

**Learning Outcomes Based Curriculum Framework  
(LOCF)  
for**

**Geography**

**I. B.A./B.Sc. (Hons.)**

**II. B.A./B.Sc. (Programme)**

**Undergraduate Programme  
2019**



**UNIVERSITY GRANTS COMMISSION  
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## **Preamble**

The UGC committee constituted for preparing the Learning Outcomes Based Curriculum Framework for BA/BSc. Hons. Geography/ B.A/B.SC (PROGRAMME), is pleased to submit this report. The Committee hereby suggests the curriculum for the students considering the global, national, regional, local issues and programs for better learning outcomes. The LOCF is designed to emphasize the teaching-learning process at the undergraduate (B.A./B.Sc) level to sensitize and train the students to develop a sound and systematic approach regarding mechanism and processes of natural and human activities. The focus is to help the students to understand the latest tools and techniques, which would help in giving focused and precise understanding of geographical phenomenon. The purpose is to enhance the capability of the students in perceiving, creating and analyzing sound geographical bases and concepts.

This Learning Outcome based Curriculum Framework is designed to emphasize the teaching and learning process at the undergraduate (B.A./ B.Sc) from teacher centric to student centric by strengthening the quality of teaching and learning in the present day real life scenario of global, regional and local level. It is considered learning as an activity of creativity of innovations and analyzing geographical phenomena. The committee prepared the major learning outcomes, which would help the students to understand and critically analyze various dimensions of the geographical issues.

The following objectives would be achieved:

- To orient the students towards identification and analysis of various facets of geographical features and processes.
- To develop students' aptitude for acquiring basic skills of carrying out field work.
- To facilitate the students to learn skills of map making.
- To guide students to learn the science and art of collecting, processing and interpreting the data.
- To expose the students to the use of the updated technologies of remote sensing, IRNSS, GNSS, Geographical Information System (GIS) and GIScience.

The Committee suggests that the following remarks may be taken in to consideration by the faculty members, departments/schools, Boards of studies in Geography Institutes/colleges and Universities, while incorporating the recommendations for utilization:

- The learning outcomes are designed in such a way to assist the students to understand the objectives of studying BA/BSc (H)/ B.A/B.SC (PROGRAMME) in Geography, which is to understand, appreciate and critically evaluate and associate with various time and space aspects.
- It is paramount to consider here BA/BSc (H)/B.A/B.SC (Programme) in Geography under CBCS remains the point of reference for LOCF recommendations. As it is a field-based learning, all stakeholders may make suitable alterations with suitable justifications while preparing the courses, finalization of objectives keeping in view global, national, regional and local issues and challenges.
- To this end, the themes, units in the LOCF documents are confirmative. Similarly the organization of themes/units should consider the spatial dimensions and references.
- The Organization of units/courses are worked in to semesters/years considering the credit loads in a given semester with the ultimate end of outcomes of the courses /programs. However, it is essential to incorporate the courses applied in nature which focus attention of the students especially in the second and third years of the given courses.
- Learning outcomes are modifiable considering the social, cultural and physical heterogeneity of the country and time scales, accordingly, themes and text units are taken into account considering all the stakeholders.
- The understanding of the LOCF Committee of Geography is to have well defined and justifiable course outcomes and their realization at the end of the course and programs.
- The department/institute/college/university is expected to encourage the faculty to inculcate the best teaching skills with innovative ideas and methods to make students to learn subjects based on field knowledge and updated spatial information.

# **PART 1**

## **INTRODUCTION**

### **Learning Outcomes based Curriculum Framework (LOCF) for Geography under CBCS**

#### **1. Introduction**

Geography has been broadly accepted as a bridge discipline between human and physical sciences. In the beginning, geography focussed on the physical aspects of the earth but the modern geography is an all-encompassing discipline that seeks to understand the earth and all of its human and natural processes as integrating elements. Geography has emerged through time as a trans-disciplinary subject integrating the regional diversity with the concepts of the timing of space and the spacing of time. It provides broad, human and place-centred perspectives on the transformation of rural ecology to globalized urban landscape at different levels, from the local/regional/national to global. Geography is transformed through:

- Journey from Village Ecology to Urban Regional Studies
- Qualitative Techniques to Spatial Information Technology
- Global to Micro-level Community Perception Approach

It is essential to focus on the current socio-spatial problems, issues and challenges to make the students aware of the application of geography to sort out the societal upcoming problems. It is also essential to rejuvenate the ancestral geographical knowledge to address the current local and global problems. In the light of exponential changes in the field of arts, science and technology, it is to be studied from multifaceted angles.

It is important for the policy makers to consider the geo-spatial aspects with references to the location and in context of the best utilization of public utilities. It is further expected that if the above said spatial aspects are considered, it will certainly develop the lagging regions and people living therein.

#### **2. Learning Outcomes based Approach to Curriculum Planning**

Learning Outcomes based Curriculum Framework (LOCF) for geography curriculum revision incorporates dynamic processes including fundamental and modern techniques, contemporary

paradigms such as global initiatives like Sustainable Development Goals (SDGs), Disaster Risk Reduction (DRR), Paris Climate Action and national initiatives like smart cities, Securities of food, water, energy, human health and livelihood, biodiversity, and disaster management. The approaches are to make geography more scientific and societal-need oriented that could be the panacea of India's developmental challenges. Geography uses scientific knowledge with the current focus that includes spatio-temporal analysis, skill development, GIScience, sustainable development and human security.

## **2.1 Nature and Extent of the B.A./B.Sc. (Hons.) Programme**

Geography curriculum inculcates knowledge of essential concepts of physical and human geography together with appropriate techniques using lectures, tutorials, group discussions, presentations, assignment evaluation, lab work and field visits. Thus, pedagogy process includes:

- Identifying and explaining the physical and cultural characteristics globally and processes at varied spatio-temporal contexts.
- Understanding human-environment and nature-society interactions as well as various global environmental challenges.
- Analysing geographic information by using geo-spatial technologies.
- Responding towards the global and national challenges and initiatives.

## **2.2 Aims of B.A./B.Sc. (Hons.) Programme**

Four distinct and new learning outcomes have been incorporated from each Course such as:

- Appreciate the relevance of geographical knowledge to everyday life.
- Demonstrate the ability to communicate geographic information by utilising both lecture and practical exercises.
- Inculcate the ability to evaluate and solve geographical problems effectively.
- Demonstrate the skills in using geographical research tools including spatial statistics, cartography, remote sensing, GIS, IRNSS and GIScience.
- Based on the field knowledge and advanced technologies, the students should be able to understand the on-going geographical problems in different regions and levels with appropriate pragmatic solutions.

### **3. Graduate Attributes in Geography**

The curriculum uses CBCS framework and organises under Core Course, Skill Enhancement Course, Elective - Discipline Specific and Elective - Generic Courses. The core courses cover key areas of geography about which all students should have basic knowledge. These courses are grouped as follows:

- A. Theory – These courses build up the theoretical and conceptual foundations of geography.
- B. Practical – Three courses on Statistical Techniques in Spatial Analysis; Remote Sensing and Geographical Information System, GIScience and Research Methods and Fieldwork in Geography will strengthen the methodological and practical foundations of geography.
- C. Regional Approach – Such courses focus on World Geography, Geography of India / different states.
- D. Application Oriented – This includes disaster management, climate change, tourism geography, health and wellbeing, etc.

Each Course has one objective, three learning outcomes, five uniform contents and reading list incorporating a few Hindi books also wherever possible.

### **4. Qualification Descriptors for B.A./B.Sc. (Hons.) Programme**

The qualification descriptors for the B.A./B.Sc. (Hons.) programme in Geography shall have the learning attributes such as field knowledge, use of advance tools and techniques for better comprehension of space and society etc. It also involves awareness among the students regarding the issues of different regions and socio-cultural aspects. The main qualification descriptors for the geography B.A./B.Sc. (Hons.) students are to develop the critical evaluation and understanding. Each Honour student in Geography should be able to;

- Demonstrate systematically geographical knowledge and understanding the theoretical as well as practical applications with understanding of various aspects.
- Demonstrate the ability to understand the significance of geographical aspects in relation to development of the regions and minimizing regional inequalities.
- Demonstrate the ability and geographical thinking critically regarding rural and urban spaces and their day to day problems with the application of geographical knowledge.
- Students have to demonstrate their geographical knowledge acquired in the class and apply the same in real world.



- Recognise the scope of geography in terms of exploring the career opportunities, employment and life-long engagement in teaching and utilise the knowledge for publication for the future academic endeavors.

The students have to develop the ability through the theoretical and practical means for realising the Sustainable Development Goals (SDG) both in rural and urban spaces to minimize the differentials in developmental aspects.

## **5. The Programme Learning Outcomes B.A./B.Sc. (Hons.) Programme**

The programme learning outcomes relating to B.A./B.Sc. (Hons.) Programme in geography:

- Demonstrating the understanding of basic concepts in geography.
- Demonstrating the coherent and systematic knowledge in the discipline of geography to deal with current issues and their solution.
- Display an ability to read and understand maps and topographic sheets to look at the various aspects on the space.
- Cultivate ability to evaluate critically the wider chain of network of spatial aspects from global to local level on various time scales as well.
- Recognize the skill development in Geographical studies programme as part of career avenues in various fields like teaching, research and administration.

It is also suggested that after the completion of B.A./B.Sc. (Hons.) Programme, students should be able to demonstrate the knowledge obtained in such way so that they can explore the employability options and service to the society.

### **5.1 Learning Outcomes**

Three distinct and new learning outcomes have been incorporated from each course such as to:

1. Understand the relevance of geographical knowledge to everyday life.
2. Getting the ability to communicate geographic information utilizing both lecture and practical exercises.
3. Inculcate the ability to evaluate geographical problems effectively.
4. Exhibit the skill in using geographical research tools including spatial statistics, cartography, remote sensing, GIS, IRNSS and GIScience.

## 5.2 Course Level Learning Outcomes

The course level learning outcomes includes:

3. **1.Basic Concept:** The fundamental concepts and philosophical foundation of each course need to be discussed.
4. **2. Understanding Landscape:** An understanding of landscape at different levels needs to be discussed and understood for a thorough knowledge of spatial dimensions.
5. **3.Understanding Ecosystem Structure and Potential:** To comprehend the dynamic dimensions of human and ecosystem relationships.
5. **Human Perception and Behaviour:** Learning human perception and behaviour to acquire the geographical knowledge evolved over time, is essential to improve decision making process.
6. **Identification of Critical Problems and Issues:** Detection and identification of the critical problems and spatial issues are essential for sustainable development.
7. **Field Based Knowledge:** Field based knowledge is essential to understand the ground reality, spatial patterns and processes.
8. **Spatial Tools and Techniques:** The basics and applications of spatial tools and techniques are essential to make the studies more scientific and applicable.
9. **Statistical Techniques:** Use of statistical tools and techniques is essential for precise and objective geographic analysis and interpretation of complex phenomena.
10. **Applied Dimensions:** Identification of the critical problems and spatial issues form the core of the modern geography for various applications and decision making, including Resources, Environment & Disaster Management, Land Use Planning, and Urban and Regional Development together with Climate Change Mitigation and Adaptation, etc.
11. **Case Study based Analysis:** There is a need to understand the specificities of the problems in specific areas for their in depth comprehension and solution. The case studies are essential, especially to find out the solutions to the lagging regions for their solutions based on first hand information.

## 6. Course-Level Learning Outcomes Matrix

Outcomes	Core Subjects													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Basic Concept	x	X	X	X	X	X	X	x	x	x	x	X	X	X
Understanding Landscape	x	X	X				X		X	X	X	X	X	X
Understanding Ecosystem structure and Potential			X		X		X	X	X	X	X	X		X
Human Perception and Behaviour			X				X	X	X			X	X	X
Identification of Critical Problems and Issues	X		X		X	X	X	X	X	X	X	X		X
Field Based Knowledge		X		X	X					X	x	X		X
Spatial Tools and Techniques		X		X		X				X		X		X
Statistical Techniques		X		X		X				X		X		X
Applied Dimensions	X	X	X	X	X	X		X	X	X	X	X		X
Case Study based Analysis		X	X		X	X			X	X	X	X		X
Public Policy and Management					X	X	X	X	X	X	X	X		X
Communication Skills	x	X	X	X	X	X	X	X	X	X	x	X	X	X

**11. Public Policy and Management:** Spatial aspects and dimensions are the integral parts in the policy making for sustainable regional development. Geographical knowledge needs to be inculcated for application and solutions of the various local, regional and national problems.

**12. Communication Skills:** Communication through models, maps, images and other geographical tools form the sound base for the dissemination of geographical information.

## 7. GEOGRAPHY COURSE OUTCOMES AND SDGs

The global community has adopted the Sustainable Development Goals to ensure holistic and multifaceted development of human societies across the world. These goals adopted in 2015 were an ambitious upgradation of millennium development goals.

The Indian Geographical community aims to harness the trans-disciplinary nature of the subject and link it with sustainable development goals through a range of multi-dimensional core and elective papers

### 7.1. B.A. (HONS) GEOGRAPHY- CORE PAPERS: CONTRIBUTION TOWARDS SDGs

B.A. (Hons) Geography																	
	SDG 1 No Poverty	SDG 2 Zero Hunger	SDG 3 Good Health & Wellbeing	SDG 4 Quality Education	SDG 5 Gender Equality	SDG 6 Clean Water & Sanitation	SDG 7 Affordable & Clean Energy	SDG 8 Decent Work & Economic Growth	SDG 9 Industry Innovation & Infrastructure	SDG 10 Reduced Inequalities	SDG 11 Sustainable Cities & Communities	SDG 12 Responsible Consumption & Production	SDG 13 Climate Action	SDG 14 Life Below Water	SDG 15 Life on Land	SDG 16 Peace, Justice and Strong Institutions	SDG 17 Partnerships for the Goals
Geomorphology														X	X		
Cartographic Techniques (Practical)				X													
Geography of Human and Cultural Landscape					X											X	X
Statistical Methods in Geography (Practical)													X				
Climatology and Oceanography													X	X	X		
Fundamentals of Remote Sensing (Practical)				X					X				X				
Geography of India											X	X	X				
Introduction to Global Economic System								X	X	X	X	X					
Environment and Natural Resource Management	X	X	X			X	X									X	X
Geographical Information System (Practical)				X					X				X				
Regional Planning and Sustainable Development	X	X	X		X	X										X	X
Field Techniques, Surveying and Research Methods (Practical)				X													
Evolution of Geographical Thought				X													
Disaster Management Project Work													X				

## 7.2. B.A. (HONS) GEOGRAPHY- ELECTIVE PAPERS: CONTRIBUTION TOWARDS SDGs.

Geography Electives																	
	SDG 1 No Poverty	SDG 2 Zero Hunger	SDG 3 Good Health & Wellbeing	SDG 4 Quality Education	SDG 5 Gender Equality	SDG 6 Clean Water & Sanitation	SDG 7 Affordable & Clean Energy	SDG 8 Decent Work & Economic Growth	SDG 9 Industry Innovation & Infrastructure	SDG 10 Reduced Inequalities	SDG 11 Sustainable Cities & Communities	SDG 12 Responsible Consumption & Production	SDG 13 Climate Action	SDG 14 Life Below Water	SDG 15 Life on Land	SDG 16 Peace, Justice and Strong Institutions	SDG 17 Partnerships for the Goals
Demography and Population Studies				X	X												
Hydrology and Soil Studies														X	X		
Urbanization and Urban System			X			X	X	X	X	X	X	X					
Agriculture and Food Security	X	X											X				
Geography of Health			X			X				X	X						
Political Geography				X									X			X	X
Biogeography													X	X	X		
Geography of Social Wellbeing	X	X			X												
Disaster Management													X			X	X
Geography of Tourism and Pilgrimage								X	X								
Geospatial Information Technology				X							X		X				
Coupled Human and Environment System										X		X				X	X
Climate Change Vulnerability and Adaptation		X											X		X	X	X
Rural Development	X	X	X			X	X	X		X							
Industrial Development								X	X	X		X					
Sustainable Resource Development			X		X						X	X					
Digital Remote Sensing (Practical)				X					X				X				
Spatial Statistical Techniques				X									X				
Introduction to GIScience (Practical)									X				X				
Thematic Atlas				X													

## 8. (a) Teaching Learning Processes

Learning Outcomes based Curriculum Framework (LOCF) for geography incorporates dynamic processes including fundamental and modern techniques, contemporary paradigms such as global initiatives like Sustainable Development Goals (SDGs), Disaster Risk Reduction (DRR), Paris Climate Action and national initiatives like smart cities, food security, water security, energy security, biodiversity, disaster management, human health and wellbeing and livelihood security. The approaches are to make geography more scientific and societal-need oriented that could be the panacea of India's development. Geography uses scientific knowledge with the present focus that includes spatio-temporal analysis, skill development, GIScience, sustainable development and human security.

Learning is a challenging, engaging, and enjoyable activity. Learners should be encouraged to engage in a rigorous process of learning and self-discovery by adopting a highly focused and yet flexible approach to education. Each day learners should be encouraged to focus on key areas of the course and spend time on learning the course fundamentals and their application in life and

society. In teaching and learning pedagogy, there should be a shift from domain or conclusions based approach to the experiential or process based approach.

Geography curriculum inculcates knowledge of essential concepts of physical and human geography together with appropriate techniques using lectures, tutorials, group discussion, presentation, assignment evaluation, lab work and field visits. Thus, pedagogy process includes:

- Identifying and explaining the physical and cultural characteristics globally and processes at varied spatio-temporal contexts.
- Understanding human-environment and nature-society interactions as well as various global environmental challenges.
- Analysing geographic information by using geo-spatial technologies.
- Responding towards the global and national initiatives.

Broad framework for teaching in the class includes:

1. Theory courses should have 6 hours per week for courses carrying 6 credits.
2. Tutorial group of each theory course should have a group size of 15 students.
3. Practical courses should have 12 hours per week for a group of 15 students.
4. Practical courses will not have tutorials.
5. There is no practical paper in B.A./BSc. Programme

The faculty should promote learning on a proportionate scale of 20:30:50 principle, where lectures (listening/hearing) constitute 20 per cent of the delivery; visuals (seeing) 30 per cent of the learning methods; and experience (doing/participating) 50 per cent. This ratio is subject to change as per institutional needs.

In order to achieve its objective of focused process based learning and holistic development, the Institution/University may use a variety of knowledge delivery methods:

### **1. Lectures**

Lectures should be designed to provide the learners with interesting and fresh perspectives on the subject matter. Lectures should be interactive in a way that students work with their teachers to get new insights in the subject area, on which they can build their own bridges to higher learning.

### **2. Discussions**

Discussions are critical components of learning, and can be used as a platform for students to be creative and critical with old and new ideas. Besides developing critiquing skills, arriving at consensus on various real life issues and discussion groups lead to innovative problem solving and, ultimately to success.

### **3. Life Skills:**

Life skills provide students opportunities to understand real life situations and scenarios (i.e. coping with disaster), and solve challenges in a controlled environment or make use of them in simulating cultural experiences by locating/transposing them in new (local, regional, national and international) situations.

### **4. Case Studies:**

Case studies, wherever possible, should be encouraged in order to challenge students to find creative solutions to complex problems of individual, community, society and various aspects of knowledge domain concerned.

### **5. Role Playing**

Assuming various roles, as in real life, is the key to understanding and learning. Students are challenged to make strategic decisions through role-plays, and to analyze the impact of these decisions. For this purpose, incidents from literary texts may also be used.

### **6. Team Work**

Positive collaboration in the form of teamwork is critical in the classroom environment, for which it is necessary to transcend one's prejudices and predilections so as to achieve the desired outcomes. In the process of teamwork, learners will acquire the skills of managing knowledge acquisition and other collaborative learners, thereby understanding how to incorporate and balance personalities.

### **7. Study Tours/Field Visits:**

Study Tours/ Field trips provide opportunities to the learners to test their in-class learning in real life situations as well as to understand the functional diversity in the learning spaces. These may include visits to sites of knowledge creation, preservation, dissemination and application. Institutions may devise their own methods to substitute/modify this aspect.

### **8. Academics-Industries Interface:**

The course curriculum of B.A/BSc. (Hons.) should encourage students for closer interaction with industries/corporate/research institutes, etc. for at least one week internship and training.

**8 (b) Assessment Methods:**

The assessment of students' achievement in geography will be aligned with course/program learning outcomes and the academic and geographical skills that the program is designed to be developed. Different assessment methods that are appropriate within the discipline of geography will be used. Learning outcomes will be assessed through continuous evaluation using the oral and written examinations, cartographic and computer based exercises (GIS), practical assignments, observations of practical skills, project and field work reports, seminar presentations, viva voce, output from collaborative work activities and attendances, etc.



## PART II: STRUCTURE OF B.A/B.COM/B.SC GEOGRAPHY

### 9. Introduction

The curriculum uses CBCS framework and organise under Core Courses, Skill Enhancement Course, Elective Discipline Specific and Elective Generic Courses. The core courses cover key areas of geography about which all students should have basic knowledge. These courses are grouped as follows:

- **Theory** – These courses build up the theoretical and conceptual foundations of geography.
- **Practical** – Three courses on Statistical Techniques in Spatial Analysis; Remote Sensing and Geographical Information System, GIScience and Research Methods and Fieldwork in Geography will strengthen the methodological and practical foundations of geography.
- **Regional Approach** – Such courses focus on Geography of India / different states.
- **Application Oriented** – This includes disaster management, climate change, tourism geography, health and wellbeing etc.

Each Course has three learning outcomes, five uniform contents and references incorporating a few Hindi books wherever possible.

## 10.1. STRUCTURE OF BA (HONS) IN GEOGRAPHY

**Note:** For the structure of BA Hons. Geography, the Committee has followed the number of credits per course as suggested in the CBCS document, that is, six credits per course.

<b>A. Core Courses: 14 papers (14x6= 84 credits)</b> <b>B. Discipline Specific Electives: 4 papers (4x6= 24 credits)</b> <b>C. Generic Electives: 4 papers (4x6= 24 credits)</b> <b>D. Ability Enhancement Compulsory Courses: 2 papers (2x4=8 credits)</b> <b>E. Skill Enhancement Courses: 2 papers (2x4=8 credits)</b>  GRAND TOTAL (A+B+C+D): 148 (84+24+24+8+8) credits			
<b>A. CORE COURSES (14)</b>			
Serial No	Title of the Course	Credits: 6 credits each Total 84 (credit distribution to be decided by institutions as per UGC/CBCS guidelines). 1. For Theory courses Theory and Tutorial (5+1) 2. For practical courses 6 without tutorials	Credit Hours Distribution L T O L Lectures : 5 / [5]/[4] T Tutorials: 1 / [1]/(0)  [Note: There can be different options depending on the pedagogical and assessment weightage distribution] L and T
1.	Geomorphology	6	5 +1
2	Cartographic Techniques (Practical)	6	12
3	Geography of Human and Cultural Landscape	6	5+1
4	Statistical Methods in Geography (Practical)	6	12
5	Climatology and Oceanography	6	5+1
6	Fundamentals of Remote Sensing (Practical)	6	12
7.	Geography of India	6	5+1

8.	Introduction to Global Economic System	6	5+1
9	Environment and Natural Resource Management	6	5+1
10.	Digital Remote Sensing (Practical)	6	12
11.	Regional Planning and Sustainable Development	6	5+1
12.	Field Techniques, Surveying and Research Methods (Practical)	6	12
13.	Evolution of Geographical Thought	6	5+1
14.	Disaster Management Project Work (Practical)	6	12

#### **B. DISCIPLINE CENTRIC ELECTIVES (ANY FOUR)**

	Course title	Credits 24 (4x6) 6 credits each (credit distribution to be decided by institutions as per CBCS guidelines).	Credit Hours Distribution L T O L Lectures : 5 /[5]/[4] T Tutorials: 1
1	Demography and Population Studies	6	5+1
2	Hydrology and Soil Studies	6	5+1
3	Urbanization and Urban System	6	5+1
4	Agriculture and Food Security	6	5+1
5	Geography of Health	6	5+1
6	Political Geography	6	5+1
7	Biogeography	6	5+1
8	Geography of Social Wellbeing	6	5+1

<b>C. GENERIC ELECTIVES (ANY FOUR)</b>			
	Course Title	Credits 24 (4x6) 6 credits each (credit distribution to be decided by institutions as per CBCS guidelines).	Credit Hours Distribution L T O L Lectures : 4 /[5]/[4] T Tutorials: 1 /[1]/(0)
1	Disaster Management	6	5+1
2	Geography of Tourism and Pilgrimage	6	5+1
3	Geospatial Information Technology	6	5+1
4	Coupled Human and Environment System	6	5+1
5	Climate Change Vulnerability and Adaptation	6	5+1
6	Rural Development	6	5+1
7	Industrial Development	6	5+1
8	Sustainable Resource Development	6	5+1
<b>D. ABILITY ENHANCEMENT COURSES (COMPULSORY)</b>			
	PAPER TITLES	Credits 8 (4x2)	Credit Hours L T O [To be devised by institutions]
1	Geographic Information System (Practical)	4	8
2	Spatial Statistical Techniques	4	3+1
<b>E. SKILL ENHANCEMENT COURSES</b>			
	Course Titles	Credits 8 (4x2)	Credit Hours L T O [To be devised by institutions]
1	Introduction to GIScience (Practical)	4	8
2	Thematic Atlas	4	3+1
<b>Note:</b> 1. Universities/Institutions/Departments may wish to add more courses against categories marked C, D and E, depending on the availability of specialists and other required resources. 2. Any major deviation from category A is likely to impact the very philosophy of LOCF in Geography.			

## **10.2. Choice Based Credit System (CBCS)**

### **SYLLABUS OF COURSES TO BE OFFERED**

#### **B.A. / B. Sc (Honours) Geography**

##### **Core Courses (All courses are compulsory)**

##### **Semester I**

1. Geomorphology
2. Cartographic Techniques (Practical)

##### **Semester II**

3. Geography of Human and Cultural Landscape
4. Statistical Methods in Geography (Practical)

##### **Semester III**

5. Climatology and Oceanography
6. Fundamentals of Remote Sensing (Practical)
7. Geography of India

##### **Semester IV**

8. Introduction to Global Economic System
9. Environment and Natural Resource Management
10. Digital Remote Sensing (Practical)

##### **Semester V**

11. Regional Planning and Sustainable Development
12. Field Techniques, Surveying and Research Methods (Practical)

##### **Semester VI**

13. Evolution of Geographical Thought
14. Disaster Management Project Work (Practical)

## **Skill Enhancement Course (1 per semester)**

### **Semester III (any one of the following)**

1. Geographic Information System(Practical)
2. Spatial Statistical Techniques

### **Semester IV (any one of the following)**

3. Introduction to GIScience (Practical)
4. Thematic Atlas

## **Elective Discipline Specific (Any Four)**

### **Semester V**

#### **DSE-1**

- 1.Demography and Population Studies
- 2.Hydrology and Soil Studies

#### **DSE-2**

- 3.Urbanization and Urban System
- 4.Agriculture and Food Security

### **Semester VI**

#### **DSE-3**

- 5.Geography of Health
- 6.Political Geography

#### **DSE-4**

- 7.Biogeography
- 8.Geography of Social Wellbeing

## **Elective Generic Papers (any four)**

### **Semester I (any one)**

1. Disaster Management
2. Geography of Tourism and Pilgrimage

### **Semester II (any one)**

3. Geospatial Information Technology
4. Coupled Human and Environment System

### **Semester III (any one)**

5. Climate Change Vulnerability and Adaptation
6. Rural Development

### **Semester IV (any one)**

7. Industrial Development
8. Sustainable Resource Development

## **Core Courses**

### **1. Geomorphology**

#### **Learning Outcomes:**

After the completion of course, the students will have ability to:

1. Understand the functioning of Earth systems in real time and analyze how the natural and anthropogenic operating factors affects the development of landforms
2. Distinguish between the mechanisms that control these processes
3. Assess the roles of structure, stage and time in shaping the landforms, interpret geomorphological maps and apply the knowledge in geographical research.

#### **Course Content:**

1. Geomorphology: Nature, Scope, Key concepts and Systems approach; Earth: Interior Structure.
2. Earth Movements: Isostasy. Plate Tectonics, Types of Folds and Faults, Earthquakes and Volcanoes.
3. Geomorphic Processes: Weathering, Mass Wasting, Cycle of Erosion (Davis and Penck).
4. Evolution of Landforms (Erosional and Depositional): Fluvial, Karst, Aeolian, Glacial, and Coastal.
5. Applied Geomorphology and Environment.

#### **References:**

1. Bloom, A. L., (2003): *Geomorphology: A Systematic Analysis of Late Cenozoic Landforms*, Prentice-Hall of India, New Delhi.
2. Bridges, E. M., (1990): *World Geomorphology*, Cambridge University Press, Cambridge.
3. Christopherson, R. W. and Birkeland, G. H., (2012) *Geosystems: An Introduction to Physical Geography* (8<sup>th</sup> edition), Pearson Education, New Jersey.
4. Das Gupta, A and Kapoor, A.N., (2001) *Principles of Physical Geography*, S.C. Chand & Company Ltd. New Delhi.



5. Dayal, P., (1996) A Text book of Geomorphology. Shukla Book Depot, Patna.
6. Huggett, R.J. (2007) *Fundamentals of Geomorphology*, Routledge, New York.
7. Kale, V. S. and Gupta A., (2001): *Introduction to Geomorphology*, Orient Longman, Hyderabad.
8. Khullar, D.R., (2012)*Physical Geography*, Kalyani Publishers, New Delhi.
9. Mal, Suraj, Singh, R.B. and Huggel, Christian (2018): *Climate Change, Extreme Events and Disaster Risk Reduction*, Springer, Switzerland, pages 309.
10. Selby, M.J., (2005): *Earth's Changing Surface*, Indian Edition, OUP
11. Singh, S (2009):*BhautikBhugolkaSwaroop(Hindi)*, PrayagPustak,Allahabad.
12. Skinner, Brian J. and Stephen C. Porter (2000), *The Dynamic Earth: An Introduction to Physical Geology*, 4th Edition, John Wiley and Sons.
13. Strahler, A. H. and Strahler, A N., (2001):*Modern Physical Geography* (4/E), John Wiley and Sons, Inc., New York.
14. Summerfield M. A. (2013): *Global Geomorphology*, Routledge, New York
15. Thornbury, W. D., (2004): *Principles of Geomorphology*, Wiley, New York.
16. Tikka, R N (1989): *BhautikBhugolkaSwaroop(Hindi)*, Kedarnath Ram Nath, Meerut.

## 2. Cartographic Techniques (Practical)

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Read and prepare maps.
2. Comprehend locational and spatial aspects of the earth surface.
3. Use and importance of maps for regional development and decision making.

### Course Content:

1. Cartography – Nature and Scope; Scales – Concept and application; Graphical Construction of Plain, Comparative and Diagonal Scales.
2. Map Projections – Classification, Properties and Uses; Merits and Demerits of Polar Zenithal, Stereographic, Bonne's and Mercator's Projections.
3. Topographic profiles-Introduction and plotting of Cross and Longitudinal Profiles.
4. Topographical Maps- Interpretation (one each- hilly/plain area) and Slope Analysis (Wentworth's method).
5. Interpretation of Weather Maps (at least one of summer, winter and monsoon seasons)

### Practical Record:

A Project File in pencil comprising one exercise *each*, on scale, map projection, profile, interpretation of topographic sheet and weather maps.

### References:

1. Anson, R., and Ormelling F. J.,(1994): *International Cartographic Association: Basic Cartographic*, Vol.Pregmen Press.
2. Singh, Gopal., (1998): *Map Work and Practical Geography (4th Edition)*, Vikas Publishing House, Ahmedabad.
3. Gupta, K.K. and Tyagi V.C.,(1992): *Working with Map*, Survey of India, DST, New Delhi.
4. Kraak, M.J., (2010):*Cartography: Visualization of Geospatial Data* (3<sup>rd</sup> edition), Pearson Education Ltd., London.

5. Misra, R.P.,(2014): *Fundamentals of Cartography* (Second Revised and Enlarged Edition), Concept Publishing, New Delhi.
6. Monkhouse, F. J. and Wilkinson, H. R.,(1973): *Maps and Diagrams*, Methuen, London.
7. Rhind, D. W. and Taylor D. R. F., (eds.) (1989): *Cartography: Past, Present and Future*, Elsevier, International Cartographic Association.
8. Robinson, A. H.,(2009): *Elements of Cartography* (6<sup>th</sup> Edition), John Wiley and Sons, New York.
9. Sarkar, A.,(2015):*Practical geography: A systematic approach*, Orient Black Swan Private Ltd., New Delhi
10. Sharma, J. P., (2010): *PrayogicBhugol(Hindi)*, Rastogi Publishers, Meerut.
11. Singh, R.L. and Singh R.P.B.,(1999): *Elements of Practical Geography*, Kalyani Publishers, New Delhi.
12. Singh, R.L. & Dutta, P.K., (2012):*PrayogatmakBhugol(Hindi)*, Central Book Depot, Allahabad
13. Singh,R.L.,& Singh, Rana. P.B.,(1991):*PrayogtmakBhugolkeMoolTatva(Hindi)*, Kalyani Publishers, New Delhi
14. Steers, J.A. (1970):*An Introduction to the Study of Map Projections*, University of London Press, London.
15. Khan, Zulfequar Ahmad., (1998):*Text book of Practical Geography*, Concept Publishing Company, New Delhi.

### 3. Geography of Human and Cultural Landscape

#### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Know the changing human and cultural landscape at different levels.
2. Understand patterns and processes of population growth and its implications.
3. Appreciate the nature and quality of human landscapes.

#### Course Content:

1. Human Geography: Definition, Scope and Principles; Contemporary Relevance.
2. Population: Population Growth and Distribution; Population Composition; Malthusian and Demographic Transition Theories.
3. Space and Society: Cultural Regions; Race; Tribes, Religion and Language.
4. Settlements: Types of Rural Settlements; Classification of Urban Settlements; Trends and Patterns of World Urbanization.
5. Population-Resource Relationships and Regional Resource Development

#### References:

1. Chandna, R.C., (2017): *Population Geography*, Kalyani Publishers, New Delhi.
2. Daniel, P.A. and Hopkinson, M.F. (1989): *The Geography of Settlement*, Oliver & Boyd, London.
3. Hassan, M.I. (2005): *Population Geography*, Rawat Publications, Jaipur
4. Hussain, Majid., (2012): *ManavBhugol*, Rawat Publications, Jaipur.
5. Johnston, R., Gregory, D., & Pratt, G., et al. (2008): *The Dictionary of Human Geography*, Blackwell Publication.
6. Jordan-Bychkov., et al., (2006): *The Human Mosaic: A Thematic Introduction to Cultural Geography*, W. H. Freeman and Company, New York.
7. Kaushik, S.D., (2010): *ManavBhugol*, Rastogi Publication, Meerut.
8. Maurya, S.D., (2012): *ManavBhugol*, ShardaPustakBhawan, Allahabad.
9. Rozenblat., Celine., Pumain., Denise and Velasquez., Elkin Eds. (2018): *International and Transnational Perspectives on Urban Systems*, Springer, Japan, pages 393.
10. Singh, R.B., Ed. (2015): *Urban Development Challenges, Risk and Resilience in Asian Mega Cities-Sustainable Urban Future of Emerging Asian Mega Region*, Springer, Tokyo, Pages 488, 2015.

## **4. Statistical Methods in Geography (Practical)**

### **Learning Outcomes:**

After the completion of course, the students will have ability to:

1. Understand the basics of data collection and processing for the meaningful outcomes.
2. Comprehend the representation and interpretation of the results.
3. Put into practice results obtained in representation as well as day-to-day life.

### **Course Content:**

1. Use of Data in Geography: Significance of Statistical Methods in Geography; Sources of Data, Scales of Measurement (Nominal, Ordinal, Interval and Ratio).
2. Tabulation and Descriptive Statistics: Frequencies (Deciles, Quartiles), Cross Tabulation, Central Tendency (Mean, Median and Mode, Centro-graphic Techniques, Dispersion (Standard Deviation, Variance and Coefficient of Variation).
3. Sampling: Purposive, Random, Systematic and Stratified.
4. Theoretical Distribution: Probability and Normal Distributions.
5. Association and Correlation: Rank Correlation, Product Moment Correlation, and Simple Regression.

### **Class Record:**

Each student will submit a record containing five exercises:

1. Construct a data matrix (of about 10 x 10) with each row representing an areal unit (districts or villages or towns) and about 10 columns of relevant attributes of the areal units.
2. Based on the above table, a frequency table, measures of central tendency and dispersion would be computed and interpreted for any two attributes.
3. Histograms and frequency curve would be prepared for the entire data set and attempt to fit a normal curve and interpreted for one or two variables.
4. From the data matrix a sample set (20 per cent) would be drawn using random-systematic and/or stratified methods of sampling and locate the samples on a map with a short note on method used.

5. Based on the sample set and using two relevant attributes, a scatter and regression line would be plotted and residual from regression would be mapped with a short interpretation.

## References:

1. Ajai, S. G. and Sanjaya, S.G. (2009) *Statistical Methods for Practice and Research*, Sage Publications, New Delhi.
2. Berry, B. J. L. and Marble, D. F. (eds.): *Spatial Analysis—A Reader in Geography*.
3. Ebdon, D., (1977): *Statistics in Geography: A Practical Approach*.
4. Hammond, P. and McCullagh, P. S., (1978): *Quantitative Techniques in Geography: An Introduction*, Oxford University Press.
5. King, L. S., (1969): *Statistical Analysis in Geography*, Prentice-Hall.
6. Mahmood, A., 1977: *Statistical Methods in Geographical Studies*, Concept.
7. Pal, S. K., (1998): *Statistics for Geoscientists*, Tata McGraw Hill, New Delhi.
8. Rogerson, P. A., (2001) *Statistical Methods for Geography*, Sage Publications, New Delhi.
9. Sarkar, A. (2013): *Quantitative geography: techniques and presentations*. Orient Black Swan Private Ltd., New Delhi
10. Shinha, Indira., (2007): *Sankhyikibhugol(Hindi)*. Discovery Publishing House, New Delhi.
11. Silk, J., (1979): *Statistical Concepts in Geography*, Allen and Unwin, London.
12. Taylor P.J., (1983) *Quantitative Methods in Geography: An Introduction to Spatial Analysis*, Waveland Press, Boston Publishers.
13. Yeates, M., (1974): *An Introduction to Quantitative Analysis in Human Geography*, McGraw Hill, New York.

## 5. Climatology and Oceanography

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Understand the elements of weather and climate and its impacts at different scales.
2. Comprehend the climatic aspects and its bearing on planet earth.
3. Understand the oceanic process and availability of resources.

### Course Content:

1. Atmospheric Composition and Structure: Variation with Altitude, Latitude and Season; Insolation and Temperature: Factors and Distribution, Heat Budget, Temperature Inversion.
2. Atmospheric Pressure and Winds: Planetary Winds, Forces affecting Winds, General Circulation of Air, Jet Streams; Atmospheric Moisture: Evaporation, Humidity, Condensation, Fog and Clouds, Precipitation Types, Stability and Instability; Climatic Regions.
3. Cyclones: Tropical Cyclones, Temperate Cyclones, Monsoon - Origin and Mechanism, El Nino.
4. Ocean Floor Topography and Oceanic water Movements: Waves, Currents and Tides.
5. Ocean Salinity and Temperature: Distribution and Determinants; Coral Reefs and Marine Deposits and Ocean Resources.

### References:

1. Anikouchine, W. A. and Sternberg, R. W., (1973): *The World Oceans: An Introduction to Oceanography*, Prentice-Hall.
2. Barry, R. G., and Chorley, R. J., (2009): *Atmosphere, Weather and Climate*(9<sup>th</sup> Edition), Routledge, New York.
3. Bhutani, S., (2000): *Our Atmosphere*, Kalyani Publishers, Ludhiana.
4. Critchfield, H. J., (1987): *General Climatology*, Prentice-Hall of India, New Delhi
5. Gupta, L.S., (2000): *Jalvayu Vigyan(Hindi)*, Madhyam Karyanvay Nidishalya, Delhi Vishwa Vidhyalaya, Delhi

6. Kershaw, S., (2000): *Oceanography: An Earth Science Perspective*, Stanley Thornes, UK.
7. Lal, D. S., (2006): *Jalvayu Vigyan (Hindi)*, Prayag Pustak Bhavan, Allahabad
8. Lutgens, F. K., Tarbuck E. J. and Tasa D., (2009): *The Atmosphere: An Introduction to Meteorology*, Prentice-Hall, Englewood Cliffs, New Jersey.
9. Oliver, J. E., and Hidore J. J., (2002): *Climatology: An Atmospheric Science*, Pearson Education, New Delhi.
10. Pinet, P. R., (2008): *Invitation to Oceanography* (Fifth Edition), Jones and Barlett Publishers, USA, UK and Canada.
11. Singh, S., (2009): *Jalvayu Vigyan (Hindi)*, Prayag Pustak Bhawan, Allahabad
12. Strahler, A.N., (1987) *Modern Physical Geography*, John Wiley and Sons, New York, Singapore.
13. Sverdrup, K. A. and Armbrust, E. V., (2008): *An Introduction to the World Ocean*, McGraw Hill, Boston.
14. Trewartha, G. T., and Horne L. H., (1980): *An Introduction to Climate*, McGraw-Hill.



## **6. Fundamentals of Remote Sensing (Practical)**

### **Learning Outcomes:**

After the completion of course, the students will have ability to:

1. Appreciate the strength and application of remote sensing
2. Map the resources, their location and availability
3. Apply this knowledge for sustainable development

### **Course Content:**

1. Remote Sensing: Definition, Development, Platforms and Types
2. Aerial Photography and Satellite Remote Sensing: Principles, Types and Geometry of Aerial Photograph; EMR Interaction with Atmosphere and Earth Surface; Satellites – geostationary and remote sensing (Landsat and IRS) and Sensors, Resolution (spatial and temporal).
3. Introduction to Image Processing and Data Analysis: Geo-Referencing; Editing and Output.
4. Interpretation and Application of Remote Sensing: Land use/ Land Cover, Urban Sprawl Analysis,.
5. Interpretation and Application of Remote Sensing: Forests Monitoring, Water Resources and Natural hazards.

### **Practical Record:**

A project file consisting of two exercises will be done from aerial photos and satellite images (scale, orientation and interpretation) and 3 exercises on using any Software on above mentioned themes.

### **References:**

1. Anji Reddy, M. (2008): Textbook of Remote Sensing and Geographic Information System, B.S. Publication, Hyderabad
2. Campbell, J. B., (2007): *Introduction to Remote Sensing*, Guildford Press.
3. Chauniyal, D.D., (2010): *SudurSamvedanevam Bhogolik Suchana Pranali (Hindi)*, Sharda Pustak Bhawan, Allahabad.

4. Jensen, J. R., (2004): *Introductory Digital Image Processing: A Remote Sensing Perspective*, Prentice Hall Inc., New Jersey.
5. Jensen, J.R. (2007): *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice-Hall Inc., New Jersey.
6. Joseph, G. (2005): *Fundamentals of Remote Sensing*, United Press India.
7. Kumar, Dilip, Singh, R.B. and Kaur, Ranjeet (2019): *Spatial Information Technology for Sustainable Development Goals*, Springer.
8. Lillisand, T.M., and Kiefer, P.W., (2007): *Remote Sensing and Image Interpretation*, 6<sup>th</sup> Edition, John Wiley & Sons, New York.
9. Nag, P. and Kudra, M., (1998): *Digital Remote Sensing*, Concept, New Delhi.
10. Rees, W. G., (2001): *Physical Principles of Remote Sensing*, Cambridge University Press.
11. Sarkar, A. (2015): *Practical geography: A systematic approach*. Orient Black Swan Private Ltd., New Delhi
12. Singh, R. B. and Murai, S., (1998): *Space-informatics for Sustainable Development*, Oxford and IBH Pub.
13. Wolf, P. R. and Dewitt, B. A., (2000): *Elements of Photogrammetry: With Applications in GIS*, McGraw-Hill.

## 7. Geography of India

### Learning outcomes:

After the completion of course, the students will have ability to:

1. Understand the physical profile of the country
2. Study the resource endowment and its spatial distribution and utilization for sustainable development
3. Synthesise and develop the idea of regional dimensions.

### Course Content:

1. Physical: Location, Physiographic Divisions, Climate: characteristics and classification; Soil and Natural vegetation
2. Population: Distribution and Growth, Structure; Social: Distribution of Population by Race, Caste, Religion, Language, Tribes and their Correlates.
3. Regionalisation of India: Physiographic (R. L. Singh), Socio-Cultural (Sopher), Economic (Sengupta)
4. Economic: Mineral and Power Resources: Distribution and Utilization of Iron Ore, Coal, Petroleum, Gas; Agricultural Production of Rice, Wheat, Cotton and Sugarcane;
5. Spatial Patterns of Industrial Development: Automobile and Information Technology

### References:

1. Deshpande, C. D., (1992): *India: A Regional Interpretation*, ICSSR, New Delhi.
2. Douglas, L. Johnson.,(2009): *World Regional Geography*, Tenth edition, Pearson Education Inc, New Jersey.
3. Johnson, B. L. C., ed. (2001):*Geographical Dictionary of India*. Vision Books, New Delhi.
4. Khullar, D.R. (2014): *India: A Comprehensive Geography*, Kalyani Publishers, New Delhi.
5. Majid Husain (2009): *Geography of India*, Tata McGraw hill Education Private Ltd, New Delhi.
6. Mandal, R. B. (ed.), (1990): *Patterns of Regional Geography–An International Perspective. Vol. 3–Indian Perspective*.

7. Pathak, C. R. (2003): *Spatial Structure and Processes of Development in India*. Regional Science Assoc., Kolkata.
8. Sdyasuk, Galina and P, Sengupta., (1967): *Economic Regionalisation of India*, Census of India.
9. Sharma, T.C. (2013): *Economic Geography of India*. Rawat Publication, Jaipur.
10. Singh R. L., (1971): *India: A Regional Geography*, National Geographical Society of India.
11. Singh, Jagdish.,(2003): *India - A Comprehensive & Systematic Geography*, Gyanodaya Prakashan, Gorakhpur.
12. Singh, R. B. and Prokop, Pawel.,(2016): *Environmental Geography of South Asia*, Springer, Japan.
13. Spate O. H. K. and Learmonth A. T. A., (1967): *India and Pakistan: A General and Regional Geography*, Methuen.
14. Tirtha, Ranjit (2002): *Geography of India*, Rawat Publs., Jaipur & New Delhi.
15. Tiwari, R.C. (2007): *Geography of India*. PrayagPustakBhawan, Allahabad.

## 8. Introduction to Global Economic System

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Distinguish different types of economic activities and their utilities.
2. Appreciate the factors responsible for the location and distribution of activities.
3. Examine the significance and relevance of theories in relation to the location of different economic activities.

### Course Content:

1. Introduction to Global Economic System: Concept and Classification of Economic Activities.
2. Theories: Agriculture (Von Thunen); Industry (Weber's theory).
3. Primary Activities: Agriculture, Precision agriculture, Forestry, Fishing and Mining.
4. Secondary Activities: Manufacturing (Cotton Textile, Iron and Steel), Concept of Manufacturing Regions, Special Economic Zones and Technology Parks.
5. Tertiary Activities: Transport, Trade and Services.

### References:

1. Alexander, J. W., (1963): *Economic Geography*, Prentice-Hall Inc., Englewood Cliffs, New Jersey.
2. Bagchi-Sen, S. and Smith, H. L., (2006): *Economic Geography: Past, Present and Future*, Taylor and Francis.
3. Clark, Gordon L.; Feldman, M.P. and Gertler, M.S., eds. (2000): *The New Oxford Handbook of Economic Geography*, Oxford Press.
4. Coe, N. M., Kelly P. F. and Yeung H. W., (2007): *Economic Geography: A Contemporary Introduction*, Wiley-Blackwell.
5. Combes, P., Mayer T. and Thisse, J. F., (2008): *Economic Geography: The Integration of Regions and Nations*, Princeton University Press.
6. Durand, L., (1961): *Economic Geography*, Crowell.
7. Hodder, B. W. and Lee, Roger, (1974): *Economic Geography*, Taylor and Francis.

8. Knowles, R. & Wareing, J., (2004): *Economic and Social Geography Made Simple*, Rupa & Co., Kolkata.
9. Knox, P. & Marston, S., (2013): *Human Geography: Places and Regions in Global Context*, 6th Edition, Pearson Education, New Delhi
10. Prithwish, Roy (2014): *Economic Geography - A study of Resources*, New Central Book Agency, Kolkata.
11. Saxena, H.M., (2013): *Economic Geography*, Rawat Publications, Jaipur.
12. Siddhartha, K., (2013): *Economic Geography*, Kisalaya Publications Pvt. Ltd., New Delhi.
13. Wheeler, J. O., (1998): *Economic Geography*, Wiley.
14. Willington, D. E., (2008): *Economic Geography*, Husband Press.

## 9. Environment and Natural Resource Management

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Understand the dynamic interactive relationship between man and environment.
2. Have sound understanding on distribution, utilization and proper management of natural resources at global level.
3. Make assessment and review of planning and policies related to environment and natural resources.

### Course Content:

1. Environment and Natural Resource Management: Concept, Human-Environment Relationships;
2. Ecosystem: Concept, Structure and Functions.
3. Environmental Issues in Tropical, Temperate and Polar Ecosystems.
4. Natural Resource: Concept, Classification; Distribution, Utilisation, Problems and Management of Land, Water Forests and Energy.
5. Appraisal and Conservation of Environment and Natural Resources and Sustainable Resource Development.
6. Environmental Programmes and Policies – Global, National and Local levels

### References:

1. Chandna, R. C., (2002): *Environmental Geography*, Kalyani, Ludhiana.
2. Cunningham, W. P. and Cunningham, M. A., (2004): *Principals of Environmental Science: Inquiry and Applications*, Tata Macgraw Hill, New Delhi.
3. Goudie, A., (2001): *The Nature of the Environment*, Blackwell, Oxford.
4. Holechek, J. L. C., Richard, A., Fisher, J. T. and Valdez, R., (2003): *Natural Resources: Ecology, Economics and Policy*, Prentice Hall, New Jersey.
5. Jones, G. and Hollier, G., (1997): *Resources, Society and Environmental Management*, Paul Chapman, London.
6. Kumaraswamy, K., Alagappa Moses., A & Vasanthy, M. (2004) *Environmental Studies*, Bharathidasan University, Tiruchirappalli.

7. Miller, G. T., (2004): *Environmental Science: Working with the Earth*, Thomson BrooksCole, Singapore.
8. Mitchell, B., (1997): *Resource and Environmental Management*, Longman Harlow, England.
9. MoEF, (2006): *National Environmental Policy-2006*, Ministry of Environment and Forests, Government of India.
10. Odum, E. P. et al, (2005): *Fundamentals of Ecology*, Cengage Learning India.
11. Saxena, H.M., 2012: *Environmental Studies*, Rawat Publications, Jaipur.
12. Singh, R.B., and Hietala, R. (Eds.) (2014): *Livelihood security in Northwestern Himalaya: Case studies from changing socio-economic environments in Himachal Pradesh, India. Advances in Geographical and Environmental Studies*, Springer
13. Singh, Savindra.,(2001): *Paryavaran Bhugol (Hindi)*, Prayag Pustak Bhawan, Allahabad. (in Hindi)
14. Singh, R.B., Prokop, Pawel (Eds.) (2016): *Environmental Geography of South Asia*, Springer Japan
15. UNEP, (2007): *Global Environment Outlook: GEO4: Environment for Development*, United Nations Environment Programme.



## 10. Digital Remote Sensing (Practical)

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Develop the skill so as to use digital satellite data using software
2. Prepare the maps based with satellite data to compare with the ground realities.
3. Classify digital data for the land use/land cover and urban studies

### Course Content:

1. Image Processing (Digital and Manual): Pre-processing (Radiometric and Geometric Correction); Enhancement (Filtering); Classification (Supervised and Un-supervised)
2. Digital Image Processing and Interpretation.
3. Application of Digital Remote Sensing: Land Use /Land Cover.
4. Application of Digital Remote Sensing in Urban Studies.
5. Application of Remote Sensing in weather (cyclones) studies and natural hazards (e.g. floods)

**Practical Record:** A project file consisting of 5 exercises on using any method on above mentioned themes.

### References:

1. Bhatta , B., (2008): *Remote Sensing and GIS*, Oxford University Press, New Delhi.
2. Campbell, J. B., (2007): *Introduction to Remote Sensing*, Guildford Press
3. Chauniyal, D., (2010): *SudurSamvedana Avam Bhaugolik Suchna Pranali*, Sharda Pustak Bhawan, Allahabad.
4. Hord R.M.,(1989): *Digital Image Processing of Remotely Sensed Data*, Academic, New York.
5. Jensen, J. R., (2005): *Introductory Digital Image Processing: A Remote Sensing Perspective*, Pearson Prentice-Hall.
6. Jensen, J. R.,(2007): *Remote Sensing of the Environment: An Earth Resource Perspective*, Prentice-Hall Inc, New Jersey.
7. Joseph, G.,(2005): *Fundamentals of Remote Sensing*, United Press India.

8. Kumar, Dilip, Singh, R.B. and Kaur, Ranjeet.,(2019): “*Spatial Information Technology for Sustainable Development Goals*”, Springer.
9. Li, Z., Chen, J. and Batsavias, E., (2008): *Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences*, CRC Press, Taylor and Francis, London
10. Lillesand, T. M., Kiefer R. W. and Chipman, J. W., (2004): *Remote Sensing and Image Interpretation*, Wiley. (Wiley Student Edition).
11. Mukherjee, S. (2004): *Textbook of Environmental Remote Sensing*, Macmillan, Delhi.
12. Nag, P. and Kudra, M., (1998): *Digital Remote Sensing*, Concept, New Delhi.
13. Richards, J. A. and JiaXiuping., (2005): *Remote Sensing Digital Image Analysis: An Introduction*, 4<sup>th</sup> Edition, Springer, Verlag, Berlin.

## 11. Regional Planning and Sustainable Development

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Identify notable lagging regions and solutions for their overall development
2. Have comprehensive understanding regarding the different regions and application of different models and theories for integrated regional development.
3. Select appropriate indicators for the measurement of socio-economic regional development.

### Course Content:

1. Definition of Region, Evolution and Types of Regional planning: Formal, Functional, and Planning Regions and Regional Planning; Need and types of Regional Planning.
2. Choice of a Region for Planning: Characteristics of an Ideal Planning Region; Delineation of Planning Region; Regionalization of India for Planning (Agro-Ecological Zones)
3. Theories and Models for Regional Planning: Growth Pole Model of Perroux; Growth Centre Model in Indian Context; Myrdal, Hirschman, Rostow and Friedmann; Village Cluster.
4. Sustainable Development: Concept of Development and Underdevelopment; Efficiency-Equity Debate: Definition, Components and Sustainability for Development. Indicators (Economic, Social and Environmental).
5. Sustainable Development Policies and Programmes: Rio+20; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance.

### References:

1. Agyeman, Julian, Robert, D. Bullard and Bob, Evans., (Eds.) (2003):*Just Sustainabilities: Development in an Unequal World*. London: Earthscan. (Introduction and conclusion.).
2. Anand, Subhash.,( 2011):*Ecodevelopment : Glocal Perspectives*, Research India Press, New Delhi.
3. Ayers, Jessica and David Dodman., (2010): “*Climate change adaptation and development I: the state of the debate*”. Progress in Development Studies 10 (2): 161-168.

4. Baker, Susan., (2006): *Sustainable Development*. Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge. (Chapter 2, “*The concept of sustainable development*”).
5. Blij, H. J. De., (1971): *Geography: Regions and Concepts*, John Wiley and Sons.
6. Friedmann, J. and Alonso W. (1975): *Regional Policy - Readings in Theory and Applications*, MIT Press, Massachusetts.
7. Gore C. G., (1984): *Regions in Question: Space, Development Theory and Regional Policy*, Methuen, London.
8. Haynes J., (2008): *Development Studies*, Polity Short Introduction Series.
9. Johnson E. A. J., (1970): *The Organization of Space in Developing Countries*, MIT Press, Massachusetts.
10. Misra, R. P., Sundaram, K.V.and V.L.S.Prakasa Rao, (1974): *Regional Development planning in India*, Vikas Publishing House Delhi.
11. Peet, R., (1999): *Theories of Development*, The Guilford Press, New York.
12. Singh, R.B. (2002): *Human Dimensions of Sustainable Development*, Rawat Pub., Jaipur, pages
13. UNDP (2001-04): *Human Development Report*, Oxford University Press.

## **12. Field Techniques, Surveying and Research Methods (Practical)**

### **Learning Outcome:**

After the completion of course, the students will have ability to:

1. Conduct proper field work for the collection of primary data to bring out grassroots realities.
2. Make use of proper tools and surveying methods for measurement in context of collection and processing of data.
3. Prepare a report based on field data.

### **Course Content:**

1. Meaning, Significance, Types and Approaches to Research in Geography; Literature review; Field Work in Geographical Studies –Defining the Field and Identifying the Case Study.
2. Research Design: Identification of Research Problem; Research questions. Data Collection: Type and Sources of Data; Methods of Collection; Data Analysis, Data Representation Techniques.
3. Field Techniques – Merits, Demerits and Selection of the Appropriate Technique; Observation (Participant / Non-Participant), Questionnaires (Open/ Closed / Structured / Non-Structured); Interview with Special Focus Group Discussions.
4. Surveying Use of Field Tools: Plain Table survey, Prismatic Compass, Theodolite.
5. Designing the Field Report – Aims and Objectives, Methodology, Analysis, Interpretation and Writing the Report.

## Practical Record:

1. Each student will prepare an individual report based on primary and secondary data collected during fieldwork.
2. The duration of the fieldwork should not exceed 10 days.
3. The word count of the report should be about 8000 to 12,000 excluding figures, tables, photographs, maps, references and appendices.
4. One copy of the report on A 4 size paper should be submitted in soft binding.

## References:

1. Creswell, J., (1994): *Research Design: Qualitative and Quantitative Approaches* Sage Publications.
2. Dikshit, R. D.,(2003):*The Art and Science of Geography: Integrated Readings*, Prentice-Hall of India, New Delhi.
3. Evans, M., (1988): “*Participant Observation: The Researcher as Research Tool*” in *Qualitative Methods in Human Geography*, eds. J. Eyles and D. Smith, Polity.
4. Misra, R.P., (2014). *Fundamentals of Cartography*. (Second revised, enlarged Edition). Concept Publishing, New Delhi.
5. Mukherjee, Neela.,(1993): *Participatory Rural Appraisal: Methodology and Application*, Concept Publs. Co., New Delhi.
6. Mukherjee, Neela.,(2002):*Participatory Learning and Action: with 100 Field Methods*. Concept Publs. Co., New Delhi
7. 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.
8. Singh, R.L., & Dutta, P.K., (2012): *Prayogatmak Bhugol* (Hindi). Central Book Depot, Allahabad.
9. Special Issue on “Doing Fieldwork” *The Geographical Review* 91:1-2 (2001).
10. Stoddard, R. H., (1982): *Field Techniques and Research Methods in Geography*, Kendall/Hunt.
11. Wolcott, H., (1995): *The Art of Fieldwork*, Alta Mira Press, Walnut Creek, CA.

## 13. Evolution of Geographical Thought

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Distinguish the paradigms in geography discipline through time
2. Understand the geographical thinking in different regions of world
3. Appreciate the past and future trends of world geography in general and Indian geography in particular

### Course Content:

1. **Paradigms** in Geography
2. **Pre-Modern** – Early Origins of Geographical Thinking with reference to the Classical and Medieval Philosophies.
3. **Modern** – Evolution of Geographical Thinking and Disciplinary Trends in Germany, France, Britain, United States of America.
4. **Debates** – Environmental Determinism and Possibilism, Systematic and Regional, Ideographic and Nomothetic.
5. **Trends** – Quantitative Revolution and its Impact, Behaviouralism, Systems Approach, Radicalism, Feminism; Towards Post-Modernism – Changing Concept of Space in Geography, Future of Geography.

### References:

1. Bhat, L.S., (2009): *Geography in India* (Selected Themes). Pearson
2. Bonnett, A., (2008): *What is Geography?* Sage.
3. Dikshit, R. D., (1997): *Geographical Thought: A Contextual History of Ideas*, Prentice–Hall India.
4. Freeman, R., (1970): *Hundred year of Geography*, Hutchinson. London.
5. Hartshorne, R., (1959): *Perspectives of Nature of Geography*, Rand MacNally and Co.
6. Harvey, David., (1969): *Explanation in Geography*, London: Arnold.
7. Holt-Jensen, A., (2011): *Geography: History and Its Concepts: A Students Guide*, SAGE.
8. Hussain, M., (2005): *Bhougolik Chintan Ka Itihas*, Rawat Publications

9. Johnston, R. J., (1997): *Geography and Geographers*, Anglo-American Human Geography since (1945), Arnold, London.
10. Johnston, R. J., (Ed.): *Dictionary of Human Geography*, Routledge.
11. Kapur, A., (2001): *Indian Geography Voice of Concern*, Concept Publications.
12. Martin Geoffrey J., (2005): *All Possible Worlds: A History of Geographical Ideas*, Oxford.
13. Singh, R.B. (2016): *Progress in Indian Geography*, Indian National Science Academy, New Delhi.
14. Soja, Edward (1989): *Post-modern Geographies*, Verso, London. Reprinted 1997: Rawat Publ., Jaipur and New Delhi.
15. Sudeepta, Adhikari., (2015): *Fundamentals of Geographical Thought*, Orientblackswan private limited.



## **14. Disaster Management Project Work (Practical)**

### **Learning Outcomes:**

After the completion of course, the students will have ability to:

1. Understand processes and impact of disaster
2. Understand both the natural and man-made disaster and human negligence in context of environment
3. Write a field work based report on Disaster Management to minimize the disaster risk/  
Risk from Disaster.

### **Course Content:**

The Project Report based on any two fields based case studies among following disasters and one disaster preparedness plan of respective college/locality and district:

1. Flood
2. Drought
3. Cyclone and Hailstorms
4. Earthquake and Volcanoes
5. Landslides
6. Human Induced Disasters: Fire Hazards, Chemical, Industrial accidents

### **References:**

1. Carter, N., (1991): *Disaster Management: A Disaster Manager's Handbook*. Asian Development Bank, Manila.
2. Government of India (2011): *Disaster Management in India*. Ministry of Home Affairs, New Delhi.
3. Government of India (2008): *Vulnerability Atlas of India*. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India
4. Kapur, A., (2010): *Vulnerable India: A Geographical Study of Disasters*, Sage Publication, New Delhi.
5. Modh, S., (2010): *Managing Natural Disaster: Hydrological, Marine and Geological Disasters*, Macmillan, Delhi.

6. Ramkumar, M., (2009): *Geological Hazards: Causes, Consequences and Methods of Containment*, New India Publishing Agency, New Delhi.
7. Savindra, Singh and Jeetendra, S., (2013): *Disaster Management*, Pravalika Publications, Allahabad
8. Singh Jagbir., (2007): “*Disaster Management Future Challenges and Opportunities*”, 2007. Publisher- I.K. International Pvt. Ltd New Delhi, India.
9. Singh, R. B., (ed.), (2006): *Natural Hazards and Disaster Management: Vulnerability and Mitigation*, Rawat Publications, New Delhi.
10. Singh, R.B., (2005): *Risk Assessment and Vulnerability Analysis*, IGNOU, New Delhi. Chapter 1, 2 and 3
11. Sinha, A., (2001): *Disaster Management: Lessons Drawn and Strategies for Future*, New United Press, New Delhi.
12. Stoltman, J.P., et al. (2004): *International Perspectives on Natural Disasters*, Kluwer Academic Publications. Dordrecht.

## **Skill Enhancement Course (Any 2)**

### **15. Geographical Information System (Practical)**

#### **Learning Outcome:**

After the completion of course, the students will have ability to:

1. Understand various components and principles of GIS
2. Construct the thematic maps using different digital layers
3. Apply GIS in various geographical studies

#### **Course Content:**

1. Geographical Information System (GIS): Definition and Components.
2. Global Positioning System (GPS): Principles and Uses.
3. GIS Data Structures: Types (spatial and non-spatial), Raster and Vector Data Structure.
4. GIS Data Analysis: Input; Geo-Referencing; Editing, Output and Query; Overlays.
5. Application of GIS: Land Use Mapping; Urban Sprawl Analysis; Forests Monitoring natural disasters.

#### **Practical Record:**

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

#### **References:**

1. Bhatta, B., (2010): *Analysis of Urban Growth and Sprawl from Remote Sensing*, Springer, Berlin Heidelberg.41
2. Burrough, P.A., and McDonnell, R.A. (2000): *Principles of Geographical Information System-Spatial Information System and Geo-statistics*. Oxford University Press
3. Chauniyal, D.D. (2010): *Sudur Samvedan evam Bhogolik Suchana Pranali*, Sharda Pustak Bhawan, Allahabad
4. Gomarasca, M. A. (2009) *Basics of Geomatics*, Springer Science, New York
5. Heywoods, I., Cornelius, S and Carver, S., (2006): *An Introduction to Geographical Information system*. Prentice Hall.

6. Jha, M.M. and Singh, R.B., (2008) *Land Use: Reflection on Spatial Informatics Agriculture and Development*, New Delhi: Concept.
7. Kumar, Dilip, Singh, R.B. and Kaur, Ranjeet (2019): *Spatial Information Technology for Sustainable Development Goals*, Springer.
8. Nag, P. (2008) *Introduction to GIS*, Concept India, New Delhi.
9. Sarkar, A. (2015) *Practical geography: A systematic approach*. Orient Black Swan Private Ltd., New Delhi
10. Singh, R.B. and Murai, S. (1998) *Space Informatics for Sustainable Development*, Oxford and IBH, New Delhi.

## 16. Spatial Statistical Techniques

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Understand the basics of data collection and, processing for the meaningful outcomes
2. Understand the selection of proper sampling techniques for the collection of data
3. Put into practice the results obtained for spatial analysis of results and to apply various statistical softwares for the study

### Course Content:

1. Statistics and Statistical Data: Spatial and non-spatial; .
2. Probability theory, probability density functions with respect to Normal, Binomial and Poisson distributions and their geographical applications.
3. Sampling plans for spatial and non-spatial data, sampling distributions; sampling estimates for large and small samples tests involving means and proportions.
4. Correlation and Regression Analysis: Rank order correlation and product moment correlation; linear regression, residuals from regression, and simple curvilinear regression; Introduction to multi-variate regression and correlation analysis.
5. Time Series Analysis: Time Series processes; Smoothing time series; Time series components.

Note: Any Statistical Software Package (SPSS, MS Excel, R, etc.) may be used for practice.

### References:

1. Bart, James, E, and Gerald, M. Barber., (1996): *Elementary Statistics for Geographers*, The Guieford Press, London.
2. Cressie, N.A.C., (1991): *Statistics for Spatial Analysis*, Wiley, New York.
3. Eldon, D., (1983): *Statistics in Geography: A Practical Approach*, Blackwell, London.
4. Gregory, S., (1978): *Statistical Methods and the Geographer (4th Edition)*, Longman, London.

5. Haining, R.P., (1990): *Spatial Data Analysis in the Social and Environmental Science*, Cambridge University Press, Cambridge.
6. Hammond, R. and McCullagh, P.S., (1974): *Quantitative Techniques in Geography: An Introduction*, Clarendon Press, Oxford.
7. Mathews, J.A., (1987): *Quantitative and Statistical Approaches to Geography: A Practical Manual*, Pergamon, Oxford.
8. Mc Grew, Jr. and Cahrles, B. M., (1993): *An Introduction to Statistical Problem Solving in Geography*, W.C. Brocan Publishers, New Jersey.
9. Rogerson ,P. A. (2001) *Statistical Methods for Geography*, Sage Publications, New Delhi.
10. Wei, W.S.,(1990): *Time Series Analysis: Variate and Multivariate Methods* , Addison Wesley Publishing.
11. Yeates, Mauris, (1974): *An Introduction to Quantitative Analysis in Human Geography*, McGrawhill, New York.

## 17. Introduction to GIScience (Practical)

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Have comprehensive understand of GIS for the construction of maps and their use the development planning.
2. Have knowledge of using GPS & DGPS for the accurate location
3. Apply the GIScience platform for the monitoring and forecasting analysis

### Course Contents:

1. Evolution of GIScience, Institutions and GI data sharing, GIS: Definition and Components
2. Global Positioning System (GPS) – Principles and Uses
3. GIS Data Structures: Types (spatial and Non-spatial), Raster and Vector Data Structure.
4. GIS Data Analysis: Input; Geo-Referencing; Editing, Query
5. Application of GIS: Land Use Mapping; Urban Sprawl Analysis; Forests Monitoring, Natural disasters

**Practical Record:** A project file consisting of 5 exercises on using any GIS

Software on abovementioned themes.

### References:

1. Bhatta, B., (2010): *Analysis of Urban Growth and Sprawl from Remote Sensing*, Springer, Berlin Heidelberg 41
2. Burrough, P.A., and McDonnell, R.A., (2000): *Principles of Geographical Information System-Spatial Information System and Geo-statistics*. Oxford University Press
3. Chauniyal, D.D., (2010): *Sudur Samvedan evam Bhogolik Suchana Pranali*, Sharda Pustak Bhawan, Allahabad
4. Heywoods, I., Cornelius, S and Carver, S., (2006): *An Introduction to Geographical Information system*, Prentice Hall.

5. Jha, M.M. and Singh, R.B. (2008): *Land Use: Reflection on Spatial Informatics Agriculture and Development*, Concept Publishing, New Delhi.
6. Kumar, Dilip, Singh, R.B. and Kaur, Ranjeet: *Spatial Information Technology for Sustainable Development Goals*, Springer, 2019.
7. Nag, P., (2008): *Introduction to GIS*, Concept India, New Delhi.
8. Sarkar, A., (2015): *Practical geography: A systematic approach*, Orient Black Swan Private Ltd., New Delhi
9. Singh, R.B. and Murai, S., (1998): *Space Informatics for Sustainable Development*, Oxford and IBH, New Delhi.



## 18. Thematic Atlas

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Have sound knowledge regarding the classification and elements of maps.
2. Have proper utilization of maps for the development.
3. Appreciate the preparation of various thematic maps with the application of various techniques.

### Course Content:

1. Maps – Classification and Types; Principles of Map Design.
2. Diagrammatic Data Presentation – Line, Bar and Circle.
3. Thematic Mapping Techniques – Properties, Uses and Limitations; Areal Data -- Choropleth, Dot, Proportional Circles; Point Data – Isopleths.
4. Cartographic Overlays – Point, Line and Areal Data.
5. Thematic Maps – Preparation and Interpretation.

**Practical Record:** A Thematic Atlas should be prepared on a specific theme with at least five plates for any state in India.

### References:

1. Singh, R. L, and Duttta, P. K., (2012): *Prayogatama Bhugol*, Central Book Depot, Allahabad
2. Cuff, J. D. and Mattson, M. T., (1982): *Thematic Maps: Their Design and Production*, Methuen Young Books
3. Dent, B. D., Torguson, J. S., and Holder, T. W., (2008): *Cartography: Thematic Map Design* (6th Edition), McGraw Hill Higher Education
4. Gupta, K. K. and Tyagi, V. C., (1992): *Working with Maps*, Survey of India, DST, New Delhi.
5. Kraak, M.J. and Ormeling, F., (2003): *Cartography: Visualization of Geo-Spatial Data*, Prentice-Hall.
6. Mishra, R. P. and Ramesh, A., (1989): *Fundamentals of Cartography*, Concept, New Delhi.

7. Sarkar, A., (2015): *Practical geography: A systematic approach*. Orient Black Swan Private Ltd., New Delhi
8. Sharma, J. P., (2010): *Prayogic Bhugol (Hindi)*, Rastogi Publishers, Meerut.
9. Singh, R. L. and Singh, Rana, P. B., (1999): *Elements of Practical Geography*, Kalyani Publishers.
10. Singh, L. R, & Singh. R., (1977): *Manchitra or Pryaogatamek Bhugol (Hindi)*, Central Book Depot, Allahabad
11. Singh, R.L. and Dutt, P.K. (1979) *Elements of Practical Geography*, Kalyani Publishers, New Delhi
12. Slocum, T. A., McMaster, R. B. and Kessler, F. C., (2008): *Thematic Cartography and Geovisualization* (3rd Edition), Prentice Hall.
13. Tyner, J. A., (2010): *Principles of Map Design*, The Guilford Press.

## **Elective Discipline Specific (any four)**

### **19. Demography and Population Studies**

#### **Learning Outcome:**

After the completion of course, the students will have ability to:

1. Learn the role of demography and population studies as a distinct fields of human geography
2. Have sound knowledge of key concept, different components of population along with its drivers
3. Examine population dynamics and characteristic with contemporary issues

#### **Course Contents:**

1. Defining the Field – Nature and Scope; Sources of Data with special reference to India (Census, Vital Statistics and NSS).
2. Population Size, Distribution and Growth – Determinants and Patterns; Theories of Growth – Malthusian Theory and Demographic Transition Theory.
3. Population Dynamics: Fertility, Mortality and Migration – Measures, Determinants and Implications.
4. Population Composition and Characteristics – Age-Sex Composition; Rural and Urban Composition; Literacy.
5. Contemporary Issues – Ageing of Population; Declining Sex Ratio; HIV/AIDS.

#### **References:**

1. Barrett, H. R., (1995): *Population Geography*, Oliver and Boyd.
2. Bhende, A. and Kanitkar, T., (2000): *Principles of Population Studies*, Himalaya Publishing House.
3. Chandna, R. C. and Sidhu, M. S., (1980): *An Introduction to Population Geography*, Kalyani Publishers.
4. Chandna, R C (2006): *JansankhyaBhugol*, Kalyani Publishers, Delhi
5. Chandna,R.C., *Geography of Population*, Kalyani Publishers, Ludhiana.
6. Clarke, J. I., (1965): *Population Geography*, Pergamon Press, Oxford.
7. Debjani, Roy., *Population Geography*, Books and Allied Private Limited, Kolkata.

8. Jones, H. R., (2000): *Population Geography*, 3rd ed. Paul Chapman, London.
9. Lutz, W., Warren, C. S. and Scherbov, S., (2004): *The End of the World Population Growth in the 21st Century*, Earthscan
10. Maurya, S D (2009): *JansankyaBhugol*, Sharda Putak Bhawan, Allahabad
11. Newbold, K. B., (2009): *Population Geography: Tools and Issues*, Rowman and Littlefield Publishers.
12. Pacione, M., (1986): *Population Geography: Progress and Prospect*, Taylor and Francis.
13. Panda, B. P., (1988): *JanasankyaBhugol*, M P Hindi Granth Academy, Bhopal
14. Wilson, M. G. A., (1968): *Population Geography*, Nelson.

## 20. Hydrology and Soil Studies

### Learning Outcome

After the completion of course, the students will have ability to:

1. Understand the basic components of hydrological cycle and comprehend practices of integrated watershed management.
2. Evaluate the water balancing and river basin and water disputes.
3. Study the soil as a basic resource, focusing its distribution, problems and management.

### Course Content:

1. Hydrological Cycle: Systems approach in hydrology, human impact on the hydrological cycle; Precipitation, interception, evaporation, evapotranspiration, infiltration, ground-water, runoff and overland flow;
2. Water Balance: input and output; water balance; floods and droughts; Integrated water resource management.
3. River Basin: Characteristics and problems of river basins, basin surface run-off, and measurement of river discharge. Watershed management
4. River Water Dispute; River linkages; Case studies
5. Soil Resource: Definition, Types and Distribution, Utilisation, Problems and Management of Soil Resource.

### References:

1. Andrew. D. ward, and Stanley, Trimble., (2004): *Environmental Hydrology*, 2nd edition, Lewis Publishers, CRC Press.
2. Fetter, C.W. (2005): *Applied Hydrogeology*, CBS Publishers & Distributors, New Delhi.
3. Reddy, K. Ramamohan, Venkateswara Rao,B, Sarala, C., (2014): *Hydrology and Watershed Management*, Allied Publishers.
4. Karanth, K.R., (1988): *Ground Water: Exploration, Assessment and Development*, Tata- McGraw Hill, New Delhi.
5. Lyon, J.G., (2003): *GIS for Water Resource and Watershed Management*, Taylor and Francis, New York.
6. Meinzer, O.E., (1962): *Hydrology*, Dover Publication, New York.

7. Ramaswamy, C., (1985): *Review of floods in India during the past 75 years: A Perspective*, Indian National Science Academy, New Delhi.
8. Rao, K.L., (1982): *India's Water Wealth*, 2nd edition, Orient Longman, Delhi.
9. Singh, M., Singh, R.B. and Hassan, M.I., (Eds.) (2014): *Landscape ecology and water management*, Proceedings of IGU Rohtak Conference, Volume 2. *Advances in Geographical and Environmental Studies*, Springer.
10. Singh, Vijay P., (1995): *Environmental Hydrology*. Kluwar Academic Publications, The Netherlands.
11. Tideman, E.M., (1999): *Watershed management - Guidelines for Indian Conditions*, Omega Scientific Publishers, New Delhi
12. Todd, D.K. (1959): *Ground water Hydrology*, Wiley India Edition, New Delhi.

## 21. Urbanization and Urban System

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Understand the fundamentals and patterns of urbanization process
2. Learn the functional classification of cities and Central Place Theory
3. Know contemporary problems of Delhi, Mumbai, Kolkata and Chennai

### Course Content:

1. Urban Geography: Introduction, nature, scope and approaches.
2. Patterns of Urbanisation in developed and developing countries
3. Functional classification of cities: Quantitative and Qualitative Methods
4. Cities and Central Place Theory: Christaller and Losch
5. Urban Issues: problems of housing, slums, civic amenities (water and transport); Case studies of Delhi, Mumbai, Kolkata, Chennai.

### References:

1. Carter, H., (1972): *The study of Urban Geography*, Edward Arnold, London.
2. Fyfe, N. R. and Kenny, J. T., (2005): *The Urban Geography Reader*, Routledge.
3. Graham, S. and Marvin, S., (2001): *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*, Routledge.
4. Hall, T., (2006): *Urban Geography*, Taylor and Francis.
5. Kaplan, D. H., Wheeler, J. O. and Holloway, S. R., (2008): *Urban Geography*, John Wiley.
6. Knox, P. L., and McCarthy, L., (2005): *Urbanization: An Introduction to Urban Geography*, Pearson Prentice Hall New York.
7. Knox, P. L., and Pinch, S., (2006): *Urban Social Geography: An Introduction*, Prentice-Hall.
8. Pacione, M., (2009): *Urban Geography: A Global Perspective*, Taylor and Francis.
9. Ramachandran, R., (1989): *Urbanisation and Urban Systems of India*, Oxford University Press, New Delhi
10. Ramachandran, R., (1992): *The Study of Urbanisation*, Oxford University Press, Delhi

11. Sassen, S., (2001): *The Global City: New York, London and Tokyo*, Princeton University Press.
12. Singh, R.B., (Ed.) (2015): *Urban development, challenges, risks and resilience in Asian megacities*, Advances in Geographical and Environmental Studies, Springer
13. Singh, R.B., (Eds.) (2001): *Urban Sustainability in the Context of Global Change*, Science Pub., Inc., Enfield (NH), USA and Oxford & IBH Pub., New Delhi.
14. Sharma, Poonam and Rajput, Swati (Eds.) (2017) *Sustainable Smart Cities in India; Challenges and Future Perspectives*, Springer.
15. Sharma, Vishwa Raj and Chadrakanta, (2019): *Making Cities Resilient*, Springer.



## 22. Agriculture and Food Security

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Conceptualise the agriculture and its determinants.
2. Get the overview of Indian and World agriculture regions and systems.
3. Have sound knowledge of agriculture revolutions and food security

### Course Content:

1. Defining the field: Introduction, nature and scope; Land use/ land cover definition and classification.
2. Determinants of Agriculture: Physical, Technological and Institutional
3. Agricultural Regions of India: Agro-climatic, Agro-ecological & Crop Combination Regions.
4. Agricultural Systems of the World (Whittlesey's classification) and Agricultural Land use model (Von Thunen, modification and relevance).
5. Food Security: Concept, approaches, pattern, Indian revolution and government policies.

### References:

1. Basu, D.N., and Guha, G.S., (1996): *Agro-Climatic Regional Planning in India*, Vol.I& II, Concept Publication, New Delhi.
2. Bryant, C.R., Johnston, T.R., (1992): *Agriculture in the City Countryside*, Belhaven Press, London.
3. Burger, A., (1994): *Agriculture of the World*, Aldershot, Avebury.
4. Grigg, D.B., (1984): *Introduction to Agricultural Geography*, Hutchinson, London.
5. Hussain, M. (1996): *Systematic Agricultural Geography*, Rawat Publications, Jaipur.
6. Ilbery, B. W., (1985): *Agricultural Geography: A Social and Economic Analysis*, Oxford University Press.
7. Mohammad, N., (1992): *New Dimension in Agriculture Geography*, Vol. I to VIII, Concept Pub., New Delhi.

8. Roling, N.G., and Wageruters, M.A.E.,(ed.) (1998): *Facilitating Sustainable Agriculture*, Cambridge University Press, Cambridge.
9. Shafi, M., (2006): *Agricultural Geography*, Doring Kindersley India Pvt. Ltd., New Delhi
10. Singh, J., and Dhillon, S.S., (1984): *Agricultural Geography*, Tata McGraw Hill, New Delhi.
11. Tarrant, J. R., (1973): *Agricultural Geography*, David and Charles, Devon.

## 23. Geography of Health

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Understand the key concepts related to health and its driving forces
2. Identify the linkages between the health, environment, exposure and risk.
3. Explain the relationships among health and disease pattern in environmental context with reference to climate change

### Course Content:

1. Perspectives on Health: Definition; linkages with environment, development and health; driving forces in health and environmental trends - population dynamics, urbanization, poverty and inequality.
2. Pressure on Environmental Quality and Health: Human activities and environmental pressure land use and agricultural development; industrialisation; transport and energy.
3. Exposure and Health Risks: Air and water pollution; household wastes;; housing; workplace.
4. Health and Disease Pattern in Environmental Context with special reference to India, Types of Diseases and their regional pattern (Communicable and Lifestyle related diseases).
5. Climate Change and Human Health: Changes in climate system – heat and cold; Biological disease agents; food production and nutrition.

### References:

1. Rais, Akhtar., (Ed.), (1990): *Environment and Health Themes in Medical Geography*, Ashish Publishing House, New Delhi.
2. Avon, Joan, L. and Jonathan, A, Patzed (2001): *Ecosystem Changes and Public Health*, Baltimin, John Hopling Unit Press(ed).
3. Bradley,D.,(1977): *Water, Wastes and Health in Hot Climates*, John Wiley Chichesten.
4. Christaler, George and Hristopoles, Dionissios., (1998): *Spatio-Temporal Environment Health Modelling*, Boston Kluwer Academic Press.

5. Cliff, A.D. and Peter, H., (1988): *Atlas of Disease Distributions*, Blackwell Publishers, Oxford.
6. Gatrell, A. and Loytonen, (1998): *GIS and Health*, Taylor and Francis Ltd, London.
7. Harpham T. and Tanner, M., (eds) (1995): *Urban Health in Developing Countries; Progress and Prospects*, Routledge, London.
8. Hazra, J., (1997): *Health Care Planning in Developing Countries*. University of Calcutta, Calcutta.
9. Moeller, Dade, ed., (1993): *Environmental Health*, Cambridge, Harvard Univ. Press.
10. Murray, C. and A. Lopez, (1996): *The Global Burden of Disease*, Harvard University Press.
11. Narayan, K.V., (1997): *Health and Development Inter-Sectoral Linkages in India*. Rawat Publications, Jaipur.
12. Phillips, D. and Verhasselt, Y., (1994): *Health and Development*, Routledge, London.
13. Tromp, S., (1980): *Biometeorology: The Impact of Weather and Climate on Humans and their Environment*, Heydon and Son.

## 24. Political Geography

### Course Learning Outcomes:

After the completion of course, the students will have ability to:

1. Learn the concept of nation and state and geopolitical theories
2. Understand the different dimensions of electoral geography and resource conflicts
3. Have sound knowledge of politics of displacement, focusing on dams and SEZ

### Course Content:

1. Introduction: Concepts, Nature and Scope.
2. State, Nation and Nation State – Concept of Nation and State, Attributes of State – Frontiers, Boundaries, Shape, Size, Territory and Sovereignty, Concept of Nation State; Geopolitics; Theories (Heartland and Rimland)
3. Electoral Geography – Geography of Voting, Geographic Influences on Voting pattern, Geography of Representation, Gerrymandering.
4. Political Geography of Resource Conflicts – Water Sharing Disputes, Disputes and Conflicts Related to Forest Rights and Minerals.
5. Politics of Displacement: Issues of relief, compensation and rehabilitation: with reference to Dams, Highways and Special Economic Zones

### References:

1. Adhikari, S. (2007): *Political Geography*, Rawat Publication, NewDelhi.
2. Adhikari, S. (2013): *Political Geography of India* –Sharda Pustak Bhawan, Allahabad.
3. Agnew, J., (2002): *Making Political Geography*, Arnold.
4. Agnew, J., Mitchell K. and Total G., (2003): *A Companion to Political Geography*, Blackwell.
5. Cox, K. R., Low M. and Robinson J., (2008): *The Sage Handbook of Political Geography*, Sage Publications.
6. Cox, K., (2002): *Political Geography: Territory, State and Society*, Wiley-Blackwell
7. Gallaher, C., et al, (2009): *Key Concepts in Political Geography*, Sage Publications.
8. Glassner, M., (1993): *Political Geography*, Wiley.
9. Hodder, Dick, Sarah, J, Llyod and Keith, S, McLachlan., (1998): *Land Locked States of Africa and Asia (vo.2)*, Frank Cass

10. Jones, M., (2004): *An Introduction to Political Geography: Space, Place and Politics*, Routledg .
11. Painter, J. and Jeffrey, A., (2009): *Political Geography*, Sage Publications.
12. Taylor, P. and Flint, C., (2000): *Political Geography*, Pearson Education.
13. Verma, M. K., (2004): *Development, Displacement and Resettlement*, Rawat Publications, Delhi.

## 25. Biogeography

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Familiarise the dynamics of climate and related theories.
2. Understand of Vegetation as an index of climate.
3. Assess of different aspects of floral and faunal provinces.

### Course Content:

1. Introduction to Bio-geography: Nature, scope, and components.
2. World Climatic Patterns (Koppen) vis-à-vis biogeographical regions
3. Evolution of major groups of floral and faunal provinces.
4. Ecological successions: stages and climax.
5. Biodiversity; bio-diversity hotspots, biodiversity conservation.

### References:

1. Bhattacharyya, N.N.(2003): *Biogeography*, Rajesh Publications, New Delhi.
2. Clarke, G. L. (1967): *Elements of ecology*, New York: John Wiley Pub.
3. Haden-Guest, S., Wright, J. K. and Teclaff, E. M. (1956): *World Geography of Forest Resources*, New York: Ronald Press Co.
4. Hoyt, J.B. (1992): *Man, and the Earth*, Prentice Hall, U.S.A.
5. Huggett, R.J. (1998): *Fundamentals of Biogeography*, Routledge, U.S.A.
6. Lal, D. S. 2003. *Climatology*, Allahabad: ShardaPustakBhawan.
7. Lapedes, D.N. (1974): *Encyclopaedia of Environmental Science* (eds.), McGraw Hill.
8. Mal, Suraj., and Singh, R.B. (Eds.) (2009): *Biogeography and Biodiversity*, Rawat Publication, Jaipur
9. Mathur, H.S. (1998): *Essentials of Biogeography*, Anuj Printers, Jaipur.
10. *Mountain and Tree cover in Mountain Regions Report - 2002*, UNEP-WCMC.
11. Parmesan, C., Yohe, G. (2003): *A globally coherent fingerprint of climate change impacts across natural systems*. *Nature*, 421 (6918), 37–42
12. Singh, Savindra (2015): *Paryawaran Bhoogol (Hindi)*, PrayagPustakBhawan, Allahabad (Hindi).
13. Sivaperuman, Chandrakasan et al., (2018): *Biodiversity and Climate Change Adaptation in Tropical Islands*, Academic Press, London.

14. Trewartha, G. T., (1980): *An Introduction to Climate*, McGraw Hill Company, New York.



## 26. Geography of Social Wellbeing

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Understand the nature, scope and relationships of geography and human wellbeing;
2. Acquire knowledge on spatial dimensions of social diversity components;
3. Appreciate the social welfare programs related to inclusive and exclusive policies in India.

### Course Content:

1. Geography of Social Wellbeing: Concept, Origin, Nature and Scope.
2. Social Diversity: Caste, Class, Religion, Race and Gender and their Spatial distribution
3. Social Wellbeing and Inclusive Development: Concept and Components – Healthcare, Housing and Education.
4. Social Geographies of Inclusion and Exclusion, Slums, Gated Communities, Communal Conflicts and Crime.
5. Social welfare program and policies.

### References:

1. Ahmed, A., (1999): *Social Geography*, Rawat Publications.
2. Casino, V. J. D., Jr., (2009): *Social Geography: A Critical Introduction*, Wiley Blackwell.
3. Cater, J. and Jones, T., (2000): *Social Geography: An Introduction to Contemporary Issues*, Hodder Arnold.
4. Holt, L., (2011): *Geographies of Children, Youth and Families: An International Perspective*, Taylor & Francis.
5. Panelli, R., (2004): *Social Geographies: From Difference to Action*, Sage.
6. Rachel, P., Burke, M., Fuller, D., Gough, J., Macfarlane, R. and Mowl, G., (2001): *Introducing SocialGeographies*, Oxford University Press.
7. Ramotra, K.C., (2008): *Development Processes and the scheduled Castes*, Rawat Publication.
8. Smith, D. M., (1977): *Human geography: A Welfare Approach*, Edward Arnold, London.

9. Smith, D. M., (1994): *Geography and Social Justice*, Blackwell, Oxford.
10. Smith, S. J., Pain, R., Marston, S. A., Jones, J. P., (2009): *The SAGE Handbook of Social Geographies*, Sage Publications.
11. Sopher, David., (1980): *An Exploration of India*, Cornell University Press, Ithasa.
12. Valentine, G., (2001): *Social Geographies: Space and Society*, Prentice Hall.

## Elective Generic Papers

### 27. Disaster Management

#### Learning Outcome:

After the completion of course, the students will have ability to:

1. Gain a perspective of disasters and various dimensions of disaster management
2. Have comprehensive knowledge of various natural and manmade disasters in India
3. Examine the response and mitigation measures of disasters

#### Course Content:

1. Disasters: Definition and Concepts; Risk and Vulnerability; Classification
2. Disasters in India: (a) Flood: Causes, Impact, Distribution and Mapping; Landslide: Causes, Impact, Distribution and Mapping; Drought: Causes, Impact, Distribution and Mapping
3. Disasters in India: (b) Earthquake and Tsunami: Causes, Impact, Distribution and Mapping; (c) Cyclone: Causes, Impact, Distribution and Mapping.
4. Manmade disasters: Causes, Impact, Distribution and Mapping
5. Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do's and Don'ts During and Post-disasters.

#### References:

1. Government of India, (2008): *Vulnerability Atlas of India*. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.
2. Govt. of India, (2011): *Disaster Management in India*, Ministry of Home Affairs, New Delhi.
3. Kapur, Anu., (2010): *Vulnerable India: A Geographical Study of Disasters*, Sage Publication, New Delhi.
4. Modh, S., (2010): *Managing Natural Disaster: Hydrological, Marine and Geological Disasters*, Macmillan, Delhi.
5. Singh, Jagbir., (2007): *"Disaster Management Future Challenges and Opportunities"*, 2007.

6. Singh, R. B., (ed.), (2006): *Natural Hazards and Disaster Management: Vulnerability and Mitigation*, Rawat Publications, New Delhi.
7. Singh, R.B., (2005): *Risk Assessment and Vulnerability Analysis*, IGNOU, New Delhi. Chapter 1, 2 and 3
8. Sinha, A., (2001): *Disaster Management: Lessons Drawn and Strategies for Future*, New United Press, New Delhi.
9. Stoltman, J.P., et al. (2004): *International Perspectives on Natural Disasters*, Kluwer Academic Publications. Dordrecht.

## 28. Geography of Tourism and Pilgrimage

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Equip with a basic understanding of nature and scope, trends and patterns of various types of tourisms.
2. Have sound knowledge on geographical, environmental and socio-cultural aspects of tourism in India.
3. Apply the principles of Geo-tourism and analyse the prospects and problems associated with pilgrimage tourism.

### Course Content:

1. Scope and Nature: Concepts and Issues, Tourism, Recreation and Leisure Inter-Relations; Geographical Parameters of Tourism by Robinson.
2. Trends and Patterns: Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage, Geo-tourism.
3. Recent Trends of Tourism: International and Regional; Domestic (India); Eco-Tourism, Sustainable Tourism, Meetings Incentives Conventions and Exhibitions
4. Impact of Tourism: Economy; Environment; Society
5. Tourism in India: Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal Areas; India's World Heritage Sites and National Geological Monuments National Tourism Policy

### References:

1. Alan, A. Lew, (2017): *New Research Paradigms in Tourism Geography*, Routledge,.
2. Dhar, P.N., (2006): *International Tourism: Emerging Challenges and Future Prospects*, Kanishka, New Delhi.
3. Hall, M., and Stephen, P., (2006): *Geography of Tourism and Recreation – Environment, Place and Space*, Routledge, London.
4. Kamra, K. K., and Chand, M., (2007): *Basics of Tourism: Theory, Operation and Practise*, Kanishka Publishers, Pune.
5. Milton, D., (1993): *Geography of World Tourism*, Prentice. Hall, New York,.
6. Nelson, V., (2017): *An Introduction to the Geography of Tourism*, Rowman & Littlefield,.

7. Page, S. J., (2011): *Tourism Management: An Introduction*, Butterworth-Heinemann-USA.
8. Raj, R. and Nigel, D., (2007): *Morpeth Religious Tourism and Pilgrimage Festivals Management: An International perspective by CABI*, Cambridge, USA.
9. Robinson, H. A.,(1996): *Geography of Tourism*, Macdonald and Evans, London,.
10. Singh, Jagbir., (2014): “*Eco-Tourism*”, I.K. International Pvt. Ltd. New Delhi, India.
11. Tourism Recreation and Research Journal, Centre for Tourism Research and Development, Lucknow.
12. Widawski, K., and Wyrzykowski, J.,(2017): *The Geography of Tourism of Central and Eastern European Countries*, Springer.

## 29. Geospatial Information Technology

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Appreciate the basic concepts and historical development of geographical information technology
2. Acquire knowledge on data structure, interpolation, modelling, functions and working of geographical information technology
3. Apply the geographical information technology for sustainable development of the nation

### Course Content:

1. Introduction: Definitions, Concept and Historical Development of geospatial technology.
2. Geospatial Data: Web data sources; Registration and projection; Data structures; Data interpolation and modelling
3. Working on spatial information system
4. Functions of Geospatial Information System: Information retrieval; Topological modelling; Networks; Overlay; Data output
5. Application of Geospatial Information Technology for sustainable development

### References:

1. D. Tomlin., (1990): *Geographic Information Systems and Cartographic Modeling*, Prentice-Hall, Englewood Cliffs, NJ, ISBN 0-13-350927-3.
2. Esperança and Samet, H.,(1997): “An overview of the SAND spatial database system, to appear in *Communications of the ACM*”, (<http://www.cs.umd.edu/~hjs/pubs/sandprog.ps.gz>)
3. G. Hjaltason and Samet, H., “*Ranking in Spatial Databases in Advances in Spatial Databases —4th Symposium*”, SSD’95, M. J. Egenhofer and J. R. Herring, Eds., Lecture Notes in Computer Science 951,
4. Heywood, I., Comelius, S., and Carver, S., (1988): *An Introduction to Geographical Information Systems*, Addison Wiley Longmont, New York.

5. <http://www.cs.umd.edu/~hjs/pubs/kim2.ps>
6. Kumar, Dilip., Singh, R.B., and Kaur, Ranjeet., (2019):*Spatial Information Technology for Sustainable Development Goals*, Springer.
7. Samet, H., (1990): *Applications of Spatial Data Structures: Computer Graphics, Image Processing, and GIS*, Addison-Wesley, Reading, MA, ISBN 0-201- 50300-0.
8. Samet, H., (1990): *The Design and Analysis of Spatial Data Structures*, Addison-Wesley, Reading, MA, ISBN 0-201-50255-0.
9. Samet, H., (1995): *Spatial Data Structures in Modern Database Systems: The Object Model, Interoperability, and Beyond*, W. Kim, Ed., Addison-Wesley/ACM Press, 361-385. <http://www.cs.umd.edu/~hjs/pubs/kim.ps>



## 30. Coupled Human and Environment System

### Course Learning Outcome:

After the completion of course, the students will have ability to:

1. Understand the fundamental concepts of coupled human-environment system.
2. Assess the vulnerability, risk and resilience issues associated with the human-environment system.
3. Develop possible solutions for addressing the contemporary sustainability challenges.

### Course Content:

1. Concepts, components and theories of coupled human environment system.
2. Biogeochemical cycles: Interactions and impact between human and natural systems.
3. Global and regional case studies: Himalaya-Ganga system; Atmosphere-water system; Surface and ground water and Coastal-water interaction.
4. Integrated Assessment of Vulnerability Risk; Resilience and Sustainability.
5. Management, Governance and Policies.

### References:

1. Clarke, G. L., (1967). *Elements of ecology*, New York: John Wiley Pub.
2. Haden-Guest, S., Wright, J. K., and Teclaff, E. M.,(1956):*World Geography of Forest Resources*, New York: Ronald Press Co.
3. Hoyt, J.B.,(1992):*Man, and the Earth*, Prentice Hall, U.S.A.
4. Lapedes, D.N.,(1974):*Encyclopaedia of Environmental Science (eds.)*, McGraw Hill.
5. Parmesan, C., Yohe, G.,(2003):*A globally coherent fingerprint of climate change impacts across natural systems*. *Nature*, 421 (6918), 37–42.
6. Singh Savindra., (2015): *Paryawaran Bhoogol (Hindi)*, Prayag Pushtak Bhawan, Allahabad.
7. Singh, R.B., Schickhoff, Udo and Mal, Suraj., (2016): *Climate Change, Glacier Response and Vegetation Dynamics in the Himalaya*, Springer, Switzerland.
8. Singh, R.B., Prokop, Pawel., (Eds.) (2016):*Environmental Geography of South Asia*, Springer Japan.
9. Sivaperuman, Chandrakasan et al. (2018):*Biodiversity and Climate Change Adaptation in Tropical Islands*. Academic Press, London.

10. Trewartha G. T., (1980):*An Introduction to Climate*, McGraw Hill Company, New York.
11. UNEP (2002): "*Mountain and Tree cover in Mountain Regions*" Report - 2002, UNEP-WCMC.

## 31. Climate Change Vulnerability and Adaptation

### Learning Outcome:

After the completion of course, the students will have ability to:

1. Understand the foundational concepts of climate change and its impacts.
2. Assess the human and environmental vulnerability to climate change.
3. Learn the various adaptation and mitigation for reducing the impacts of climate change and national action plan.

### Course Content:

1. Climate Change: Understanding Climate Change; Greenhouse Gases and Global Warming; Global Climatic Assessment- IPCC
2. Climate Change and Vulnerability: Physical Vulnerability; Economic Vulnerability; Social Vulnerability
3. Impact of Climate Change: Agriculture and Water; Flora and Fauna; Human Health
4. Adaptation and Mitigation: Global Initiatives with Particular Reference to South Asia.
5. National Action Plan on Climate Change; Local Institutions (Urban Local Bodies, Panchayats)

### References:

1. IPCC (2014): *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
2. IPCC (2007): *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.*
3. OECD (2008): *Climate Change Mitigation: "What do we do?"* (Organisation and Economic Co-operation and Development).
4. Sen, Roy, S., and Singh, R.B., (2002): *Climate Variability, Extreme Events and Agricultural Productivity in Mountain Regions*, Oxford & IBH Pub., New Delhi.

5. Singh, M., Singh, R.B., and Hassan, M.I., (Eds.) (2014): *Climate change and biodiversity*, Proceedings of IGU Rohtak Conference, Volume 1. Advances in Geographical and Environmental Studies, Springer
6. Singh, R.B., Mal, Suraj, and Huggel, Christian (2018): *Climate Change, Extreme Events and Disaster Risk Reduction*, Springer, Switzerland, pages 309.
7. UNEP (2007): *Global Environment Outlook: GEO4: Environment for Development*, United Nations Environment Programme.

## 32. Rural Development

### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Appreciate the concepts, needs and various approaches to rural development;
2. Understand the strong economic bases of rural areas of India;
3. Appreciate the area based and target group based approaches and provision of services to rural development.

### Course Content:

1. Defining Development: Inter-Dependence of Urban and Rural Sectors of the Economy; Need for Rural Development, Gandhian Approach of Rural Development.
2. Rural Economic Base: Panchayati Raj System, Agriculture and Allied Sectors, Seasonality and Need for Expanding Non-Farm Activities, Co-operatives, PURA.
3. Area Based Approach to Rural Development: Drought Prone Area Programmes, PMGSY.
4. Target Group Approach to Rural Development: SJSY, MNREGA, Jan DhanYojana and Rural Connectivity.
5. Provision of Services – Physical and Socio-Economic Access to Elementary Education and Primary Health Care and Micro credit

### References:

1. Anand, Subhash.,(2013): *Dynamics of Rural Development*, Research India Press, Delhi
2. Gilg, A. W., (1985): *An Introduction to Rural Geography*, Edwin Arnold, London.
3. Krishnamurthy, J.,(2000): *Rural Development - Problems and Prospects*, RawatPubls., Jaipur
4. Lee, D. A. and Chaudhri, D. P., (eds.)(1983): *Rural Development and State*, Methuen, London.
5. Misra, R. P., and Sundaram, K. V., (eds.)(1979): *Rural Area Development: Perspectives and Approaches*, Sterling, New Delhi.
6. Misra, R. P., (ed.), (1985): *Rural Development: Capitalist and Socialist Paths*, Vol. 1, Concept, New Delhi.

7. Palione, M., (1984): *Rural Geography*, Harper and Row, London.
8. Ramachandran, H., and Guimaraes, J.P.C., (1991): *Integrated Rural Development in Asia—Learning from Recent Experience*, Concept Publishing, New Delhi.
9. Robb, P.,(1983): *Rural South Asia: Linkages, Change and Development*, Curzon Press.
10. Singh, R.B., (1985): *Geography of Rural Development*, Inter India, New Delhi.
11. UNAPDI (1986):*Local Level Planning and Rural Development: Alternative Strategies*.  
(United Nations Asian & Pacific Development Institute, Bangkok), Concept Publs. Co.,  
New Delhi.
12. Wanmali, S., (1992): *Rural Infrastructure Settlement Systems and Development of the Regional Economy in South India*, International Food Policy Research Institute,  
Washington, D.C.
13. Yugandhar, B. N. and Mukherjee, Neela., (eds.) (1991): *Studies in Village India: Issues in Rural Development*, Concept Publications. Co., New Delhi.

### 33. Industrial Development

#### Learning Outcomes:

After the completion of course, the students will have ability to:

1. Understand the factors responsible for location of an industry.
2. Differentiate various types of industries and industrial regions and policies of India.
3. Evaluate the socio, economic and environmental implications of various types of industries.

#### Course Contents:

1. Nature and Scope of Industrial Geography.
2. Types, Geographical Characteristics and Location of Industries (Weber's Theory): Small and Medium
3. Industries, Heavy Industries: Coal and Iron based industries, Rural based Industries, Footloose Industry.
4. Mega Industrial Complexes: National Capital Region, Mumbai-Pune Industrial Region, Bengaluru-Chennai Industrial Region and Chota Nagpur Industrial Region
5. Impact of Industrialisation in India: Environmental; Social and Economic
6. Industrial Policy of India

#### References:

1. Gunnar, Andersson., (1967): "*Geography of Manufacturing*, Prentice Hall, New Jersey
2. Leong, G.C., (1997): "*Human and economic geography*", Oxford University Press, New York.
3. Miller, E., (1962): "*Geography of Manufacturing*, Prentice Hall, Englewood Cliff, New Jersey
4. Pathak, C. R.,(2003): "*Spatial Structure and Processes of Development in India*. Regional Science Assoc., Kolkata.
5. Sharma, T.C., (2013): "*Economic Geography of India*, Rawat Publication, Jaipur
6. Singh, Jagdish (2003): "*India - A Comprehensive & Systematic Geography*, Gyanodaya Prakashan, Gorakhpur.

7. Thoman, R.S., Conkling E.C., and Yeates. M.H., (1968): *Geography of Economic Activity*, McGraw Hill Book Company, 1968.
8. Tirtha, Ranjit (2002): *Geography of India*, Rawat Publs., Jaipur & New Delhi.
9. Tiwari, R.C., (2007): *Geography of India*, Prayag Pustak Bhawan, Allahabad
10. Truman, A. Harishorn, John W. Alexander., (2000): "*Economic Geography*", Prentice Hall of India Ltd., New Delhi.



## **34. Sustainable Resource Development**

### **Learning Outcomes:**

After the completion of course, the students will have ability to:

1. Understand difficulties in defining the components of sustainable development;
2. Distinguish the patterns of regional development of the world and the need for sustainable development plan;
3. Appreciate the efforts and initiatives of the Governments in reducing the levels of poverty and inequality among the people of various countries.

### **Course Content:**

1. Sustainable Resource Development: Definition, Components and Limitations
2. The Millennium Development Goals: National Strategies and International Experiences
3. Sustainable Regional Development: Need and examples from different Ecosystems.
4. Inclusive Development: Poverty and Inequality; Education, Health; Climate Change: The role of higher education in sustainable resource development; The Challenges of Universal Health Coverage,
5. Sustainable Development Policies and Programmes: The proposal for SDGs at Rio+20; SDGs; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy, CDM.

### **References:**

1. Agyeman, Julian, Robert D. Bullard and Bob, Evans., (Eds.) (2003): *Just Sustainabilities: Development in an Unequal World*. London: Earthscan. (Introduction and conclusion.).
2. Ayers, Jessica and David, Dodman., (2010): “*Climate change adaptation and development I: the state of the debate*”. Progress in Development Studies 10(2): 161-168.
3. Baker, Susan., (2006): *Sustainable Development*. Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge.
4. Brosius, Peter., (1997): “*Endangered forest, endangered people: Environmentalist representations of indigenous knowledge*”, Human Ecology 25: 47-69.
5. Lohman, Larry., (2003): *Re-imagining the population debate*, Corner House Briefing.

6. Martínez-Alier, Joan., (2010): “*Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm*” *Ecological Economics* 69: 1741-1747.
7. Merchant, Carolyn., (Ed.) (1994):*Ecology. Atlantic Highlands*, N.J: Humanities Press. (Introduction, pp 1-25.)
8. Osorio, Leonardo., et al., (2005): “*Debates on sustainable development: towards a holistic view of reality*”, *Environment, Development and Sustainability* 7: 501-518.
9. Robbins, Paul., (2004):*Political Ecology: A Critical Introduction*. Blackwell Publishing.
10. Singh, R.B., (Ed.) (2001): *Urban Sustainability in the Context of Global Change*, Science Pub., Inc., Enfield (NH), USA and Oxford & IBH Pub., New Delhi.

## **PART III**

### **Learning Outcomes based Curriculum Framework (LOCF) for Geography B.A. /B.Sc. (Programme)**

#### **11. Introduction**

The aim of Learning Outcome based Curriculum Framework Committee (LOCF) constituted by the University Grants Commission (UGC) is to introduce the students of geography not only to the conventional and innovative courses but also to provide them an understanding of the basic principles of technology based practical courses such as Geographical Mapping, Remote Sensing, Spatial Information Technology, Satellite System, etc. It also intends to expose the learners the technical skills required to analyse and interpret the results by applying such techniques.

The LOCF is designed to emphasize the teaching-learning process at the undergraduate (B.A./B.Sc) level to sensitise and train the students to develop a sound and systematic approach regarding mechanism and processes of natural and human made hazards and disasters. The focus is to help the students to understand the latest tools and techniques, which would help in giving focused and precise understanding of geographical phenomenon.

The purpose is to enhance the capability of the students in perceiving, creating and analyzing sound geographical bases and concepts. This Learning Outcome based Curriculum Framework is designed to emphasize the teaching and learning process at the undergraduate (B.A./ B.Sc) from teacher centric to student centric by strengthening the quality of teaching and learning in the present day real life scenario of global, regional and local level. It is considered learning as an activity of creativity of innovations and analysing geographical phenomena.

The committee prepared the major objectives and learning outcomes, which would help the students to understand and critically analyse various dimensions of the geographical issues.

The following objectives would be achieved:

- To orient the students towards identification and analysis of various facets of geographic and geographical features and processes.
- To develop students' aptitude for acquiring basic skills of carrying out field work.
- To facilitate the students to learn skills of map making.
- To guide students to learn the science and art of collecting, processing and interpreting the data.
- To expose the students to the use of the updated technologies of remote sensing and Geographical Information System (GIS).

## 12.1.B.A/B.SC (PROGRAMME) Geography Course Outcomes and SDGs

The global community has adopted the Sustainable Development Goals to ensure holistic and multi-faceted development of human societies across the world. These goals adopted in 2015 were an ambitious upgradation of millennium development goals. The Indian Geographical community aims to harness the trans-disciplinary nature of the subject and link it with sustainable development goals through a range of multi-dimensional core and elective papers

### B.A. (Programme) GEOGRAPHY: CONTRIBUTION TOWARDS SDGs

B.A. (Prog) Geography																	
	SDG 1 No Poverty	SDG 2 Zero Hunger	SDG 3 Good Health & Wellbeing	SDG 4 Quality Education	SDG 5 Gender Equality	SDG 6 Clean Water & Sanitation	SDG 7 Affordable & Clean Energy	SDG 8 Decent Work & Economic Growth	SDG 9 Industry Innovation & Infrastructure	SDG 10 Reduced Inequalities	SDG 11 Sustainable Cities & Communities	SDG 12 Responsible Consumption & Production	SDG 13 Climate Action	SDG 14 Life Below Water	SDG 15 Life on Land	SDG 16 Peace, Justice and Strong Institutions	SDG 17 Partnerships for the Goals
Physical Geography													X	X	X		
Human Geography				X	X					X						X	X
Cartographic Techniques				X													
Environmental Geography						X	X						X	X	X	X	
Regional Planning and Sustainable Development	X	X	X						X	X	X	X					
Fundamentals of Remote Sensing and GPS								X	X		X						
Field Techniques and Surveying Methods				X													
Introduction to Geographic Information System				X									X				
Systematic Geography of India			X		X	X	X			X	X						
World Economic Geography	X	X						X	X	X	X	X					
Disaster Risk Reduction													X			X	X
Geography of Tourism								X	X								
Disaster Management			X										X			X	X
Climate Change Vulnerability and Mitigation		X											X			X	X

## 12.2. STRUCTURE OF B.A. & B.Sc (Programme) IN GEOGRAPHY

**Note:** For the structure of B.A. & B.Sc (Programme) in Geography, the Committee has followed the number of credits per course as suggested in the CBCS document, that is, six credits per Core Course.

- A. Core Courses: (4) (4x6= **24 Credits**)
- B. Elective courses (EC) (any two) (2x6=**12 Credits**)
- C. Ability Enhancement Compulsory Course (AECC)  
(As per UGC CBCS guidelines) (08 Credits)
- D. Skill Enhancement Course (SEC) (4x4=**16 Credits**)

GRAND TOTAL (A+B+C+D+E): Total Courses: **10**  
Total Credits: (24+12+16+8=60)

### A. CORE COURSE (4)

Serial No	Title of the Course	Credits: 6 credits per course. Total 24 (credits distribution to be decided by institutions as per UGC/CBCS guidelines).	L+T
1.	Physical Geography	6	5+1
2	Human Geography	6	5+1
3	Cartographic Techniques	6	5+1
4	Environmental Geography	6	5+1

### B. Elective Courses (any two) EC

	Course Title	Credits 12 (2x6)	Credit Hours L T O [To be devised by the institutions]
1	Systematic Geography of India or	6	5+1

	World Economic Geography		
2	Disaster Risk Reduction or Geography of Tourism	6	5+1
3	Disaster Management	6	5+1
4	Climate Change Vulnerability and Mitigation	6	5+1

### C. Ability Enhancement Compulsory Course (AECC)

	Course Title	Credits (2x4=8Cr.) (credit distribution to be decided by institutions as per CBCS guidelines).	Distribution of Credit Hours L T O L Lectures : 4 /[5]/[4] T Tutorials: 1 /[1]/(0) O Others: 1 /[0]/[2]2 [Note: There can be different options depending upon the pedagogical and assessment weightage distribution]
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### D. Skill Enhancement Course (SEC)

	Course Title	Credits 16 (4x4) (Credit) distribution to be decided by institutions as per CBCS guidelines).	Distribution of Credit Hours L T O L Lectures : 4 /[5]/[4] T Tutorials: 1 /[1]/(0) O Others: 1 /[0]/[2]2
1	Regional Planning and Sustainable Development	4	4

2	Fundamentals of Remote Sensing and GPS	4	4
3	Field Techniques and Surveying Methods	4	4
4	Introduction to GIScience	4	4

**Note:**

1. *Universities/Institutions/Departments may wish to add more courses against categories marked B and C, depending upon the availability of specialists and other required resources.*
2. *Any major deviation from category A is likely to impact the very philosophy of LOCF in Geography.*

## 9.2 Choice Based Credit System B.A. / B. Sc (Programme)

### Geography

	Core Course (12) (4 credits per course)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC)(2)	Discipline Specific Elective (DSE) (2)	Generic Elective (GE) (2)
<b>I</b>	English/MIL-1	(English/MIL Communication) / Environmental Science			
	Physical Geography				
	DSC- 2 A				
<b>II</b>	English/MIL-1	Environmental Science/ (English/MIL Communication)			
	Human Geography				
	DSC- 2 B				
<b>II I</b>	English/MIL-2		Regional Planning and Sustainable		
	Cartographi				

	c Techniques		Development		
	DSC- 2 C				
<b>I V</b>	English/MIL -2		Fundamentals of Remote Sensing and GPS		
	Environmental Geography				
	DSC- 2 D				
<b>V</b>			Field Techniques and Surveying Methods	Systematic Geography of India or World Economic Geography	Disaster Manageme nt
				DSE-2 A	
<b>V I</b>			Introduction to Geographic Information System	Disaster Risk Reduction or Geography of Tourism	Climate Change Vulnerabilit y and Mitigation
				DSE-2 B	

## B.A./B.Sc (Programme) Geography

### Core Course (4 Compulsory courses)

#### Semester I

1. Physical Geography

#### Semester II

2. Human Geography

#### Semester III

3. Cartographic Techniques

#### Semester IV

4. Environmental Geography



**Skill Enhancement Course (2 Compulsory courses)**

**Semester III**

1. Regional Planning and Sustainable Development

**Semester IV**

2. Fundamentals of Remote Sensing and GPS

**Semester V**

3. Field Techniques and Surveying Methods

**Semester VI**

4. Introduction to Geographic Information System

**Discipline Specific Elective Papers (2 Compulsory courses)**

**Semester V**

1. Systematic Geography of India
2. World Economic Geography

**Semester VI**

3. Disaster Risk Reduction
4. Geography of Tourism

**Generic Elective (2)**

**Semester V**

1. Disaster Management

**Semester VI**

2. Climate Change Vulnerability and Mitigation

# **Core Courses**

## **1. Physical Geography**

### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Understand the components of the earth system – atmosphere, lithosphere and hydrosphere;
2. Appreciate and understand various features of the spheres with local, regional and global examples;
3. Associate and bring out the relationships of the features of one sphere with other spheres.

### **Course Content:**

1. Physical Geography – Definition and Scope, Concepts, Components of Earth System.
2. Atmosphere – Heat Balance, Global Circulation Pattern, Tropical Cyclones, Monsoon, Climatic Classification (Koppen).
3. Lithosphere – Internal Structure of Earth based on Seismic Evidence, Plate Tectonics and its Associated Features.
4. Fluvial Cycle of Erosion – Davis and Penck.
5. Hydrosphere – Hydrological Cycle, Ocean Bottom Relief Features, Tides and Ocean Currents.

### **References:**

1. Conserva, H. T., (2004): Illustrated Dictionary of Physical Geography, Author House, New York.
2. Gabler, R. E., Petersen, J. F. and Trapasso, L. M., (2007): Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, New York..
3. Garrett, N., (2000): Advanced Geography, Oxford University Press, Oxford.
4. Goudie, A., (1984): The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.
5. Hamblin, W. K., (1995): Earth's Dynamic System, Prentice Hall, N.J.
6. Husain, M., (2002): Fundamentals of Physical Geography, Rawat Publications, Jaipur.
7. Monkhouse, F. J. (2009): Principles of Physical Geography, Platinum Publishers, Kolkata.

8. Singh, Savindra. (2018): Bhoutik Bhugol, Prayag Pustak Bhawan, Allahabad.
9. Strahler, A. N. and Strahler, A. H., (2008): Modern Physical Geography, John Wiley & Sons, New York.

## **2. Human Geography**

### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Understand the basic concepts in various sub-fields of human geography;
2. Appreciate the growth, distribution and composition of population in different parts of the world;
3. Analyse the types and patterns of rural and urban settlements, urbanisation and related issues in India and other regions of the world.

### **Course Content:**

1. Definition, Nature, Major Sub-fields, Contemporary Relevance.
2. Space and Society: Cultural Regions; Race; Religion and Language.
3. Population: Population Growth and Demographic Transition Theory.
4. World Population Distribution and Composition (Age, Gender and Literacy).
5. Settlements: Types and Patterns of Rural Settlements; Classification of Urban Settlements; Trends and Patterns of World Urbanisation.

### **References:**

1. Chandna, R.C. (2010) Population Geography, Kalyani Publisher, New Delhi.
2. Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.
3. Ghosh, S. (2015) Introduction to Settlement Geography, Orient Black Swan Private Ltd., Kolkata.
4. Hussain, Majid (2012) Manav Bhugol. Rawat Publications, Jaipur.
5. Johnston, R; Gregory, D, Pratt, G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication, New Jersey.
6. Jordan-Bychkov, et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.
7. Kaushik, S.D. (2010) Manav Bhugol, Rastogi Publication, Meerut.
8. Maurya, S.D. (2012) Manav Bhugol, Sharda Pustak Bhawan, Allahabad.

### **3. Cartographic Techniques**

#### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Distinguish between various types of maps and also appreciate the elements of map;
2. Appreciate how projections are applied to prepare maps from the globe;
3. Acquire knowledge to prepare maps from geographic data and also the ability to interpret them.

#### **Course Content:**

1. Maps: Types, Elements and Uses
2. Map Scales: Types and Application, Reading Distances on a Map.
3. Map Projections: Criteria for Choice of Projections; Attributes and Properties of: Zenithal Gnomonic Polar Case, Zenithal Stereographic Polar Case, Cylindrical Equal Area, Mercator's Projection, Conical Projection with Two-Standard Parallel, Bonne's Projection.
4. Representation of Data: Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, Interpretation of Thematic Maps.
5. Environmental Mapping: Bio-physical and Cultural Environment.

#### **References:**

1. Dent, B. D., (1999) Cartography: Thematic Map Design, (Vol. 1), McGrawHill, New York .
2. Gupta, K. K and Tyagi, V. C., (1992) Working with Maps, Survey of India, DST, New Delhi.
3. Misra, R.P., (2014) Fundamentals of Cartography (Second Revised and Enlarged Edition), Concept Publishing, New Delhi.
4. Robinson, A., (1953) Elements of Cartography, John Wiley, New Jersey.
5. Sharma, J. P., (2010) Prayogic Bhugol, Rastogi Publishers, Meerut.
6. Singh, R. L. and Singh, R. P. B., (1999): Elements of Practical Geography, Kalyani Publishers, New Delhi.
7. Singh, R. L., (1998) Prayogic Bhoogol Rooprekha, Kalyani Publications, New Delhi.
8. Steers, J. A., (1965) An Introduction to the Study of Map Projections, University of London, London.

## **4. Environmental Geography**

### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Appreciate the structure and functions of ecosystems with examples;
2. Understand the environmental problems and relevant management strategies;
3. Acquire knowledge about the new environmental policies and the need to revise policies to tackle the environmental issues of India, in particular.

### **Course Content:**

1. Environmental Geography: Concepts and Approaches; Ecosystem – Concept and Structure; Ecosystem Functions.
2. Human-Environment Relationship in Equatorial, Desert, Mountain and Coastal Regions.
3. Environmental Problems and Management: Air Pollution; Solid and Liquid Waste; Biodiversity Loss
4. Environmental Programmes and Policies: Developed Countries; Developing Countries.
5. New Environmental Policy of India; Government Initiatives.

### **References:**

1. Anand, Subhash (2010) Solid Waste Management, Mittal Publication, New Delhi.
2. Casper, J.K. (2010) Changing Ecosystems: Effects of Global Warming. Info base Pub. New York.
3. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.
4. Kumaraswamy K., Alagappa Moses A., and M. Vasanthy (2018) Glimpses of Environmental Sciences, Notion Press, Chennai.
5. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.
6. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.
7. Singh, R.B., Prokop, Pawel (Eds.) (2016) Environmental Geography of South Asia, Springer, Tokyo.
8. Singh, Savindra (2001). Paryavaran Bhugol, Prayag Pustak Bhawan, Allahabad. (*in Hindi*)

9. UNEP (2007) Global Environment Outlook: GEO4: Environment for Development, United Nations Environment Programme. University Press, Cambridge.
10. Wright, R. T. and Boorse, D. F. (2010) Toward a Sustainable Future, PHI Learning Pvt. Ltd., New Delhi.

## **Skill Enhancement Courses (2 Compulsory Courses)**

### **1. Regional Planning and Sustainable Development**

#### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Appreciate the basics of regional planning methodology and the need for adopting newer models in the planning process;
2. Understand the history of adopting various planning strategies for balanced national development;
3. Capable of diagnosing the regional issues and the necessity to adopt suitable SDGs in India.

#### **Course Content:**

1. Regional Planning: Concepts, Need and Types; Delineation of Planning Regions.
2. Models for Regional Planning: Growth Pole Theory; Core Periphery Model and Growth Foci Concept in Indian Context.
3. Backward Regions and Regional Plans - Special Area Development Plans in India; DVC-The Success Story and the Failures; NITI Aayog.
4. Sustainable Development: Concept, Principles and Components.

Sustainable Development Goals (SDGs): History, Global Challenges, Blueprint, Target by 2030, Partnerships.

#### **References:**

1. Bajaj, Amrita and Ajay Kumar, (2018): Geography of Development: Indian Perspectives, Indian Pub. House, Jaipur.
2. Blij H. J. De, (1971): Geography: Regions and Concepts, John Wiley and Sons, New Jersey.
3. Claval, P.I, (1998): An Introduction to Regional Geography, Blackwell Publishers, Oxford.
4. Friedmann, J. and Alonso W. (1975): Regional Policy - Readings in Theory and Applications, MIT Press, Massachusetts.
5. Gore, C. G., (1984): Regions in Question: Space, Development Theory and Regional Policy,



Methuen, London.

6. Gore, C. G., Köhler G., Reich U-P. and Ziesemer T., (1996): Questioning Development; Essays on the Theory, Policies and Practice of Development Intervention, Metropolis- Verlag, Marburg.
7. Haynes, J., (2008): Development Studies, Polity Short Introduction Series, John Wiley and Sons, New Jersey.
8. Johnson, E. A. J., (1970): The Organization of Space in Developing Countries, MIT Press, Massachusetts.
9. Peet, R., (1999): Theories of Development, The Guilford Press, New York.
10. Singh, R.B. (Ed.) (2015) Urban Development Challenges, Risks and Resilience in Asian Mega Cities, Springer, Tokyo.
11. UNDP (2001-04): Human Development Report, Oxford University Press, Oxford.
12. World Bank (2001-05): World Development Report, Oxford University Press, Oxford.

## 2. Fundamentals of Remote Sensing and GPS

### Learning Outcomes:

After the completion of the course, the students will have the ability to:

1. Appreciate the development and uses of aerial and satellite remote sensing system and navigation satellite systems in India and other nations;
2. Understand the basics of EMR and energy interaction in atmosphere and on earth surface features;
3. Analyse and interpret the aerial and satellite data products and GNSS/GPS survey results.

### Course Content:

1. Remote Sensing: Definition, Development, Platforms and Types.
2. Aerial Photography: Principles, Types and Geometry.
3. Satellite Remote Sensing: Principles, EMR Interaction with Atmosphere and Earth Surface; Satellites (Landsat and IRS) and Sensors.
4. Interpretation and Application of Remote Sensing: Land use/ Land Cover.
5. Global Positioning System (GPS) and Global Navigation Satellite System (GNSS) – Its Principles and Uses.

**Practical Record:** A project consisting of five exercises will be done from satellite images and navigation satellite positioning (scale, orientation and interpretation).

### References:

1. Campbell, J. B., (2007) Introduction to Remote Sensing, Guildford Press, New York.
2. Jensen, J. R., (2004) Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall, New Jersey.
3. Joseph, G. (2005) Fundamentals of Remote Sensing, Universities Press, Hyderabad.
4. Kumar, Dilip, Singh, R.B. and Kaur, Ranjeet (2019) Spatial Information Technology for Sustainable Development Goals, Springer, Basel.
5. Lillesand, T. M., Kiefer, R. W. and Chipman J. W., (2004) Remote Sensing and Image Interpretation, Wiley, New Jersey. (*Wiley Student Edition*).

6. Nag P. and Kudra, M., (1998) Digital Remote Sensing, Concept, New Delhi.
7. Rees, W. G., (2001) Physical Principles of Remote Sensing, Cambridge University Press, Cambridge.
8. Singh, R. B. and Murai, S., (1998) Space-informatics for Sustainable Development, Oxford and IBH Pub, New Delhi.
9. Wolf, P. R. and Dewitt, B. A., (2000) Elements of Photogrammetry: With Applications in GIS, McGraw-Hill, New York.

### **3. Field Techniques and Surveying Methods**

#### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Conduct field work in physical and human geography, besides investigating socio-economic and environmental issues;
2. Develop tools to collect primary data from the field and interpret them meaningfully;
3. Prepare field report with suitable tables, maps and diagrams based on the data collected from the field and secondary sources.

#### **Course Content:**

1. Field work in Geographical Studies – Definition, Concept, Role, Value and Ethics of Field work.
2. Defining the Field and Identifying the Case Study – Rural / Urban / Physical / Human / Environmental, Types of data. Field Techniques – Merits, Demerits and Selection of the Appropriate Technique; Observation and navigation satellite positioning (Participant / Non Participant). Surveying methods: Questionnaires (Open/ Closed / Structured / Non-Structured); Interview with Special Focus on Focused Group Discussions; Participatory Rural Appraisal (PRA).
3. Designing the Field Report – Aims and Objectives, Methodology, Analysis, Interpretation and Writing the Report.

#### **Practical Record**

1. Each student will prepare an individual report based on primary and secondary data collected during field work.
2. The duration of the field work should not exceed 10 days.
3. The word count of the report should be about 6,000 to 10,000 excluding figures, tables, photographs, maps, references and appendices.
4. Students are advised to make use of navigation satellite positioning (GNSS/GPS) during observation and its report.
5. One copy of the report on A4 size paper should be submitted in soft binding.

## References:

1. Creswell, J., (1994): Research Design: Qualitative and Quantitative Approaches, Sage Publications, California.
2. Dikshit, R. D. (2003). The Art and Science of Geography: Integrated Readings, Prentice-Hall of India, New Delhi.
3. Evans, M., (1988): "Participant Observation: The Researcher as Research Tool" in Qualitative Methods in Human Geography, Eds. J. Eyles and D. Smith, Polity, Cambridge.
4. Mukherjee, N., (1993). Participatory Rural Appraisal: Methodology and Application. Concept Pubs. Co., New Delhi.
5. Mukherjee, N., (2002). Participatory Learning and Action: with 100 Field Methods. Concept Pub. Co., New Delhi.
6. Robinson, A., (1998): "Thinking Straight and Writing That Way", in Writing Empirical Research Reports: A Basic Guide for Students of the Social and Behavioural Sciences, eds. by F. Pryczak and R. Bruce Pryczak, Publishing, Los Angeles.
7. The Geographical Review (2001) Special Issue on "Doing Fieldwork" 91:1-2, John Wiley, New Jersey..
8. Stoddard, R. H., (1982): Field Techniques and Research Methods in Geography, Kendall/Hunt, Iowa.
9. Wolcott, H. (1995). The Art of Fieldwork. Alta Mira Press, California.

## 4. Introduction to Geographic Information System

### Learning Outcomes:

After the completion of the course, the students will have the ability to:

1. Appreciate the basic principles and components of GIS;
2. Apply raster and vector data structure for GIS analysis;
3. Analyse the basic resources, land use and urban related data using GIS software for meaningful interpretation.

### Course Content:

1. Geographic Information System (GIS): Definition, Components and Principles.
2. GIS Data Structures: Types (Spatial and Non-spatial), Raster and Vector Data Structure.
3. GIS Data Analysis: Input; Geo-Referencing; Editing and Output; Overlays.
4. Application of GIS in Natural Resource Management.
5. Application of GIS in Urban Sprawl, Land use/Land-cover.

**Practical Record:** A project file consisting of 5 exercises on using any GIS Software (free software like QGIS, AGIS etc.) on above mentioned themes.

### References:

1. Bhatta, B. (2010) Analysis of Urban Growth and Sprawl from Remote Sensing, Springer, BerlinHeidelberg.
2. Burrough, P.A., and McDonnell, R.A. (2000) Principles of Geographical Information System-Spatial Information System and Geo-statistics, Oxford University Press, Oxford.
3. Chauniyal, D.D. (2010) Sudur Samvedanevam Bhogolik Suchana Pranali, Sharda Pustak Bhawan, Allahabad.
4. Heywoods, I., Cornelius, S and Carver, S. (2006) An Introduction to Geographical Information system. Prentice Hall, New Jersey.
5. Jha, M.M. and Singh, R.B. (2008) Land Use: Reflection on Spatial Informatics Agriculture and Development, Vedams eBooks (P) Ltd., New Delhi.
6. Nag, P. (2008) Introduction to GIS, Concept India, New Delhi.

7. Sarkar, A. (2015) Practical Geography: A Systematic Approach. Orient Black Swan Private Ltd., New Delhi.
8. Singh, R.B. and Murai, S. (1998) Space Informatics for Sustainable Development, Oxford and IBH, New Delhi.

## **Discipline Specific Elective Courses (2 Compulsory Courses)**

### **1. Systematic Geography of India**

#### **Learning Outcome:**

After the completion of the course, the students will have the ability to:

1. Learn the differences in terms of varied physiography of India;
2. Understand the demographic component and settlement structure in India;
3. Study the economy and various types of resources in India.

#### **Course Content:**

1. Physical Setting – Location, Structure and Relief, Drainage, Climate.
2. Population – Size and Growth since 1901, Population Distribution, Literacy, Sex Ratio.
3. Settlement System - Rural Settlement Types and Patterns, Urban Patterns.
4. Resource Base – Livestock (Cattle and Fisheries), Power (Coal, and Hydro-electricity), Minerals (Iron Ore and Bauxite).
5. Economy – Agriculture (Rice, Wheat, Sugarcane, Groundnut, Cotton); Industries (Cotton Textile, Iron-Steel, Automobile), Transportation Modes (Road and Rail).

#### **References:**

1. Dave, Bharati, (2018): Mapping the Quality of Living Spaces in India, Indian Research Academy, New Delhi.
2. Hussain, M., (1992): Geography of India, Tata McGraw Hill Education, New York.
3. Mamoria, C. B., (1980): Economic and Commercial Geography of India, Shiva Lal Agarwala.
4. Miller, F. P., Vandome, A. F. and McBrewster, J., (2009): Geography of India: Indo-Gangetic Plain, Thar Desert, Major Rivers of India, Climate of India, Geology of India, Alphascript Publishing, New Delhi.
5. Nag, P. and Sengupta, S., (1992): Geography of India, Concept Publishing, New Delhi.
6. Pichamuthu, C. S., (1967): Physical Geography of India, National Book Trust, Delhi.
7. Rana, Tejbir Singh, (2015) Diversity of India, R.K. Books, New Delhi.



8. Sharma, T. C. and Coutinho O., (1997): Economic and Commercial Geography of India, Vikas Publishing, New Delhi.
9. Singh, Gopal, (1976): A Geography of India, Atma Ram, New Delhi.
10. Spate, O. H. K. and Learmonth, A. T. A., (1967): India and Pakistan: A General and Regional Geography, Methuen, London.

## **2. World Economic Geography**

### **Learning Outcome:**

After the completion of the course, the students will have the ability to:

1. Appreciate the basic concepts and approaches of economic geography;
2. Examine the significance and relevance of theories in relation to the location of different economic activities;
3. Distinguish different types of human activities and their inter and intra relationships.

### **Course Content:**

1. Economic Geography: Definition, Approaches and Fundamental Concepts; Patterns of Development.
2. Locational Theories: Agriculture (Von Thunen), Industrial (Weber) and Services (Christaller).
3. Primary Activities: Subsistence Agriculture, Intensive Farming, Commercial Grain Farming, Plantation, Commercial Dairy Farming, Commercial Fishing and Mining (Iron Ore, Coal and Petroleum).
4. Secondary Activities: Cotton Textile Industry, Petro-Chemical Industry, Major Manufacturing Regions.
5. Tertiary and Quaternary Activities: Modes of Transportation, Patterns of International Trade, and Information and Communication Technology Industry.

### **References:**

1. Alexander, J. W., (1963): Economic Geography, Prentice-Hall Inc., Englewood Cliffs, New Jersey.
2. Bagchi-Sen, S. and Smith, H. L., (2006): Economic Geography: Past, Present and Future, Taylor and Francis, London.
3. Coe, N. M., Kelly P. F. and Yeung H. W., (2007): Economic Geography: A Contemporary Introduction, Wiley-Blackwell, New Jersey.
4. Combes, P., Mayer T. and Thisse J. F., (2008): Economic Geography: The Integration of Regions and Nations, Princeton University Press, New Jersey.
5. Durand, L., (1961): Economic Geography, Crowell Washington, D.C..

6. Hodder, B. W. and Lee, R., (1974): *Economic Geography*, Taylor and Francis, London.
7. Wheeler, J. O., (1998): *Economic Geography*, Wiley, New Jersey.
8. Willington, D. E., (2008): *Economic Geography*, Husband Press, London.

### **3. Disaster Risk Reduction**

#### **Learning Outcome:**

After the completion of the course, the students will have the ability to:

1. Acquire knowledge on concepts, types, distribution and mapping of disasters in India;
2. Understand the man-made disasters and human negligence in the context of environment;
3. Bring awareness about the preparedness, mitigation and processes of disaster risk reduction.

#### **Course Content:**

1. Disasters, Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
2. Disasters in India: (a) Causes Impacts, Distribution and Mapping: Flood and Drought.
3. Disasters in India: (b) Causes, Impacts, Distribution and Mapping: Earthquake and Cyclone.
4. Human induced disasters: Causes, Impacts, Distribution and Mapping.
5. Disaster Risk Reduction: Mitigation and Preparedness, NDMA and NIDM; Community-Based Disaster Management; Do's and Don'ts during Disasters.

#### **References:**

1. Government of India. (1997) Vulnerability Atlas of India. Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India, New Delhi.
2. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.
3. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.
4. Singh, Jagbir (2007) "Disaster Management Future Challenges and Opportunities",. Publisher-I.K. International Pvt. Ltd New Delhi.

## **4. Geography of Tourism**

### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Appreciate the basic concepts and geographical parameters of tourism;
2. Acquire knowledge on the recent trends and patterns of tourism development in India and other countries;
3. Understand the impacts of tourism on national, regional and local economy, environment and society.

### **Course Content:**

1. Tourism: Concepts, Nature and Scope ; Inter-Relationships between Tourism, Pilgrimage, Recreation and Leisure.
2. Geographical Parameters of Tourism by Robinson; Type of Tourism: Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage, Geo-tourism
3. Recent Trends of Tourism: International and Regional; Domestic (India); Eco- Tourism, Sustainable Tourism, Meetings, Incentives, Conventions and Exhibitions (MICE); Trends of Pilgrimage Tourism.
4. Impacts of Tourism: Economy; Environment; Society.
5. Tourism in India: World heritage sites Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal and Heritage; National Tourism Policy.

### **References:**

1. Dhar, P.N. (2006) International Tourism: Emerging Challenges and Future Prospects. Kanishka, New Delhi.
2. Hall, M. and Stephen, P. (2006) Geography of Tourism and Recreation – Environment, Place and Space, Routledge, London.
3. Kamra, K. K. and Chand, M. (2007) Basics of Tourism: Theory, Operation and Practise, Kanishka Publishers, Pune.
4. Page, S. J. (2011) Tourism Management: An Introduction, Butterworth- Heinemann, Oxford.
5. Raj, R. and Nigel, D. (2007) Morpeth Religious Tourism and Pilgrimage Festivals

Management: An International perspective by, CABI, Cambridge([www.cabi.org](http://www.cabi.org)).

6. Singh, Jagbir (2014) "Eco-Tourism, I.K. International Publisher. New Delhi.
7. Tourism Recreation and Research Journal, Center for Tourism Research and Development, Lucknow.

## **Generic Elective Courses (2)**

### **1. Disaster Management**

#### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Understand the basic concepts and the classification method of disasters;
2. Acquire knowledge on the causes, impacts, distribution and mapping of disasters of India;
3. Appreciate the responses and mitigation measures of disasters in India.

#### **Course Content:**

1. Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
2. Disasters in India: (a) Causes, Distribution, Impact, Mapping and Historical Perspectives: Flood, Landslide, Drought.
3. Disasters in India: (b) Causes, Impact, Distribution and Mapping: Earthquake, Tsunami and Cyclone.
4. Human induced disasters: Causes, Impact, Distribution and Mapping.
5. Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do's and Don'ts During Disasters.

#### **References:**

1. Government of India. (1997) Vulnerability Atlas of India. Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India, New Delhi.
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## **2. Climate Change Vulnerability and Mitigation**

### **Learning Outcomes:**

After the completion of the course, the students will have the ability to:

1. Understand the climate change and its physical, economic and social vulnerabilities;
2. Diagnose the impacts of climate change on various spheres of the earth;
3. Appreciate the global, national and local adaptation and mitigation efforts and plans of the Governments.

### **Course Content:**

1. Science of Climate Change: Understanding Climate Change; Green House Gases and Global Warming; Global Climatic Assessment - IPCC
2. Climate Change and Vulnerability: Physical Vulnerability; Economic Vulnerability; Social Vulnerability
3. Impacts of Climate Change: Agriculture and Water; Flora and Fauna; Human Health
4. Adaptation and Mitigation: Global Initiatives with Particular Reference to South Asia.
5. National Action Plan on Climate Change; Local Institutions (Urban Local Bodies, Panchayats)

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### 13.Keywords

Atmosphere and Climate	Inclusive Development	Spatio-temporal analysis
Biodiversity	India	Statistical Techniques
Cartography	Land Use and Land cover Change	Surveying Sustainable Development Goals
Climate Change	Land Use Planning	Thematic Atlas
Climate Change Mitigation	Landscape	Topographical Modeling
Demography	Mapping	Tourism
Disaster Management	Physical Geography	Urban Geography
Disaster Risk Reduction	Political Geography	Urban System
Ecosystem	Population-Resource Relationships	Watershed Management
Field work	Remote Sensing	
Food Security	Research Methods Resource Management	
Geospatial	Rural Ecology	
GIScience	Settlement	
Hazard	Social wellbeing	
Health Geography	Soil System	
Human Ecology	Spatial Statistics	
Human Geography	Spatial Data	
Hydrology	Spatial Technology Information	

