bengal; Tors and inselberges: Chhotanagpur plateau, Jharkhand; Alluvial fans: Sub-Himalayan West Bengal; Deltas and estuaries: Lower Ganga delta, West Bengal.

**Unit III: Management of Geomorphic Problems:** Management of mining subsidence with special reference to Raniganj coalbelt and Darjiling hills; Management of river discharge with special reference to Damodar Valley Corporation and Farakka Barrage Project; Management of urban water supply and disposal with special reference to Kolkata; Management of reclaimed coastal areas with special reference to Indian Sundarban.

**Unit IV: Management of Geomorphic Hazards:** Management of landslides with special reference to northern West Bengal; Management of floods with special reference to northern alluvial fans and Padma- Bhagirathi interfluvium of West Bengal; Management of riverbank erosion with special reference to Ganga and Bhagirathi in West Bengal; Management of coastal erosion with special reference to West Bengal coast.

***Suggested readings:***

Aleshire, A. (2007): *The Extreme Earth: Ocean Ridges and Trenches*, Infobase Publishing, New York  
Anderson, R.S. and Anderson, S.P. (2010): *Geomorphology: The Mechanics and Chemistry of Landscapes*, Cambridge University Press, Cambridge

- Bloom, A.L. (2002): *Geomorphology: A Systematic Analysis of Late Cenozoic Landforms*, Prentice Hall, Upper Saddle River, New Jersey
- Chorley, R.J. and Kennedy, B.A. (1971): *Physical Geography: A Systems Approach*, Prentice Hall, Upper Saddle River, New Jersey
- Condie, K.C. (2003): *Plate Tectonics and Crustal Evolution*, Butterworth-Heinemann, Oxford, Burlington
- Cooke, R.U. and Doornkamp, J.C. (1974): *Geomorphology in Environment Management*, Clarendon Press, London
- Faniran, A. and Jeje, L.K. (1983): *Humid Tropical Geomorphology*, Longman, London
- Firsch, W., Meschede, M. and Blakey, R. (2011): *Plate Tectonics, Continental Drift and Mountain Building*, Springer-Verlag, Berlin
- Goudie, A.S. (1990): *Geomorphological Techniques*, Unwin Hyman, London
- Goudie, A.S. (ed.) (2004): *Encyclopaedia of Geomorphology*, Routledge, London
- Goudie, A.S. and Viles, H. (2010): *Landscapes and Geomorphology: A Very Short Introduction*, Oxford University Press, Oxford
- Gutierrez, M. (2013): *Geomorphology*, CRC Press, Boca Raton, Florida
- Hamblin, W.K. and Christiansen, E. (2003): *Earth's Dynamic Systems*, Prentice Hall, Upper Saddle River, New Jersey
- Hart, M.G. (1986): *Geomorphology: Pure and Applied*, George Allen and Unwin, London
- Huggett, R.J. (2011): *Fundamentals of Geomorphology*, Routledge, New York
- Kale, V.S. and Gupta, A. (2001): *Introduction to Geomorphology*, Orient Longman, Kolkata
- Keary, P. and Vine, M. (1997): *Global Tectonics*, Blackwell Scientific Publications, Oxford
- Leopold, L. B., Wolman, M. G. and Miller, J. P. (1964): *Fluvial Processes in Geomorphology*, W.H. Freeman, San Francisco
- Ollier, C.D. (1981): *Tectonics and Landforms*, Longman Group Ltd., London
- Richards, K. (1982): *Rivers: Form and processes in alluvial channels*, Methuen, London
- Schumm, S.A. (1977): *Fluvial Systems*, Wiley, New York
- Selby, M.J. (1985): *Earth's Changing Surface: An Introduction to Geomorphology*, Clarendon Press, Oxford
- Small, R.J. (1978): *The Study of Landforms: A Textbook of Geomorphology*, Cambridge University Press, Cambridge 2
- Sparks, B.W. (1972): *Geomorphology*, Longman, London
- Summerfield, M.A. (1991): *Global Geomorphology: An Introduction to the Study of Landforms*, Longman, London
- Summerfield, M.A. (ed.) (2000): *Geomorphology and Global Tectonics*, Wiley, Chichester
- Thomas, M.F. (1994): *Geomorphology in the Tropics: A study of weathering and denudation in low latitudes*, John Wiley & Sons, Chichester
- Thorn, C. (1988): *Introduction to Theoretical Geomorphology*, Unwin Hyman, Boston
- Thornbury, W. D. (1960): *Principles of Geomorphology*, John Wiley & Sons, New York
- Young, A. (1972): *Slopes*, Oliver and Boyd, Edinburgh.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4102B – Welfare Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objectives :***

The major objective of this course is to impart thorough knowledge of different dimensions of welfare geography. Another objective of this course is to provide detailed knowledge of social well-being and its indicators. The learners will also be exposed to concepts like social exclusion

***Learning Outcome:***

The learners are expected to develop a sound knowledge of the basic concepts of welfare geography. Students are also expected to develop thorough knowledge on the concept of social well-being and its different measures. Learners will attain ideas and knowledge about the concept of exclusion and social welfare policies and measures.

**Welfare Geography**

**Unit I: Introduction to welfare Geography:** Welfare approach in geography, the concept of social well-being. Socio-spatial inequality and social justice. Mohan's concept of 'spatial divisions of welfare.

**Unit II: Geography of Health and Well-Being:** Health: Definition; linkages with the environment, driving forces in health and environmental trends - population dynamics, urbanization and poverty. Social determinants of Health, disparity in healthcare provision in India.

**Unit III: Indicators of Social Well-being:** Economic vs social indicators of well-being, Identification and choice of indicators; Social reporting and planning; Social development index.

**Unit IV: Geography of Exclusion and Social Welfare:** Slums and gated communities and project affected People of the large dams. Social policy and spending patterns of the state, Social welfare policies and programmes with special references to the developing countries.

***Suggested Reading:***

Ahmed, A. (1999). Social Geography. Jaipur, India: Rawat Publications.

Casino, V. J. D., Jr. (2009). Social Geography: A Critical Introduction. USA: Wiley Blackwell.

Cliff, A.D. and Peter, H. (1988). Atlas of Disease Distributions. Oxford, UK: Blackwell Publishers.

Rais, Akhtar. (Ed.) (1990). Environment and Health Themes in Medical Geography. Delhi, India: Ashish Publishing House.

Smith, D. M. (1977). Human geography: A Welfare Approach. UK: Edward 79 Arnold.

Smith, S. J., Pain, R., Marston, S. A., Jones, J. P. (2009). The SAGE Handbook of Social Geographies. USA: Sage Publications

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4103 – Research Methodology (Theory)**

**Total Marks: 50 (Credits: 4)**

**Course objective:**

The main objectives of the course are to learn about research types, research objectives, approaches to research and various research methodologies. The course will also provide knowledge about sampling techniques for collecting data from the field and their reliability and authenticity. The course aims to develop ideas and knowledge on the application of remote sensing and GIS in geographical research.

**Learning outcome:**

The learners will get the initial training on various steps involved in geographical research. They will develop the idea on fundamentals of research methodology including data collection, methodology and report writing. This course aims to develop fundamental research aptitude among all the students through field survey.

**Research Methodology**

**Unit I: Concept of Research:** Meaning, Objectives and Types of Research; Approaches to research in geography: Inductive and deductive; Objective and subjective; empiricism; Critical approaches- post-structuralism; post-modernism; Case study: Focus group discussion, participatory research; action research

**Unit II: Research Methods and Methodology:** Identification of research gap, research Problem and Hypothesis Building and Building of research questions; research objectives; Quantitative and Qualitative Methods in geography; Reliability and Authenticity of Data and Information; Literature Review; Referencing Styles; Research Ethics; Sampling methods: selection of samples; formation of survey schedule/questionnaire; preparation of a good research proposal

**Unit III: Computer applications in research:** Fundamentals of computers; MS Office and components- excel-spread sheet; graphical presentation; Database management system; WWB (World Wide Web) for research

**Unit-IV: Application RS & GIS:** Sources of satellite data: BHUBAN, USGS, Google Earth; GNSS; Digital Image processing; Geo-referencing, data layering and buffering; data integration; Application of GIS in geographical research

**Suggested reading**

Archer J. E and Dalton T. H. (1968): *Fieldwork in Geography*, B.T. Batsford Limited London

Black, J.A. and Champion, D. J. (1976): *Methods and Issues in social Research*, New York, John Wiley and Sons, Inc.

Creswell J., 1994: *Research Design: Qualitative and Quantitative Approaches* Sage Publications.

Dikshit, R. D. 2003. *The Art and Science of Geography: Integrated Readings*. PrenticeHall of India, New Delhi.

Goode and Hat ( ): *Research Methodology in Social Sciences*, Oxford University Press, New Delhi

Evans M., 1988: "Participant Observation: The Researcher as Research Tool" in *Qualitative Methods in Human Geography*, eds. J. Eyles and D. Smith, Polity.

Gupta, K. K. and Tyagi, V. C. (1992): *Working with maps*, Survey of India Publication, Dehradun

- Heywoods, I., Cornelius, S and Carver, S. (2006) *An Introduction to Geographical Information system*. Prentice Hall.
- Har Prasad (1992): *Research Methods and Techniques in Geography*, Rawat Publishers, Jaipur
- Jha, M.M. and Singh, R.B. (2008) *Land Use: Reflection on Spatial Informatics Agriculture and Development*, New Delhi: Concept.
- Jones P. A. (1968): *Field work in Geography*. Longmans, Green and Company Limited
- Mishra, H.N. and Singh V.P. (ed.) (1998): *Research Methodology: Social, Spatial and Policy Dimensions*, Rawat Publishers, Jaipur
- Mukherjee, Neela 1993. *Participatory Rural Appraisal: Methodology and Application*. Concept Pubs. Co., New Delhi.
- Mukherjee, Neela 2002. *Participatory Learning and Action: with 100 Field Methods*. Concept Pubs. Co., New Delhi.
- Nag, P. (2008) *Introduction to GIS*, Concept India, New Delhi.
- Robinson A., 1998: "Thinking Straight and Writing That Way", in *Writing Empirical Research Reports: A Basic Guide for Students of the Social and Behavioural Sciences*, eds. by F. Pryczak and R. Bruce Pryczak, Publishing: Los Angeles.
- Special Issue on "Doing Fieldwork" *The Geographical Review* 91:1-2 (2001)
- Stoddard R. H., 1982: *Field Techniques and Research Methods in Geography*, Kendall/Hunt.
- Vaidyanadhan. R. (1968); *Index to a set of 60 topographical maps*, CSIR, New Delhi
- Wolcott, H. 1995. *The Art of Fieldwork*. Alta Mira Press, Walnut Creek, CA.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4104 – Geospatial Application and Modelling (Practical)**

**Total Marks: 50 (Credits: 4)**

**Unit I: Digital Image Processing:** Acquisition of satellite data; Reading and displaying satellite data; Generating true, false and pseudo colour composites; Georeferencing; Determination of area of interest; Geometric correction of satellite image; Image fusion; Mosaic; Image subset

**Unit II: Digital Image Analysis:** Unsupervised classification; Supervised classification; Accuracy assessment; Class editing; Image statistics generation; Class export to vectors; Layout preparation; Preparations of inventories of land use/ land cover (LULC) features from satellite images

**Unit III: Photogrammetry and Imagery-based Modelling:** Satellite stereo images; application and preparation of DSM and DTM; Suitability mapping and validation (Flood susceptibility, landslide zonation; forest fire)

**DISCIPLINE-SPECIFIC CORE COURSE (CC)/MINOR COURSE (MC)**  
**Paper Code: GEOG-C4106/GEOG-G4105 – Geography of Tourism (Theory)**  
**Total Marks: 50 (Credits: 4)**

***Course Objective:***

To provide insights into Tourism Geography and its implications in contemporary society.  
To offer an overview of the fundamental concepts in tourism studies and their industrial components.

To equip students with an understanding of the tourism industry's current dimensions. Students will explore various types of tourism products and their respective markets.

***Learning Outcome:***

Students will be able to correlate social issues with the industrial components of tourism activities.

Students will be aware of the negative impacts of tourism activities in totality.

Students will develop a researcher's lens to gaze at the social implications of tourism activities.

Students will learn to design and administer attitude scales to survey tourists and locals.

Tourists will have practical knowledge about tourism products for professional job markets.

**Geography of Tourism (Theory)**

**Unit 1: Basics of Tourism Geography:** Scope and Nature of Tourism Geography; Leisure, Recreation and Tourism inter-relations; Geographical Parameters of Tourism after Robinson; Concepts in tourism studies: Tourists, Products, Demand and Supply; Tourism and its Employability; Infrastructure and support system - Types of accommodation, other facilities and amenities.

**Unit 2: Tourism Typologies:** Types of Tourism: Ecotourism, Adventure Tourism, Medical Tourism, Pilgrimage and Religious Tourism; Urban Tourism; Extended study on Cultural Tourism - concept, components, and operations; Rural Tourism - Case Study from India; MICE as a Tourism product: product types, business operations, and niche markets.

**Unit 3: Tourism Impacts and Policy:** Impact of tourism: physical, economic and social and perceptible positive and negative impacts; An extended study on Tourism-Climate interface and impacts of climate change on global destinations; Role of foreign capital and impact of globalization on tourism; Tourism in India: National Tourism Policy and its applicability

**Unit 4: Recent Trends:** Recent Trends of Tourism: Sustainable Tourism, Slow Tourism; Gender embodiments and tourism industry: employment scopes, glass ceiling, disparities; Social Tourism: concept, dimensions, opportunities and functionalities; Tourism-induced exclusion: types, causes and effects.

4<sup>th</sup> Year, Semester VIII

**DISCIPLINE-SPECIFIC MAJOR/CORE COURSE (CC)**

**Paper Code: GEOG-C4201A – Fluvial Geomorphology (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course objective:***

This course aims to instruct the learner about the morphological and hydrological aspects of drainage basins which are very much essential for planning and development. The course also aims to provide information and knowledge on channel morphology of lowlands, and fluvial hazards of a geographical region.

***Learning outcome:***

The learner will come to know how the fluvial processes work and vary spatially and temporarily in a geographical region for the occurrences of various geomorphic hazards such as soil erosion, floods, river bank erosion, etc. The students will gather ideas and knowledge regarding the techniques and methods of fluvial hazard assessment and its management over floodplains and mountains.

**Fluvial Geomorphology**

**Unit–I: Concept and approaches:** Fluvial Geomorphology: Quantitative and Modern approaches, Fluvial System concepts-threshold, feedbacks, equilibrium; drainage basin hydrology; process-form interaction in fluvial geomorphology

**Unit–II: River Hydrology:** Channel flow: Energy and velocity principle in flow, flow resistance, flow behavior, forces driving and resisting the flow; Flow generation, Stream flow velocity and fluid shear stress, upstream and downstream variation of discharge; Sediment transfer-control on sediment yield, discharge and sediment transfer, sediment budgets; Channel Equilibrium, channel adjustment and channel restoration

**Unit–III: Channel morphology:** Channel Geometry, channel geomorphic units, morphological and hydrological factors; Alluvial channel form: morphology and behavior of straight, meander and braided channel; Channel Change: spatio temporal changes of channel configuration and channel bed forms; Channel engineering: implication to flow regime and morphology

**Unit–IV: Anthropic Interference and Fluvial hazards:** Impact of large dams on river morphology and hydrology; Impact of urbanization and industrialization on river hydrology; Climate change and river response; River floods-viability of management strategies; River bank erosion and channel shifting; River pollution

***Suggested readings:***

Bridges, E. M., 1990. World Geomorphology, Cambridge University Press.

Charlton, R. 2016. Fundamentals of Fluvial Geomorphology, 2nd ed, Routledge.

- Chorley, R., Schumm, S. and Sugden, D.E. 1994. *Geomorphology*, Methuen.
- Chorley, R.J. and Kennedy, B.A. 1971. *Physical Geography: A Systems Approach*, Prentice Hall.
- Goudie, A.S. (Ed) 2004. *Encyclopaedia of Geomorphology*, vol. 1 & 2, Routledge.
- Gupta, A. (Ed) 2008. *Large Rivers*, Wiley.
- Gupta, A. 2011. *Tropical Geomorphology*, Cambridge University Press.
- Huggett, R.J. 2011. *Fundamentals of Geomorphology*, Routledge.
- Kale V.S., Gupta A. 2001. *Introduction to Geomorphology*, Orient Longman.
- Knighton, D. 1998. *Fluvial Forms and Processes: A New Perspective*, Arnold.
- Morisawa, M. 1985. *Rivers*, Longman.
- Petts, G.E., Amoros, C (Eds). 1996. *Fluvial Hydrosystems*, Chapman and Hall.
- Rosgen, D.L. 1994. A classification of natural rivers, *Catena*, 22:169-199.
- Selby, M.J. 1985. *Earth's Changing Surface*, Oxford University Press.
- Sen, P.K. 1989. *Geomorphological Analysis of Drainage Basin: An Introduction to Morphometric and Hydrological Parameters*, University of Burdwan.
- Summerfield, M.J., 2003. *Global Geomorphology: An Introduction to the Study of landforms*, Longman.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4201B – Rural and Urban Geography (Theory)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

The students who undergo this programme can understand the issues prevailing in rural and urban areas.

The students will understand the importance of rural and urban development in sustainable nation-building.

***Learning Outcome:***

Define rural areas, rural and urban economy and development, and issues of development in general and address them through various development strategies.

Explain rural local self-governance, namely, the Panchayati Raj Institutions, and their role in the planning and development of rural areas.

Understand the existing policies and programmes for rural and urban development.

**Rural and Urban Geography**

**Unit I: Rural Development Approaches:** Paradigms of rural development: Modernization paradigm, holistic development paradigm, Gandhian approach to rural development; Development, sustainable development and rural development; Approaches to rural development: Area-based (DPAP) and Target based (NFFWP); Rural Employment policies and programmes in India, PMGSY, SJSY, MNREGA, Jan Dhan Yojana

**Unit II: Rural Development Planning and Management:** Planning for rural development; 73rd constitutional amendment of India and its implications for governance; Major issues and challenges for rural development; Participatory rural planning and management with reference to JFM, Watershed management, SHGs

**Unit III: Urban Geography- Scope and Content:** Urban Geography: Nature, scope and approaches; Development of urban geography and its recent trends; Origin of urban places in ancient, medieval, modern, and post-modern periods: Factors; stages, and characteristics; Rank Size Rule; Concept of primate city

**Unit IV: Theories and Issues:** Theories of city structure: Concentric zone theory, Sector theory and multiple nuclei theory; Concept of settlement hierarchy; Christaller's central place theory; Patterns and trends of urbanization in developed and developing countries with special reference to India; Urban issues: urban poverty and crime, housing, and civic amenities.

***Suggested Reading:***

- Carter, H. 1995. *The Study of Urban Geography*, 4th ed, Arnold.
- Gilg, A.W. 1985. *An Introduction to Rural Geography*, Edwin Arnold.
- Gottdiener, M., Budd, M. Lehtovuori, P. 2016. *Key Concepts in Urban Studies*, 2nd ed, Sage.
- Jonas, A.E.G., McCann, E., Thomas, M. 2015. *Urban Geography: A Critical Introduction*, Wiley-Blackwell.
- Kaplan, D., Holloway, S. 2014. *Urban Geography*, 3rd ed, Wiley.
- Pearson.Krishnamurthy, J. 2000. *Rural Development: Problems and Prospects*, Rawat Publications.
- Latham, A., McCormack, D., McNamara, K. McNeill, D. 2009. *Key Concepts in Urban Geography*, Sage.
- LeGates, R.T., Stout, F. (Eds) 2015. *The City Reader*, 6th ed, Routledge.
- Levy, J.M. 2016. *Contemporary Urban Planning*, 11th ed, Routledge.
- Macionis, J.J., Parrillo, V.N. 2016. *Cities and Urban Life*, 7th ed, Pearson.
- Misra, R.P., Sundaram, K.V. (Eds) 1979. *Rural Area Development: Perspectives and Approaches*, Sterling Publishers.
- Pacione, M. 2009. *Urban Geography: A Global Perspective*, Routledge.
- Potter, R.B., Lloyd-Evans, S. 2014. *The City in the Developing World*, Routledge.
- Ramachandran, H., Guimaraes, J.P.C. 1991. *Integrated Rural Development in Asia: Learning from recent Experience*, Concept Publishing.
- Ramachandran, R. 1989. *Urbanisation and Urban Systems in India*, Oxford University Press.
- Ramachandran, R., 1992: *The Study of Urbanisation*, Oxford University Press
- Robb, P. (Ed) 1983. *Rural South Asia: Linkages, Change and Development*, Curzon Press.
- Singh, K., Shishodia, A. 2016. *Rural Development: Principles, Policies, and Management*, 4th ed, Sage.
- Singh, R.B. (Ed) 2015. *Urban Development, Challenges, Risks and Resilience in Asian Megacities. Advances in Geographical and Environmental Studies*, Springer.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4202A – Fluvial Geomorphology (Practical)**

**Total Marks: 50 (Credits: 4)**

***Course objective:***

This course aims to instruct the learner about the morphological and hydrological aspects of drainage basins which are very much essential for planning and development. The course also aims to provide information and knowledge on channel morphology of lowlands, and fluvial hazards of a geographical region.

***Learning outcome:***

The learner will come to know how the fluvial processes work and vary spatially and temporarily in a geographical region for the occurrences of various geomorphic hazards such as soil erosion, floods, river bank erosion, etc. The students will gather ideas and knowledge regarding the techniques and methods of fluvial hazard assessment and its management over floodplains and mountains.

**Fluvial Geomorphology**

**Unit–I: Drainage basin analysis:** Morphometry: Stream Ordering, Bifurcation Ratio, Law of Stream Frequency, Basin Shape Analysis, drainage basin hypsometry; Rating Curve, Calculation of Stream Energy; Preparation of Water Budget Graph (Recharge, discharge, surplus and deficit); Surface Runoff Estimation: Empirical Methods, SCS Curve Number Method

**Unit–II: Channel morphology analysis:** Measurement of Channel Stability: Entrenchment Ratio, W/D Ratio, Stability Rating, Sinuosity Index and Braiding Index, radii of curvature, arc angle, near bank stress; Channel cross profile: channel thalweg, hydraulic radius, depth-velocity profile; Flow properties: Raynold's Number and Fraude Number; Analysis of bank sediments by sieving; Measurement of river bank Hazards using BEHI parameters after Rosgen

**Unit–III: Fluvial Hazard analysis:** Computation and preparation of Annual hydrograph, Techniques of Base Flow Separation; Preparation of river flood hazard zonation map and Flood Probability Analysis: Weibull and Gumbel's Method; Preparation of River bank erosion map and vulnerable zone with the aid of topo-sheets, GPS, satellite images & GIS techniques; Estimation of river pollution-measurement of BoD, CoD, p<sup>H</sup>, dissolved solids (TDS), dissolved oxygen, Nitrate etc.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4202B – Rural and Urban Geography (Practical)**

**Total Marks: 50 (Credits: 4)**

***Course Objective:***

The students who undergo this programme can learn geographical techniques and their application in urban planning. The course is designed to impart the practical application of modern tools (RS and GIS) in rural and urban planning processes.

***Learning Outcome:***

Students will be familiar with the various quantitative and qualitative techniques of rural and urban planning. The students will be able to use modern tools (RS and GIS) in rural and urban planning processes

**Rural and Urban Geography**

**Unit I: Quantitative Technique in Urban Planning:** Urban growth differentials: Absolute growth, Decadal growth rate, Index of Growth; Correlation of associated variables (Pearson and Spearman methods); Residual mapping; Mapping Inequalities: Lorenz Curve, Gini's Co-efficient; Population Potential by Gravity Model and Delineation of Sphere of Influence.

**Unit II: Quantitative and Qualitative Techniques in Rural Planning:** Agricultural Regionalization: Weaver's and Jasbir Singh's Methods; Measures of Accessibility and Connectivity; Qualitative Methods of Data Collection: Focus Group Discussion, Rapid Rural Appraisal, Participatory Rural appraisal; Techniques of Questionnaire Preparation of Qualitative Data.

**Unit III: Application of RS and GIS:** Landuse-Landcover Mapping of Rural areas, Detection of Change; Landuse-Landcover Mapping of urban areas, Detection of change and Urban Expansion; Preparation of Thematic Maps at Village, Village information map using GPS and Open Street Mapping (OSM); Preparation of Thematic Maps at Ward level, Ward information Map using GPS and OSM.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**

**Paper Code: GEOG-C4204 – Water and Water Resources (Theory)**

**Total Marks: 50 (Credits: 4)**

**Course objective:**

The paper introduces students to the hydrological cycle, properties of water, physicochemical and biological water quality assessment and indices, types of water resources, and their use and management. It will also highlight the problems associated with water shortages in India and familiarize students with case studies on international and national conflicts on water.

**Learning outcome**

The students will come to know about the properties of water resources, the hydrological cycle, water budget, surface and groundwater pollution, water resource management, the importance of wetlands to meet the crisis of water resources, and conflicts, laws, and treaties for mitigating the crisis of water resources. The knowledge and ideas about the importance of water resource management will ensure sustainable growth and development.

**Water and Water Resources**

**Unit I: Introduction to Water Resources:** Water resources (oceans, rivers, lakes, and wetlands) and types of water; Physical, chemical, and biological properties of water; hydrological cycle; precipitation, runoff and runoff cycle, infiltration, evaporation, evapo-transpiration; water budget; water quality standards in India;

**Unit II: Surface and subsurface water:** Surface and groundwater pollution, water table, vertical distribution of water; formation and properties of aquifers; techniques for groundwater recharge; importance of watershed and watershed management; rainwater harvesting in urban settings; Overexploitation of surface and groundwater resources and related issues

**Unit III: Wetlands and their management:** Definition of a wetland; types of wetlands (fresh water and marine); ecological significance of wetlands; threats to wetlands; wetland conservation and management; Ramsar Convention, 1971; major wetlands of India, National River linking plan: ecological and economic impacts.

**Unit IV: Conflicts, laws and treaties:** Water resources and conflicts on its sharing, case studies on Kaveri and Krishna river water disputes; Multipurpose river valley projects in India and their environmental and social impacts; case studies of dams - Narmada and Tehri dam issues; International agreements to resolve these conflicts. Water Act 1974; Ganges water treaty; Teesta water treaty.

***Suggested readings:***

Mays, L.W. 2006. *Water Resources Sustainability*. The McGraw-Hill Publications.

Bansil, P.C. 2004. *Water Management in India*. Concept Publishing Company, India.

Brebbia, C.A. 2013. *Water Resources Management VII*. WIT Press.

CEA. 2011. *Water Resources and Power Maps of India*. Central Board of Irrigation & Power.

Grumbine, R.E. & Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science* **339**: 36- 37.

Loucks, D.P., Stedinger, J.R. & Haith, D. A. 1981. *Water Resource Systems Planning and Analysis*. Englewood Cliffs, NJ, Prentice Hall.

Schward & Zhang, 2003. *Fundamentals of Groundwater*. John Willey and Sons.

Souvorov, A.V. 1999. *Marine Ecologonomics: The Ecology and Economics of Marine Natural Resource Management*. Elsevier Publications.

Vickers, A. 2001. *Handbook of Water Use and Conservation*. Water Plow Press.

**DISCIPLINE-SPECIFIC CORE COURSE (CC)**  
**Paper Code: C4205 – Sustainable Development (Theory)**  
**Total Marks: 50 (Credits: 4)**

***Course Objective:***

The course aims to provide comprehensive and critical ideas about sustainable development. Several best practices of sustainable development will be introduced to the students. Students will be taught how to measure and assess different aspects of sustainability

***Learning Outcome:***

The students will have detail extensive knowledge of different dimensions of sustainability, measurement and assessment of sustainable development.

## **Sustainable Development**

**Unit I: An Introduction to Sustainable Development:** Sustainable development: Concept, historical perspectives; Key principles of sustainable development - economic, social and environmental dimensions: Sustainable Development Goals (SDGs): Goals, measurement and monitoring

**Unit II: Environmental sustainability and environmental ethics:** Environmental sustainability; environmental ethics; Sustainable utilization of natural resources: Land, water and forest; Concepts, types and utilization of non-conventional energy resources, advantages and disadvantages of non-conventional energy resources; Climate change, biodiversity loss and their impacts on sustainability, ecological footprint and analysis

**Unit III: Social and Economic Sustainability:** Social justice, equity and inclusivity in sustainable development; Economic sustainability: concept, importance and practices; Food security: concept, dimensions; Severity of food insecurity; Sustainable consumption; Role of organic farming in sustainable agriculture

**Unit IV: Sustainability and Livelihood:** Sustainable livelihood framework in rural; and urban context; Sustainable city and smart city: Key features; Sustainable urban planning: Compact city, transit-oriented development, vertical sprawling, green infrastructure: Urban governance and sustainability: Key features

***Suggested Reading:***

Atkinson G., Dietz S., Neumayer E. (2006) Handbook of Sustainable Development, Cheltenham: Edward Elgar Publishing Limited.

Birch, E.L. and Wachter, S.M. (eds.) (2008) Growing Greener Cities: Urban Sustainability in the 21st Century, Philadelphia: University of Pennsylvania Press.

Blewett, J. (ed.) (2008) Understanding Sustainable Development, 3rd edition, London: Routledge.

Brundtland Commission, (1987) Our Common Future, New York: Oxford University Press.

Dalal-Clayton, B. and Bass, S. (2002) Sustainable Development Strategies: A Resource Book, London: Earthscan.

Elliot, J.A. (2013) *An Introduction to Sustainable Development*, 4th ed, London: Routledge publications.

Jacquet, P., Pachauri, R.K. and Tubiana, L. (eds.) (2010) *CITIES: steering towards sustainability*, New Delhi: TERI Press.

Rogers P. (2007) *An Introduction to Sustainable Development*, London: Earthscan Publications.

Rogers, P. P., Jalal, K. F. and Boyd, J. A., (2008) *An Introduction to Sustainable Development*, UK: Earthscan.

Servaes J., (ed.) (2017) *Sustainable Development Goals in the Asian Context*, Singapore: Springer.

Smith D.W., et al (2018) *Geographies of Development*, Forth Edition. London: Routledge.

Soubbotina, T.P. (2004) *Beyond Economic Growth: An Introduction to Sustainable Development*, Washington

DEPARTMENT OF GEOGRAPHY, DIAMOND HARBOUR WOMEN'S UNIVERSITY

**Modalities of Examinations**

**Theoretical Examinations: CC / MDC / MC – (50 Marks)**

**Continuous Assessment:** 10 Marks (class test/presentation/project/ group discussion/ Interview. Quiz etc,)

**End Semester Examination:** For every 40-mark Theoretical Examination, broad marks division of questions is to be as follows.

| Group | Question type                 | Marks | To be set | To be answered | Word limit |
|-------|-------------------------------|-------|-----------|----------------|------------|
| A     | Short, definitive             | 2     | 8         | 5              | 50         |
| B     | Brief, explanatory            | 5     | 4         | 2              | 150        |
| C     | Broad, descriptive/analytical | 10    | 4         | 2              | 400        |

Each 10-mark question may (not more than two) or may not include a subdivision. The duration of the exam is to be two hours for 40 marks.

**Practical Examinations: CC / MDC / MC**

For every 50-mark Practical Examination, broad marks division of questions is to be as follows:

**Continuous Assessment:** 20 Marks (Including Laboratory Notebook)

**End Semester Examination:** 30 Marks

Three questions of 10+10+10 marks.

Each 10-mark question may or may not include subdivisions.

**Theoretical Examinations: Skill Enhancement (SEC)**

For every 30 marks Theoretical Examination, broad marks division of questions is to be as follows:

| Group | Question type                 | Marks | To be set | To be answered | Word limit |
|-------|-------------------------------|-------|-----------|----------------|------------|
| A     | Short, definitive             | 2     | 8         | 5              | 50         |
| B     | Brief, explanatory            | 5     | 4         | 2              | 150        |
| C     | Broad, descriptive/analytical | 10    | 2         | 1              | 400        |

The duration of the examination is to be one hour 30 minutes for 30 marks.

**Practical Examination: Skill Enhancement (SEC)**

Continuous Assessment: 20 Marks (Including Laboratory Notebook)

## **General guidelines for the preparation of Laboratory Notebooks and Reports**

- A laboratory notebook, comprising class assignments of the practical exercises duly authenticated by respective teachers, is to be prepared and submitted. The exercises are to be drawn in pencil / mechanical pencil with photocopied representation of source materials where necessary. All texts are to be handwritten in pen on plain or ruled paper.
- Thematic maps are to be drawn on photocopied base maps.
- Coloured pencils are to be used for colouring and shading.
- The above three points also apply for preparation of field reports.
- Paper size(s) specified at the start of practical papers in the CCF need(s) to be adhered to.
- The laboratory notebook is to contain only the practical exercises as specified in the syllabus. Each exercise is ideally to be sub-sectioned, as applicable, into (i) statement of problem, (ii) objective(s), (iii) materials and/or methods, (iv) data, (v) calculations, (vi) results/drawings, and (vii) interpretation.
- For surveying and levelling exercises, drawing the parts of the instruments is unnecessary.
- A separate laboratory notebook is to be prepared for MDC practical course in a given Semester.
- Production of the practical notebook is mandatory for appearing in the concerned practical paper.
- Preparing a new laboratory notebook is not necessary for a candidate reappearing in a semester examination. She should carry the laboratory notebook already prepared (evaluated) for (in) the last semester(s).