

Shivaji University, Kolhapur  
Department of Geography  
(Faculty of Science and Technology)



*Revised Syllabus of*  
**M.A./M.Sc. Geography**  
(Choice Based Credit System)

Implemented From...

Part I - Academic Year 2019-20 onwards  
(i.e., from June 2019)

Part II - Academic Year 2020-21 onwards  
(i.e., from June 2020)

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**M.A./M.Sc. Geography Programme Structure (CBCS PATTERN) (2019-20 onwards) M.A./M.Sc. Part – I**

<b>SEMESTER-I (Duration- Six Month)</b>											
	Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
<b>CGPA</b>	1	CC-101	4	4	4	80	32	3	20	8	1
	2	CC-102	4	4	4	80	32	3	20	8	1
	3	CC-103	4	4	4	80	32	3	20	8	1
	4	CC-104	4	4	4	80	32	3	20	8	1
	5	CCPr-105	16	16	8	200	80	*	--	--	--
<b>Total (A)</b>			--	--	<b>24</b>	<b>520</b>	--	--	<b>80</b>	--	--
<b>Non-CGPA</b>	1	AEC-106	2	2	2	--	--	--	50	20	2
<b>SEMESTER-II (Duration- Six Month)</b>											
<b>CGPA</b>	1	CC-201	4	4	4	80	32	3	20	8	1
	2	CC-202	4	4	4	80	32	3	20	8	1
	3	CCS-203	4	4	4	80	32	3	20	8	1
	4	CCS-204	4	4	4	80	32	3	20	8	1
	5	CCPr-205	16	16	8	200	80	*	--	--	--
<b>Total (B)</b>			--	--	<b>24</b>	<b>520</b>	--	--	<b>80</b>	--	--
<b>Non-CGPA</b>	1	SEC-206	2	2	2	--	--	--	50	20	2
<b>Total (A+B)</b>					<b>48</b>	<b>1040</b>	--	--	<b>160</b>	--	--

**M.A./M.Sc. Geography Programme Structure (CBCS PATTERN) (2020-21 onwards) M.A./M.Sc. Part – II**

<b>SEMESTER-III (Duration- Six Month)</b>											
	Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
			Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
			Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
<b>CGPA</b>	1	CC-301	4	4	4	80	32	3	20	8	1
	2	CCS-302	4	4	4	80	32	3	20	8	1
	3	DSE-303	4	4	4	80	32	3	20	8	1
	4	DSE-304	4	4	4	80	32	3	20	8	1
	5	CCPr -305	16	16	8	200	80	*	--	--	--
<b>Total (C)</b>			--	--	<b>24</b>	<b>520</b>	--	--	<b>80</b>	--	--
<b>Non-CGPA</b>	1	AEC-306	2	2	2	--	--	--	50	20	2
	2	EC (SWM MOOC)-307	Number of lectures and credit shall be as specified on SWAYAM MOOC								
<b>SEMESTER-IV (Duration- Six Month)</b>											
<b>CGPA</b>	1	CC-401	4	4	4	80	32	3	20	8	1
	2	CCS-402	4	4	4	80	32	3	20	8	1
	3	DSE-403	4	4	4	80	32	3	20	8	1
	4	DSE-404	4	4	4	80	32	3	20	8	1
	5	CCPr-405	16	16	8	200	80	*	--	--	--
<b>Total (D)</b>			--	--	<b>24</b>	<b>520</b>	--	--	<b>80</b>	--	--
<b>Non-CGPA</b>	1	SEC-406	2	2	2	--	--	--	50	20	2
	2	GE-407	2	2	2	--	--	--	50	20	2
<b>Total (C+D)</b>					<b>48</b>	<b>1040</b>	--	--	<b>160</b>	--	--

**Note(s):**

•Student contact hours per week : 32 Hours (Min.)	•Total Marks for M.A./M.Sc.-I : 1200 •Total Marks for M.A./M.Sc.-II : 1200
•Theory and Practical Lectures : 60 Minutes Each	•Total Credits for M.A./M.Sc.-I (Semester I & II) : 48 •Total Credits for M.A./M.Sc.-II (Semester III & IV): 48
<ul style="list-style-type: none"> <li>•CC- Core Course</li> <li>•CCS- Core Course Specialization</li> <li>•CCPr- Core Course Practical</li> <li>•DSE- Discipline Specific Elective</li> <li>•AEC- Mandatory Non-CGPA compulsory Ability Enhancement Course</li> <li>•SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course</li> <li>•EC (SWM MOOC) - Non-CGPA Elective Course</li> <li>•GE- Generic Elective</li> </ul>	<ul style="list-style-type: none"> <li>•Practical Examination is annual</li> <li>•Practical courses are divided into 2 or 3 sections</li> <li>•*Duration of practical examination as per respective BOS guidelines</li> <li>•<b>Separate passing is mandatory for Theory, Internal and Practical examination</b></li> </ul>

	M.A./M.Sc.-I	M.A./M.Sc.-II	Total
<b>Marks</b>	<b>1200</b>	<b>1200</b>	<b>2400</b>
<b>Credits</b>	<b>48</b>	<b>48</b>	<b>96</b>

**I. CGPA Courses:**

1. There shall be 12 Core Courses (CC) of 64 Credits (including 32 credits for 4 practical courses)
2. There shall be 04 Core Course Specialization (CCS) of 16 credits.
3. There shall be 04 Discipline Specific Elective (DSE) courses of 16 credits.
4. Total credits for CGPA courses shall be of 96 credits.

**II. Mandatory Non-CGPA Courses:**

1. There shall be 02 Mandatory Non-CGPA compulsory Ability Enhancement Courses (AEC) of 02 credits each.
2. There shall be 02 Mandatory Non-CGPA compulsory Skill Enhancement Course (SEC) of 02 credits each.
3. There shall be one Elective Course (EC) (SWAYAM MOOC). The credits of this course shall be as specified on SWAYAM MOOC.
4. There shall be one Generic Elective (GE) course of 02 credits. Each student has to take generic elective from the department other than parent department.
5. The total credits for Non-CGPA course shall be of 10 credits + 2/4 credits of EC as per availability.
6. The credits assigned to the course and the programme to be earned by the students and shall not have any relevance with the work load of the teacher.

**Programme and Course Guidelines (for CGPA Courses):**

1. **Title of the Course:** M.A./M.Sc. in Geography
2. **Year of Implementation:** Revised syllabus will be implemented from academic year 2019-20.
3. **Programme Duration:** The M.A./M.Sc programme duration is of two years comprising of four semesters. Each semester spanning for 6 months of minimum 120 working days (minimum 90 teaching days).
4. **Scheme of Examination:**

Paper Type	*Internal Marks	University Assessment	Total Marks	Credit per Course	No. of Course	Total Credits
Theory	20	80	100	04	16	64
Practical / Project	--	200	200	08	04	32

\*Note: Internal marks for each theory course - 20 marks (Class Test: 10 marks; Assignment/Seminar: 10 marks)

## 5. Course Structure (CBCS):

Paper No.	Course Title	Teaching hours per week	Credits
<b>M.A./M.Sc. Geography Sem. I</b>			
CC-101	Fundamentals of Geomorphology	4	4
CC-102	Principles of Climatology	4	4
CC-103	Economic Geography	4	4
CC-104	Geography of Population and Human Resource Development	4	4
CCPr-105 (Annual)	105.1 Practical's in Geomorphology and Surveying	16	8
	105.2 Analysis of Climatic Data		
	105.3 Analysis of Socio-economic Data		
<b>CGPA - Total Credit (Cumulative)</b>			<b>24 (24)</b>
AEC-106	Ability Enhancement Course	--	2
Non-CGPA - Total Credit (Cumulative)			02 (02)
<b>M.A./M.Sc. Geography Sem. II</b>			
CC-201	Applied Geomorphology	4	4
CC-202	Applied Climatology and Climate Change	4	4
CCS-203	Advanced Cartography and Surveying	4	4
CCS-204	Social and Cultural Geography	4	4
CCPr-205 (Annual)	205.1 Computer Applications in Geography	16	8
	205.2 Statistical Techniques in Geography		
	205.3 Quantitative Techniques in Geography		
<b>CGPA - Total Credit (Cumulative)</b>			<b>24 (48)</b>
SEC-206	Skill Enhancement Course	--	2
Non-CGPA - Total Credit (Cumulative)			02 (04)
<b>M.A./M.Sc. Geography Sem. III</b>			
CC-301	Geohydrology and Oceanography	4	4
CCS-302	Fundamentals of Remote Sensing and DIP	4	4
DSE-303 (Optional)	Geography of Environment OR Biogeography	4	4
DSE-304 (Optional)	Settlement Geography OR Geography of India OR Political Geography	4	4
CCPr-305 (Annual)	305.1 Research Methodology and Geographical Excursion - 2 Credits	16	8
	305.2 Dissertation/ Project – 6 Credits		
<b>CGPA - Total Credit (Cumulative)</b>			<b>24 (72)</b>
AEC-306	Ability Enhancement Course	--	2
EC-307	Elective Course (SWAYAM MOOC)	--	2/4
Non-CGPA - Total Credit (Cumulative)			4/6 (8/10)
<b>M.A./M.Sc. Geography Sem. IV</b>			
CC-401	Development of Modern Geographical Thought	4	4
CCS-402	Regional Planning and Development	4	4
DSE-403 (Optional)	Fundamentals and Applications of GIS and GPS OR Fundamentals of Soil Geography	4	4
DSE-404 (Optional)	Agricultural Geography OR Tourism Geography OR Geography of Health and Nutrition	4	4
CCPr-405 (Annual)	405.1 CCPr-405.1: Photogrammetry, Remote Sensing and DIP – 4 Credits	16	8
	405.2 Introduction to GIS Software and GPS (Optional) OR		
	405.2 Soil and Water Analysis (Optional) – 4 Credits		
<b>CGPA - Total Credit (Cumulative)</b>			<b>24 (96)</b>
SEC-406	Skill Enhancement Course	--	2
GE-407	Generic Elective Course	--	2
Non-CGPA - Total Credit (Cumulative)			4 (12/14)

## 6. Nature of Question Paper in University Assessment

### I. Nature of Theory Question Paper:

Question No.	Type of Question	Number of Questions to be Asked	Number of Questions to be Answered	Marks per Question	Total Marks
Q1.	Objective type (MCQ)	08	08	02	16
Q2.	Short Answer (Definition type)	04	04	04	16
Q3.	Short Notes (Descriptive type)	03	02	08	16
Q4.	Long Answer/ Essay type	02	01	16	16
Q5.	Long Answer/ Essay type	02	01	16	16
<b>Total = 05</b>	--	--	--	--	<b>80</b>

### II. Nature of Practical Question Paper for Course No. 105 and 205:

Question No.	Type of Question/ Assessment	No. of Questions	Total Marks/ Course
Section 1: Q1 and Q2	Practical/ Lab Assessment	02	50
Section 2: Q3 and Q4	Practical/ Lab Assessment	02	50
Section 3: Q5 and Q6	Practical/ Lab Assessment	02	50
Q7.	Practical Assignment (External)	01	25
Q8.	Viva-voce (External)	01	25
<b>Total = 08</b>	--	--	<b>200</b>

### III. Nature of Practical Question Paper for Course No. 305:

Question No.	Type of Question/ Assessment	No. of Questions	Total Marks
Section 1: Q1 and Q2	Practical/ Lab Assessment based on Research Methodology	02	30
Section 2: Q3 and Q4	Practical/ Lab Assessment based on Dissertation/ Project	02	50
Q5.	Practical Assignment based on Research Methodology and Geographical Excursion (External)	01	10
Q6.	Viva-voce based on Research Methodology and Geographical Excursion (External)	01	10
Q7.	Dissertation/ Project Report Evaluation (External)	01	50
Q8.	Viva-voce based on Dissertation/ Project Report (External)	01	50
<b>Total = 08</b>	--	--	<b>200</b>

### IV. Nature of Practical Question Paper for Course No. 405:

Question No.	Type of Question/ Assessment	No. of Questions	Total Marks
Section 1: Q1 to Q3	Practical/Lab Assessment	03	75
Section 2: Q4 to Q6 OR Section 3: Q4 to Q6	Practical/Lab Assessment	03	75
Q7.	Practical Assignment (External)	01	25
Q8.	Viva-voce (External)	01	25
<b>Total = 08</b>	--	--	<b>200</b>

**7. Equivalence in Accordance with Title and Content of Courses (for revised syllabus):**

Sr. No.	Title of Old Course	Title of New Course
1.	GCT-101: Fundamentals of Geomorphology	CC-101: Fundamentals of Geomorphology
2.	GCT-102: Principles of Climatology	CC-102: Principles of Climatology
3.	GCT-103: Economic Geography	CC-103: Economic Geography
4.	GCT-104: Geography of Population and Human Resource Development	CC-104: Geography of Population and Human Resource Development
5.	GCT-205: Applied Geomorphology	CC-201: Applied Geomorphology
6.	GCT-206: Applied Climatology and Climate Change	CC-202: Applied Climatology and Climate Change
7.	GCT-308: Advance Cartography and Surveying	CCS-203: Advanced Cartography and Surveying
8.	GOT-201: Social and Cultural Geography	CCS-204: Social and Cultural Geography
9.	GCT-101: Practical in Geomorphology and Field Survey GCP-102: Analysis of Socio-economic and Climatic Data	CCPr-105: Practical I 105.1 Practicals in Geomorphology and Surveying 105.2 Analysis of Climatic Data 105.3 Analysis of Socio-economic Data
10.	GCP-203: Computer Application in Geography GCP-204: Statistical Techniques in Geography	CCPr-205: Practical II 205.1 Computer Applications in Geography 205.2 Statistical Techniques in Geography 205.3 Quantitative Techniques in Geography
11.	GCT-307: Geohydrology and Oceanography	CC-301: Geohydrology and Oceanography
12.	GCT-308: Fundamentals of Remote Sensing and Digital Image Processing	CCS-302: Fundamentals of Remote Sensing and DIP
13.	GOT-305: Geography of Environment	DSE-303(a): Geography of Environment
14.	GOT-306: Biogeography	DSE-303(b): Biogeography
15.	GOT-307: Settlement Geography	DSE-304(a): Settlement Geography
16.	GOT-202: Geography of India	DSE-304(b): Geography of India
17.	GOT-203: Political Geography	DSE-304(c): Political Geography
18.	GCT-409: Development of Modern Geographical Thought	CC-401: Development of Modern Geographical Thought
19.	GCT-410: Regional Planning and Development	CCS-402: Regional Planning and Development
20.	GOT-409: Fundamentals of Geographical Information System and Introduction to GPS	DSE-403(a): Fundamentals and Applications of GIS and GPS
21.	GOT-410: Fundamentals of Soil Geography	DSE-403(b): Fundamentals of Soil Geography
22.	GOT-412: Agricultural Geography	DSE-404(a): Agricultural Geography
23.	GOT-411: Geography of Tourism	DSE-404(b): Tourism Geography
24.	GOT-204: Geography of Health	DSE-404(c): Geography of Health and Nutrition
25.	GCP-305: Research Methodology GCP-408: Study tour report writing GCP-407: Dissertation/ Project (Based on field work)	CCPr-305: Practical III (Dissertation) 305.1 Research Methodology and Geographical Excursion 305.2 Dissertation/ Project
26.	GCP-306: Photogrammetry, Remote Sensing and Digital Image Processing GOP-401: Introduction to GIS Software and GPS GOP-402: Soil and Water Analysis	CCPr-405: Practical IV 405.1 Photogrammetry, Remote Sensing and DIP 405.2 Introduction to GIS Software and GPS 405.2 Soil and Water Analysis

**8. Program Educational Objectives (PEOs):**

1. To enhance students' ability to apply their specialized knowledge in the geographical domain.
2. To develop employability skills and competencies to serve the job requirements in the society.
3. Inspire students to develop the abilities among them to offer services in the entrepreneurial environment.
4. To cultivate the interest among students to conduct research activities in the discipline of Geography.

**9. Programme Outcomes (POs):**

1. Students will have comprehensive knowledge in the discipline of Geography.
2. They will have ability of making comprehensive analysis, interpret spatial problems, and suggest proper solutions by using theoretical, methodological, and instrumental knowledge of Geography.
3. Good employability skills as per current need of the society to compete in the competitive world.
4. They will have good understanding about proper utilization of natural resources through geographical knowledge.
5. Aware about the regional and national environmental issues, recent trends, and technological advancements in the discipline of Geography.
6. Develop research interest to solve critical and emerging societal issues related to geography and the surrounding environment.

## CC-101: Fundamentals of Geomorphology

### Course Outcomes (COs):

1. To understand the development of geomorphic thought throughout the time with a review of fundamental concepts of geomorphology.
2. To look into the evolution of continents and ocean basins with continental drift theory.
3. To know the endogenetic and exogenetic forces controlling landform development with special reference to the denudational processes.
4. To see the mountain building activities through different theories.

### Unit: 1

**15 Lectures**

Meaning nature and scope of geomorphology, Development of geomorphic thought, a brief review of fundamental concepts of geomorphology: Principle of Uniformitarianism.

### Unit: 2

**15 Lectures**

Evolution of Continents and ocean basins: Continental drift theory of Taylor, Continental Drift theory of Wegener, Theory of Plate Tectonics.

### Unit: 3

**15 Lectures**

Factors controlling landform development: Endogenetic and Exogenetic forces, Denudational processes, Weathering, Erosion and Mass wasting.

### Unit: 4

**15 Lectures**

Mountain building activities, Geosynclinal theory of Kober, Holms Convective current theory, Theory of Isostasy.

### References:

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3. Chorley, R.J. Schumm, S.A. & Sugden, D.E. (1985): Geomorphology, Methuen & Co. Ltd., London, New York.
4. Brierley, G.J. & Fryirs, K.A. (2005): Geomorphology and River Management, Blackwell Publishing, Oxford UK.
5. Briggs, K. (1985): Physical Geography Process and System, Hodder and Stoughton, London.
6. Christopherson, R.W. (1995): Elemental Geosystems: A Foundation in Physical Geography, Prentice Hall Englewood Cliffs, New Jersey.
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8. Dayal, P. (1996): A Textbook of Geomorphology, Shukla Book Depot, Patna.
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10. Hart, M.G. (1986): Geomorphology Pure and Applied, George Allen and Unwin, London.
11. Leopold, L.B. Wolman, M.G. & Miller, J.P. (1964): Fluvial Processes in Geomorphology, W.H. Freeman, San Francisco.
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13. Moor, W.G. (1949): A Dictionary of Geography, Penguin Books, England.
14. Morgan, R.S. & Wooldridge S.W. (1959): Outline of Geomorphology the Physical basis of Geography, Longmans Green, London.
15. Robinson, Harry (1969): Morphology and Landscape, University Tutorial Press Ltd. London.
16. Singh, Savindra (1998): Geomorphology, Prayag Pustak Bhavan, Allahabad.
17. Singh, Savindra (1991): Environmental Geography, Prayag Pustak Bhavan, Allahabad.
18. Spark, B. W. (1986): Geomorphology, Longman, London.
19. Strahler, A.N. (1969): Physical Geography. John Wiley & Sons Inc., New York.
20. Thomas, M.F. (1974): Tropical Geomorphology, Macmillan, London.
21. Thornbury, W.D. (1969): Principles of Geomorphology, Wiley Eastern Ltd. New Delhi.
22. Wadia, D.N. (1993): Geology of India, Tata McGraw Hill Edition, New Delhi.
23. Worcester, P. G. (1948): Textbook of Geomorphology, Princeton, D. Van, Norstrand.



## CC-102: Principles of Climatology

### Course Outcomes (COs):

- To distinguish the weather and climate with an understanding of structure and composition of Atmosphere;
- To understand the variations of weather systems in terms of Stability and Instability of atmosphere;
- To enable the students to understand the vertical and horizontal distribution of atmospheric air;
- To get complete information about Atmospheric Disturbances in terms of cyclones and anti-cyclones;
- To know the significance of synoptic Climatology in pollution studies and navigation;

### Unit - 1:

**15 Lectures**

Introduction to Climatology: Significance of Climatology, Development of Modern Climatology, Origin of Atmosphere, Structure and Composition of Atmosphere, Insolation, Heat transfer- Radiation, Convection and conduction, terrestrial heat balance.

### Unit - 2:

**15 Lectures**

Moisture in the Atmosphere: Changes of state, Humidity, Humidity measurements, Stability and Instability of atmosphere, Condensation- Clouds and fogs, Precipitation - precipitation processes, types and forms.

### Unit - 3:

**12 Lectures**

Motion in the Atmosphere: Air Pressure, Pressure measurement and distribution, Factors affecting wind, Pressure belts & Planetary winds, Monsoon and Local winds.

### Unit - 4:

**18 Lectures**

Air Masses and Atmospheric Disturbances: Classification and modifications of Air Masses, Fronts: characteristics and types, Tropical Cyclones, Anticyclones, Thunderstorms, Tornadoes, Hurricanes, Water spouts; Application of Synoptic Climatology in pollution studies and navigation.

### References:

#### Books & Reports:

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2. **Barry, R.G.,** and Chorley, R.J. (2010): *Atmosphere, Weather and Climate*, Routledge, London, 516pp.
3. **Byers R.H.** (1974): *General Meteorology*, McGraw Hill BKCo New York.
4. **Critchfield, H.J.** (2009): *General Climatology*; Prentice Hall, London.
5. **Das P. K.** (1995): *The Monsoon*, Prayag pustak Bhavan, Allahabad, National Book Trust India.
6. **Ela Dean**, (2017); **Principles of Atmospheric Science**, Larsen and Keller Education, 249 pp.
7. **Hobbs, J.E.** (1980): *Applied Climatology*, Butterworth, London.
8. **Lal, D.S.**: *Climatology*. Prayag pustak Bhavan, Allahabad.
9. **Lutgens, F.K.,** and Tarbuck, E.J. (2013): *The Atmosphere – An Introduction to Meteorology*. Prentice Hall, Boston, 506pp.
10. **Mather J. R.** (1975): *Climatology : Fundamentals & Applications*. Mc Graw Hills Book Co., New York.
11. **Miller A., et, al.** (1983); *Elements of Meteorology*, Merrill, Columbus.
12. **Oliver J. E.** (1973): *Climate & Mans Environment*, John Wiley & Sons; New york.
13. **Robert V. Rohli, Anthony J. Vega,** (2017): *Climatology*, Jones & Bartlett Learning; 4 edition, 418 pp.
14. **Savindra Singh,** (2006): *Climatology*, Prayag Pustak Bhavan, Allahabad.
15. **Trewartha G.T,** (1968): *An Introduction to climate*, McGraw Hill BK Co.New York.
16. **Williams Sellers,** (2014): **Physical Climatology**, New India Publishing Agency, 280 pp.

#### Journals:

*Bulletin of the American Meteorological Society* (<https://journals.ametsoc.org/toc/bams/current>)

*Climate Dynamics* (<https://link.springer.com/journal/volumesAndIssues/382>)

*International journal of Climatology* (<https://rmets.onlinelibrary.wiley.com/journal/10970088>)

*Journal of Climate* (<https://journals.ametsoc.org/toc/clim/current>)

*Nature Climate Change* (<https://www.nature.com/nclimate/>)

*Weather and Climate Extremes* (<https://www.sciencedirect.com/journal/weather-and-climate-extremes>)

## CC-103: Economic Geography

### Course Outcomes (COs):

- To understand the concepts and basis of economic processes
- To get acquainted with theories and models in economic geography
- To get comprehensive knowledge of World energy resources, situation and distribution
- To know about the Nature, scope and Principles of Industrial Geography
- To understand transport and Trade policies of country
- To get detail knowledge of economic power determinants of country and able to analyze the economic development of country.

### Unit-1: Basics of Economic Geography

**15 Lectures**

Nature and scope; Approaches to the study of economic geography; Basis of economic processes: Production, exchange & consumption, Classification and characteristics of economic activities. World economic development: measurement and problems; Special Economic Zones.

### Unit-2: Energy Resources

**10 Lectures**

Concept of resources, Classification of resources, Renewable & Non-renewable energy resources, World energy situation and distribution; Sources of Energy: Coal, Oil, Natural gas and Nuclear energy, OPEC-energy crisis.

### Unit- 3: Industrial Geography

**15 Lectures**

Nature and scope of Industrial Geography, Factors of Industrial Location, Principles of Industrial Location: – Profit maximization, Least cost location- A. Weber & A. Losch- industrial location theories, Rostow's model, Industrial regionalization; World industries: locational patterns and problems; New industrial policies of India.

### Unit-4: Transportation & Trade

**20 Lectures**

Modes of transportation, Accessibility and connectivity; Interregional and Intraregional: Ullman's triad- Complementarily- Intervening Opportunity- Transferability, Trade Policy; Export processing zones, International Trade Characteristics, patterns of world trade, Regional Trade blocks EEC, EFTA, & WTO.

### References:

1. Alexander J.W. (1976): Economic Geography, Prentice Hall of India. New Delhi.
2. Alexanderson G. (1988): Geography of manufacturing, Prentice Hall of India. New Delhi.
3. Berry, Conkling & Ray (1988): Economic Geography Prentice Hall of India, New Jersey.
4. Hurst Elliott (1986): Geography of Economic Behaviour, Unwin, London.
5. Johnson R.J. & Taylor D.J. (1989): A world in crisis, Basil-Blackwell, Oxford.
6. Losch (1954): Economics of Location, Yale University Press New York.
7. Redcliff, M. (1987): Development & the environmental crisis. Methuen. London.
8. Sinha B.N.(1971): Industrial geography of India
9. Watts H.D. (1987): Industrial Geography, Longman scientific and Technical, New York.
10. Haggett, Peter: Modern Synthesis in Geography.
11. Robinson H & Bamford C. G. (1978): Geography of Transport, Macdonald & Evans USA.
12. Misra R. P.: Regional Planning, concepts, New Delhi.
13. Jones & Darkenwald : Economic geography

## CC-104: Geography of Population and Human Resource Development

**Course Outcomes (COs):** After completing the course, the students will develop an aptitude to:

1. Infer factors influencing population distribution and density;
2. Acquire skill to describe regional patterns of population composition;
3. Compute and explore fertility, mortality and human development levels for micro, meso and macro regions.
4. Analyse the population-resource regions and discover problems arising due to over and under population.
5. Understand and create awareness about provincial aspects of gender equity, social well-being and quality of life.

### Unit-1: Concepts

**15 Lectures**

Meaning, nature, scope and significance of Population Geography; Sources of population data; Factors influencing population distribution and density-global perspective; Population distribution patterns-global perspective with reference to India and States; Population composition and change: India and States - Demographic, Socio-Cultural, Economic, Health.

### Unit-2: Population Processes

**20 Lectures**

Fertility-Measures and Methods of estimation, spatio-temporal variations - India; Mortality-Measures and Methods of estimation, spatio-temporal variations - India; Migration-measures and methods of estimations.

### Unit-3: Population Theories

**10 Lectures**

Theories of population growth: Malthus, Marx, Demographic Transition Model; Migration theories: Ravenstein and Everette Lee; Epidemiological Transition.

### Unit-4: Population Development and Policies

**15 Lectures**

Population as resource, concepts of over, under and optimum population, population and development debate, population as ecosystem, Limits to Growth, Population resource regions, Human development - World, Social well-being and quality of life, Gender Equity; Population Policies-perspectives from developed and developing world, National Population Policy of India.

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2. Bhende A., Kanitkar T. (2006): Principles of Population Studies, Himalaya Publishing House, Bombay. 18th revised.
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31. **Zelinsky**, W (1966): A Prologue of Population Geography, Prentice Hall Inc, M.J.

### **Journals:**

*Demography*: <https://link.springer.com/journal/13524>

*International Migration Review*: <https://journals.sagepub.com/home/mrx>

*Journal of Population Research*: <https://link.springer.com/journal/12546>

*Population and Environment*: <https://link.springer.com/journal/11111>

*Population Bulletin*: <https://www.prb.org/population-bulletins/>

*Population Development Review*: <https://onlinelibrary.wiley.com/loi/17284457>

*Population, Space, and Place*: <https://onlinelibrary.wiley.com/journal/15448452>

*Population Studies*: <https://www.tandfonline.com/loi/rpst20>

*Studies in Family Planning*: <https://onlinelibrary.wiley.com/journal/17284465>

*The Professional Geographer*: <https://www.tandfonline.com/loi/rtpg20>

### **Useful Websites:**

*Census of India*: <http://censusindia.gov.in/>

*Population Reference Bureau*: [www.prb.org](http://www.prb.org)

*Population Division of United Nations*: <https://www.un.org/en/development/desa/population/index.asp>

*Population Council*: <https://www.popcouncil.org/>

*The World Bank*: [www.worldbank.org](http://www.worldbank.org)

*United Nations Development Program*: <http://hdr.undp.org/en/>

**CCPr-105.1: Practicals in Geomorphology and Surveying****Course Outcomes (COs):**

1. To know the methods of representation of relief.
2. Understanding the topographical maps.
3. Identification and mapping of drainage patterns
4. To look into the drainage basin morphometry.
5. To understand the field surveying methods.

**Unit-1: Relief Representation and Maps****15 Hrs.****A) Methods of Representation of Relief:**

1. Pictorial
2. Mathematical.

**B) Maps:**

3. Definition:
4. Types of maps
5. Indexing of Topographical sheets. Identification & Mapping of Landforms from Topographical Maps: Ridge; Saddle; Col.; Pass; Spur; Plateau; Escarpment; Cliff; Waterfall; River Terraces; 'U' shaped Valley; 'V' shaped Valley.

**Unit-2: Drainage Basin Analysis****40 Hrs.****A) Identification & Mapping of Drainage Patterns:**

6. Dendritic;
7. Trellis;
8. Radial;
9. Drainage Patterns.

**B) Quantitative Analysis of Channel Planform:**

10. Sinuosity Index of Straight channel.
11. Sinuosity Index of Sinuous Channel.
12. Sinuosity Index of Meandering channels.

**C) Analysis of Cross Profiles & Longitudinal Profile of Rivers:**

13. Cross profiles
14. Profile projected
15. Profile superimposed
16. Profile composite

**D) Drainage Basin Morphometry:**

17. Delineating Drainage Basin Perimeters,
18. Measurement of Drainage basin area,
19. Relief/Height (H),
20. Perimeter Length (P),
21. Strahler Stream Order system,
22. Calculation of Bifurcation Ratio,
23. Calculation of Drainage density,
24. Calculation of Stream Frequency,
25. Drainage Texture,
26. Elongation ratio,
27. Circularity Ratio.

**Unit-3: Field Surveying**

**25 Hrs.**

28. Definition and uses of surveying.
29. Classification of surveying.
30. Transit Theodolite: Concept of transiting, swinging, face left, face right and changing face.
31. Measurement of horizontal and vertical angles.
32. Determination of horizontal distance between two inaccessible points with Theodolite.
33. Theodolite Traverse Surveying and Stadia Survey.
34. Tacheometry. Preparation of Contour map of small area.
35. Total Station: Components used in Total Station Surveying;
36. To plot a small area using measurements taken from a Total Station.

**References:**

1. Davis, Peter, (1974): Science in Geography Data Description & Presentation, Vol.3, Oxford University Press, London.
2. Hanwell, J.D. & Newson, M.D. (1973): Macmillan Education Ltd., London.
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4. Monkhouse, F.JR & Wilkinson, H.R: Maps and Diagrams, Mathwn & Company, London.
5. Robinson, A.H & Sale R.D.: Elements of Cartography. Johns House & Sons, London.
6. Sing R. L. (1996): Map Work & Practical Geography, Central Book Dept. Allahabad.
7. Singh & Kanaujia (1973): Map Work & Practical Geography, Central Book Dept. Allahabad.
8. N. N. Basak (1994): Surveying and Leveling, Tata McGraw Hill Publishing Company LTD., New Delhi.
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14. Singh, S. (1998): Geomorphology, Prayag Pustak Bhawan, Allahabad.
15. Goudie, A. (1990): Geomorphological Techniques, Routledge, London

**CCPr-105.2: Analysis of Climatic Data****Course Outcomes (COs):**

1. To identify various sources of climate data
2. To understand the formats of Indian daily weather report and reading of weather signs and symbols
3. To represent meteorological elements diagrammatically and interpretation of results.
4. To know methods of measurement of meteorological elements
5. To analyse interrelationship between various meteorological elements
6. To analyse present and future trends of meteorological elements.

**Unit-1: Basics of Climatic Data Analysis****20 Hrs.****Practical Exercise(s):**

- 1-2: Nature and sources of climatic data
- 3: Measurement of meteorological elements- Temperature, Humidity of the air, Precipitation, Wind, Evaporation, Atmospheric pressure
- 4: Indian daily weather report and its format
- 5: Weather details: Weather Signs & symbols
- 6-8: Reading and interpretation of weather maps of representative seasons.

**Unit-2: Diagrammatic Depiction of Meteorological Elements****30 Hrs.****Practical Exercise(s):**

- 9-11: Construction and interpretation of Wind Rose Diagrams- Simple, Compound, Octagonal
- 12-14: Interpolation of Isopleth- Isotherms, Isobars, Isohyets
- 15-17: Depiction and Interpretation of Comfort diagrams- Climograph, Hythergraph, Climatograph
- 18-20: Time series analysis- Preparation of trend graphs- Moving averages (three years and five years), Semi-average line

**Unit-3: Analysis of Interrelationship: Meteorological Elements****30 Hrs.****Practical Exercise(s):**

- 21-23: Calculation and interpretation of Central tendency of climatic data
- 24-25: Spatial correlation of climatic variables: Graphical analysis
- 26: Water budget: Graphical analysis
- 27: Hydrograph
- 28: Analysis of upper air data- Tephigram (Temperature Height diagram)
- 29: Ergographs (Crop Calendar)
- 30-31: Dispersion graphs: Temperature and rainfall dispersion Diagram

**References:**

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2. Carbone Greg (2015): Exercises for Weather & Climate (9th Edition) ISBN-10: 0134041364, ISBN-13: 978-0134041360.
3. Critchfield: Principles of Climatology.
4. Dunlop Storm (2014): Meteorology Manual: The Practical Guide to the Weather Hardcover, Haynes Publishing UK; First edition, ISBN-10: 0857332724, ISBN-13: 978-0857332721
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8. R.L. Singh & Rana p.B. Singh: Element of Practical Geography. Kalyani Pub. New Delhi (1999).



9. Stacey, F.W. (1919): Practical exercises on the weather and climate of the British Isles and Northwest Europe Hardcover, Publisher: University Press, ASIN: B00089JQMG
10. Trewartha G.T.: An Introduction to climate McGraw – Hill Book Co. New York.
11. Ward DeCourcy R. (2010): Practical Exercises In Elementary Meteorology, Publisher: Cole Press, ISBN-10: 1445532034, ISBN-13: 978-1445532035
12. Wilks D.S.(1965): Statistical Methods in the Atmospheric Sciences, Volume 59: An Introduction (International Geophysics) Series: International Geophysics, Publisher: Academic Press, ISBN-10: 0127519653, ISBN-13: 978-0127519654.

**Websites:**

- *India Meteorological Department: <http://www.imd.gov.in>*
- *Intergovernmental Panel on Climate Change: <https://www.ipcc.ch/>*
- *NASA-Climate Change and Global Warming: <https://climate.nasa.gov/>*
- *NCDC-NOAA: <https://www.ncdc.noaa.gov/sotc/>*
- *World meteorological organization: <http://worldweather.wmo.int>*
- *India water portal: <https://www.indiawaterportal.org>*



**CCPr-105.3: Analysis of Socio-Economic Data****Course Outcomes (COs):**

1. To identify the importance of population studies regarding the fertility, mortality,
2. To understand the socio-economic structure of population
3. To study various statistical methods for analysis of Agricultural activities.
4. To determine the agriculture productivity and analyze results.
5. To get basic understanding of the economic data and its analysis.

**Unit-1: Population Data Analysis****40 Hrs.****Practical Exercise(s):**

- 1: Choropleth maps: Mapping of Socio-Economic Phenomena.
- 2: Dot method & its relevance to distribution maps.
- 3: Maps with proportional circles.
- 4: Maps with divided proportional circles.
- 5: Maps with proportional spheres.
- 6-7: Fertility measures- Crude Birth Rate, General Fertility Rate
- 8-9: Mortality measures- Crude Death Rate, Infant Mortality Rate
- 10-11: Literacy measures-Crude Literacy Rate, Gross Enrolment Ratio.
- 12-14: Measures of population Growth- rates, ratios- arithmetic & exponential
- 15-16: Age & Sex Pyramid: Compound and Superimposed pyramid
- 17: Human Development Index

**Unit-2: Agricultural Data analysis****20 Hrs.****Practical Exercise(s):**

- 18-19: Calculation of Crop Concentration index: Locational quotient method by Bhatia, Jasbir Singh Method
- 20: Calculation of Crop Diversification index: Bhatia's Method
- 21-22: Identification and interpretation of Crop Combination index by Weaver and Doi methods
- 23: Determination of Agricultural Productivity

**Unit-3: Economic Data analysis****20 Hrs.****Practical Exercise(s):**

- 24-25: Trade area delimitation- Breaking Point Theory, Law of Retail Gravitation
- 26: Construction of Flow line charts & maps of transport flows.
- 27-28: Logarithmic & Semi-logarithmic graphs.
- 29: Location Quotient method

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2. Mishra, R.P. (1982): Fundamentals of cartography, Prasaranga, University of Mysore.
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## CC-201: Applied Geomorphology

### Course Outcomes (COs):

1. To establish the relationship between the tectonism and geomorphology with the knowledge of interior of the Earth.
2. To verify the impact of dynamic agencies on denudation and their work.
3. To understand the cycle of erosion with different views with special reference to hill slope development.
4. To see the application of geomorphology in the view of anthropogenic and environmental geomorphology.

### Unit: 1

**15 Lectures**

Tectonism and geomorphology, Interior of the Earth, Earthquakes, Volcanoes and associated features, folding and faulting.

### Unit: 2

**15 Lectures**

Dynamic agencies of denudation and their work: Fluvial, Glacial, Coastal, Aeolian and Karst topography, Morphogenetic regions. (15)

### Unit: 3

**20 Lectures**

Cycle of Erosion-Geographical Cycle of Davis, Penck's model of cycle of erosion. Hill Slope development, views of W.M. Davis, Walther Penck, Allen Wood and L.C. King.

### Unit: 4

**10 Lectures**

Applied Geomorphology, Anthropogenic Geomorphology, Environmental Geomorphology and recent trends in Geomorphology.

### Reference:

1. Allaby, Michael (2008): Oxford Dictionary of Earth Science, Oxford University Press, New York.
2. Bloom, A.L. (1991): Geomorphology, 2nd Ed Englewood Cliffs, M.J. Prentice Hall.
3. Chorley, R.J. Schumm, S.A. & Sugden, D.E. (1985): Geomorphology, Methuen & Co. Ltd., London, New York.
4. Brierley, G.J. & Fryirs, K.A. (2005): Geomorphology and River Management, Blackwell Publishing, Oxford UK.
5. Briggs, K. (1985): Physical Geography Process and System, Hodder and Stoughton, London.
6. Christopherson, R.W. (1995): Elemental Geosystems: A Foundation in Physical Geography, Prentice Hall Englewood Cliffs, New Jersey.
7. Cook, R.U. & Doornkamp, J.C. (1974): Geomorphology in Environmental Management, an Introduction. Clarendon Press. Oxford.
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15. Robinson, Harry (1969): Morphology and Landscape, University Tutorial Press Ltd. London.
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23. Worcester, P. G. (1948): Textbook of Geomorphology, Princeton, D. Van, Norstrand.

## CC-202: Applied Climatology and Climate Change

### Course Outcomes (COs):

1. To recognize the importance of climate on human life;
2. To identify and categorize climate types and climatic regions of the world;
3. To understand the regional and seasonal variations of weather systems in India;
4. To get comprehensive knowledge about causes and impacts of atmospheric pollution, GHGs emission, ozone layer depletion, acid rain and el-nino;
5. To know about the history, recent trends, impacts and dynamics of climate change on earth;
6. To assess future risks of climate change and the adaptation and mitigation options;

### Unit - 1: Impact of Climate and Global Climatic Regions

**18 Lectures**

History and relevance of applied climatology and climate change studies; Impact of climate on human life, soils, agriculture, and health; Approaches to climatic classification and climatic regions; Climatic classification of Koppen, and Thornthwaite; World pattern of temperature and precipitation.

### Unit - 2: Weather Systems of India

**10 Lectures**

Characteristics of general weather systems of India – spatial and seasonal variation of temperature, humidity, wind and precipitation; Climatic zones of India; Weather forecasting and application of meteorological satellites with special reference to India.

### Unit - 3: Atmospheric Pollution and Global Change

**10 Lectures**

Causes, impacts and society's response to change in air quality and atmospheric pollution; Causes and impacts of greenhouse gas (GHGs) emission, ozone layer depletion, acid rain; El-nino and southern oscillation (ENSO).

### Unit - 4: Paleoclimatology and Climate Change

**22 Lectures**

Paleoclimatology - climate dynamics and water balance with reference to evolution of the earth systems; General overview of the climate change – observed changes and its impacts; Recent trends of climate change and its impact on natural and human subsystems; Significant climate anomalies - notable events of recent times, extreme weather and climate; Future climate changes – risks and impacts with special reference to India; Adaptation and mitigation options of climate change.

### References:

#### Books & Reports:

1. **Aguado, E.,** and Burt, J.E. (2013): *Understanding Weather and Climate*, Pearson, New York, 552pp.
2. **Ahrens, C.D.** (2008): *Essentials of Meteorology – An Invitation to the Atmosphere*, Thomson Learning, Belmont, 485pp.
3. **Ahrens, C.D.,** and Samson, P. (2011): *Extreme Weather and Climate*, Brooks/Cole, Belmont, 508pp.
4. **Barry, R.G.,** and Chorley, R.J. (2010): *Atmosphere, Weather and Climate*, Routledge, London, 516pp.
5. **Christopherson, R.W.** (2012): *Geosystems – An Introduction to Physical Geography*, Prentice Hall, Boston, 623pp.
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7. **Gabler, R.E.,** Peterson, J.F., Trapasso, L.M., and Sack, D. (2009): *Physical Geography*, Brooks/Cole, Belmont, 641pp.
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18. **Ruddiman, W.F. (2008):** *Earth's Climate – Past and Future*, W. H. Freeman, New York, 388pp.
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21. **Strahler, A. (2011):** *Introducing Physical Geography*, Wiley, New Jersey, 632pp.
22. **World Development Report 2010 – Development and Climate Change**, The World Bank, Washington D.C., 417pp.

#### Research Journals:

*Atmospheric Chemistry and Physics* (<https://www.atmospheric-chemistry-and-physics.net/index.html>)  
*Atmospheric Environment* (<https://www.sciencedirect.com/journal/atmospheric-environment>)  
*Bulletin of the American Meteorological Society* (<https://journals.ametsoc.org/toc/bams/current>)  
*Climatic Change* (<https://link.springer.com/journal/volumesAndIssues/10584>)  
*Climate Dynamics* (<https://link.springer.com/journal/volumesAndIssues/382>)  
*Global Environmental Change* (<https://www.sciencedirect.com/journal/global-environmental-change>)  
*International journal of Climatology* (<https://rmets.onlinelibrary.wiley.com/journal/10970088>)  
*Journal of Climate* (<https://journals.ametsoc.org/toc/clim/current>)  
*Mausam* (<http://metnet.imd.gov.in/indmausam/>)  
*Nature Climate Change* (<https://www.nature.com/nclimate/>)  
*Nature Geoscience* (<https://www.nature.com/ngeo/>)  
*Weather and Climate Extremes* (<https://www.sciencedirect.com/journal/weather-and-climate-extremes>)  
*WIREs Climate Change* (<https://onlinelibrary.wiley.com/journal/17577799>)

#### Websites:

India Meteorological Department: <http://www.imd.gov.in>  
Intergovernmental Panel on Climate Change: <https://www.ipcc.ch/>  
NASA-Climate Change and Global Warming: <https://climate.nasa.gov/>  
NCDC-NOAA: <https://www.ncdc.noaa.gov/sotc/>  
World Meteorological Organization: <https://public.wmo.int/en>

## CCS-203: Advanced Cartography and Surveying

### Course Outcomes (COs):

1. To understand basic principles of cartography and surveying
2. To explain various cartographic methods and techniques for preparation of maps and diagrams.
3. To compare the difference between manual and digital cartography
4. To acquaint with the skills regarding digital cartography
5. To identify sources and types of errors occurs during surveying
6. To get familiar with the basic aspects of linear, vertical and angular measurements of surveying.

### Unit - 1: Fundamentals of Cartography

**20 Lectures**

Definition, nature and scope of cartography, History of cartography, Basics of geodesy, Basic principles of cartography, Scale- definition, types & importance, Concept of datum- vertical and horizontal, Co-ordinate systems- geographical and projected, Map- definition, types and significance, Cartographic methods and techniques for representation of data.

### Unit - 2: Digital Cartography

**15 Lectures**

Introduction to digital cartography, Manual cartography vs. Digital cartography, Cartographic data and its sources, Cartographic database, Map design, Digital mapping- Thematic maps, Symbolization and visualization, Modern techniques of map production, Digital cartography- hardware and software, Advantages and disadvantages, Applications of digital cartography.

### Unit - 3: Fundamentals of Surveying

**10 Lectures**

Definition, classification and principles of surveying, Character of surveying work- field work and office work, Sources and types of errors, Precision and accuracy, Units of measurements.

### Unit - 4: Surveying Measurements

**15 Lectures**

Linear measurement-types of ranging, Methods- approximate, direct, optical and electronic, Errors and applications, Angular measurement-types of measured angles, Compass, Meridian, Bearings and azimuths, Errors, Corrections and precautions, Vertical measurement-types and methods of leveling, Contouring- definition, characteristics, methods and interpolation.

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4. Fraser Taylor, D.R. (ed.) (1983): Graphic Communication and Design in Contemporary Cartography. John Wiley and Sons, New York.
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7. Mailing, D.H. (1973): Co-ordinate Systems and Map Projections. George Philip and Sons Ltd.
8. Monkhouse, F.J. and Wilkinson, H. R (1962): Maps and Diagrams, Methuen and Company Ltd. and Company Ltd., London.
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17. Singh, R. L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, Ludhiana and New Delhi. (English and Hindi editions).
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20. Unwin, D. (1982): Introductory Spatial Analysis. Methuen and Company Ltd., London.
21. Walford, N. (1995): Geographical Data Analysis. John Wiley and Sons, Chichester.
22. Duggal, S. K. (2014): Surveying McGraw Hill Education (India) Private Limited, Fourth edition, Delhi

**Websites:**

Indian Institute of Surveying & Mapping: <http://www.iism.nic.in/>

Survey of India Department of Science & Technology: <http://www.surveyofindia.gov.in/>

Indian National Cartographic Association: <https://incaindia.org/>

Bhuvan Indian Geo Platform of ISRO: <https://bhuvan.nrsc.gov.in/>



## CCS-204: Social and Cultural Geography

### Course outcomes (Cos):

1. To study and identify the philosophical base, problems associated with society & its culture.
2. To know about the culture, cultural regions, hearths and their diffusion, realms, and distribution of races.
3. To study and knowing of socio-cultural diversity of India, and processes of social changes.
4. To understand the social justice and well-being of society, to find out the level of well-being in India.

### Unit-1: Social Geography

**15 Lectures**

Philosophical bases of Social and Cultural Geography. Definition, scope, and significance of Social and Cultural Geography. Roots of Social Geography and social problem, housing space and society, and geography of poverty.

### Unit-2: Culture and Races

**15 Lectures**

Concept of culture, culture areas and culture regions, Cultural hearths and their diffusion, World Culture Realms. Concept of race, Griffith Taylor and C.S. Coon's Theories of distribution of races of mankind in the world. Basis of racial classification and their physical characteristics. Races of India.

### Unit-3: Socio-cultural Diversity

**15 Lectures**

Concept of Dialects and ethnicity. Distribution of Religion, Caste, Tribe, Languages in India. Concept of social areas, North-South-Socio-Cultural diversity of India, Processes of Social changes: Modernization, Sanskritization and Globalization.

### Unit-4: Social Justice and Well-being

**15 Lectures**

Concept of social Justice and fair society, Equality and welfare, social development and well-being. Indicators for measurement, Levels of well-being in India, Social status of women in India.

### References:

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2. Blij, H.J. (1995): The earth-An introduction to its Physical and Human Geography, John Wiley & Sons; New York.
3. Broad, Jan O.M. & Webb, John W. (1973): A Geography of mankind, McGraw Hill Book Co. New York.
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9. Tripathi, R.S. & Parmar, S.B. Singh: Social and Economic Development in India, Ashish Publishing House New Delhi, PP 451-454.
10. Smith, David M. (1977): Human Geography- A Welfare approach, Arnold-Hinmann, London.
11. Hussain, Majid (1994): Human Geography, Rawat Publications, Jaipur.
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13. Soffer, David E. (ed.) (1980): An Exploration of India: Geographical Perspectives on Society and Culture, Cornell Uni. Press, New York.

**CCPr-205.1: Computer Applications in Geography****Course Outcomes (COs):**

1. To learn the representation of geographic data using various computational methods;
2. To know about sources and uses of online educational resources and e-learning methods;
3. To develop writing, editing, and presentation skill for representation of geographical information;
4. To compute statistical parameters with the help of computer;
5. To prepare and design maps and graphs with the help of computer software;
6. To apply computational techniques relevant in the discipline of Geography;

**Unit-I:** Geographic data: types and sources; Computer hardware and software; Online educational resources; E-learning. **30 Hrs.**

**Practical Exercise(s):**

- 1: Description with examples about geographic data types and sources.
- 2: Illustration of computer hardware and their uses.
- 3: Demonstration of useful software packages/ programs and their application.
- 4: Identification, browsing, and storing/ retrieving online educational resources.
- 5: How to access and use e-resources for effective and updated learning?
- 6: Comprehensive browsing and listing of useful geographical websites.
- 7: E-learning objectives, methods, and listing of open online e-learning websites.
- 8-9: E-learning through open online courses: MOOCS – SWAYAM and NPTEL.
- 10-11: E-learning through e-content: e-PG Pathshala, and interactive learning solutions: Moodle.

**Unit-2:** Writing / formatting of texts, graphs, tables, and references using MS word; Preparation of power point presentation using MS power point; Computation of statistical parameters using MS excel. **25 Hrs.**

**Practical Exercise(s):**

- 12: Writing / formatting of text paragraphs.
- 13: Inserting, creating, and editing of text box, smart art, pictures and graphs.
- 14: Construction and editing of tables (with and without formatting).
- 15: Reference writing styles using MS word with examples.
- 16: Preparation of MS power point presentation.
- 17: Measures of central tendency: Computation of average, median and mode.
- 18: Measures of central tendency: Calculation of weighted mean.
- 19: Measures of position: Estimation of quartiles, deciles, and percentiles.
- 20: Measures of variation: Computation of range, variance, and standard deviation.
- 21: Calculation of co-relation coefficient.

**Unit-3:** Presentation and analysis of geographic data (physical and socio-economic) using graphs, charts, maps and map labeling with the help of computer. **25 Hrs.**

**Practical Exercise(s):**

- 22-26: Presentation and analysis of geographic data using MS Excel – preparation of graphs/charts (bar graph, line graph, pie diagram, scatter diagram and trend line).
- 27: Co-relation and regression analysis using MS Excel.
- 28: Presentation and illustration of geographic data – preparation of maps with labeling.
- 29-30: Presentation and analysis of geographic data using Origin and SPSS.



### References:

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3. **Maguire, D.J.** (1989): *Computers in Geography*, Longman, London, 272pp.
4. **Mather, P.M.** (1991): *Computer Applications in Geography*, Wiley, New York, USA, 270pp.
5. **McFedries, P.** (2007): *Formulas and Functions with Microsoft Office Excel 2007*, Que/Pearson, Indianapolis, Indiana, USA, 523pp.
6. **McGrew, J.C.**, and Monroe, C.B. (2009): *An Introduction to Statistical Problem Solving in Geography (2nd Ed.)*, Waveland Pr Inc, 254pp.
7. **Miller, M.** (2007): *Absolute beginner's guide to computer basics (4th Ed.)*, Que/Pearson, Indianapolis, Indiana, USA, 430pp.
8. **Monmonier, M.S.** (1982): *Computer Assisted Cartography: Principles and Prospects*, Prentice Hall, 214pp.
9. **Pal, S.K.** (1998): *Statistics for Geoscientists: Techniques and Applications*, Concept Publishing, New Delhi, India, 610pp.
10. **Robinson, A.H.**, Morrison, J.L., Muehrcke, P.C., Kimerling, A.J., and Guptill, S.C. (1995): *Elements of Cartography (6th Ed.)*, Wiley, New York, 688pp.
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12. **Ulrich, L.A.** (2003): *How to Do Everything with Microsoft Office 2003*, McGraw-Hill/Osborne, Emeryville, California, USA, 456pp.
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e-PG Pathshala: <https://epgp.inflibnet.ac.in/>

MOOCS - NPTEL: <https://nptel.ac.in/>

MOOCS - SWAYAM: <https://swayam.gov.in/>

National Digital Library of India: <https://ndl.iitkgp.ac.in/>

Shivaji University Library (E-Resources): <http://www.unishivaji.ac.in/library/E-Resources>

**CCPr-205.2: Statistical Techniques in Geography****Course Outcomes (COs):**

1. To understand the importance and use of statistical techniques in geography
2. To form frequency distributions tables and graphically interpret the results.
3. To measure central tendency and dispersion of data.
4. To examine relationship between two or more variables with correlation and regression analysis.
5. To apply comprehensive knowledge of statistics for analysis of geographical data

**Unit-1: Basics of Statistics****20 Hrs.****Practical Exercise(s):**

- 1: Definitions of statistics
- 2: Importance and use of statistical techniques in geography
- 3: Sources of statistical data in geography
- 4: Scale of measurement: Nominal, Ordinal, Interval and Ratio
- 5: Formation of frequency distribution table
- 6-9: Graphical representation of frequency distribution using Histogram, Frequency Polygon, O give curve, Cumulative percentage curve

**Unit-2: Measures of Statistics****30 Hrs.****Practical Exercise(s):**

- 10-13: Measures of central tendency using simple, discrete and continuous data: Mean, Median and Mode.
- 14-16: Measures of position: Estimation of quartiles, deciles and percentiles.
- 17-20: Measures of dispersion: Absolute measurements- Mean deviation, Quartile deviation, and Standard deviation.
- 21-25: Relative measurements: Coefficient of mean deviation, Coefficient of quartile deviation, Coefficient of variations, Index variability and Relative variability.

**Unit-3: Analysis of Statistical Relationship****30 Hrs.****Practical Exercise(s):**

- 26-27: Skewness: Karl Pearson's and Bowley's methods
- 28: Kurtosis
- 29-30: Correlation analysis: Rank order correlation and Product moment correlation
- 31-32: Regression analysis: Simple and Multiple Regression
- 33: Least square method.

**References:**

1. Cole, J.P. & King, C.A.M. (1968): Quantitative Techniques in Geography. John Wiley & sons Inc. New York.
2. Gregory, S. (1968): Statistical methods and the geographer. Longman, London.
3. Elhance, D.N. (1972): Fundamentals of statistics, Kitab Mahal, Allahabad.
4. Mahmood, A. (1977): Statistical Methods in Geographical Studies, Rajesh Publications, New Delhi
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7. King, L.J. (1991): Statistical Analysis in geography. Prentice Hall, Englewood Cliff N.J.
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9. Singh R. L.: Elements of Practical Geography.
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## CCPr-205.3: Quantitative Techniques in Geography

### Course Outcomes (COs):

1. To understand correlation and regression among spatio-temporal data
2. To learn what is Spatial Analysis
3. For The Measurement Levels and Spatial Data
4. To Measures probability
5. To became expert in techniques for analysis of data in research
6. For Exploratory Data Analysis

### Unit-1: Introduction to Quantitative Techniques and Probability Distribution 10 Hrs.

1. Introduction to quantitative technique and its use in Geography
2. Probability - Introduction
3. Normal probability
4. Poisson probability
5. Binomial probability

### Unit-2: Hypothesis Testing 30 Hrs.

6. Hypothesis testing
7. Chi-square test
8. Student's t-test
9. The Man – Whitney U test
10. The Wilcoxon test for paired samples
11. Analysis of variance
12. Kruskal – wallis analysis of variance
13. Snedecor's variance ratio test (F test)
14. ANOVA- One way
15. ANOVA- Two ways (single entry and multiple entry)

### Unit-3: Measures of Spatial Distribution and Models 40 Hrs.

16. Point and line distribution
17. Quadrat Analysis
18. Nearest neighbour index
19. The Join Count statistics
20. Moran's I statistics
- 21-23. Combinational Analysis - Nelson's method; Raffiullah's method; Ternary diagram
24. Importance of models in geography
25. Models as quantitative techniques
26. Simulation models
27. Gravity models
28. Transportation model

### Reference:

1. **Cole, J.P. & King, C.A.M.** (1968): *Quantitative Techniques in Geography*. John Wiley & sons Inc. New York.
2. **R Hammond & P S McCullagh** (1978): *Quantitative techniques in Geography An Introduction (2nd Ed.)*, Oxford University Press, USA, 384pp.
3. **Burt, J.E., Barber, G.M., and Rigby, D.L.** (2009): *Elementary Statistics for Geographers (3rd Ed.)*, The Guilford Press, 653pp.
4. **Mahmood, A.** (1977): *Statistical Methods in Geographical Studies*, Rajesh Pub, New Delhi, 172pp.

## CC-301: Geohydrology and Oceanography

### Course Outcomes (COs):

1. To know about the development of methods of scientific observation in hydrology and Oceanography;
2. To understand the origin, importance and distribution of water on Earth;
3. To learn about the hydro-geological, coastal and marine processes, landforms and resources;
4. To recognize the role of oceans to deal with the vulnerability of the dynamic earth system;
5. To comprehend about the recent trends in research in Geohydrology and Oceanography;

### Unit-1: Groundwater & Basin Hydrology

15 Lectures

Introduction to Geohydrology; Distribution of surface and subsurface water resources on Earth; Hydrological cycle; Groundwater: occurrence, movement and management; Hydrological characteristics of aquifers; Basin hydrology: precipitation, evaporation, infiltration and run-off; Unit hydrograph; Groundwater regimes in India and Maharashtra.

### Unit-2: Applied Geohydrology

10 Lectures

Groundwater exploration and water pollution with special reference to India; Problems related to water use; Fresh and salt water relationship in coastal and inland areas; Conservation and planning for the development of water resources; Watersheds and Wetlands in India.

### Unit-3: Geological Oceanography

15 Lectures

Introduction to Oceanography; Origin and evolution of ocean basins: theory of plate tectonics and seafloor spreading; Topography of the ocean floor: continental shelf, slope, rise, submarine channels, hills, ridges, trenches and abyssal plains; Bottom relief of Pacific, Atlantic and Indian Ocean; Origin and evolution of island arcs; Estuarine & coastal processes and landforms.

### Unit-4: Physical, Chemical and Biological Oceanography

20 Lectures

Air-sea interaction and ocean circulation: currents, waves and tides; Currents of Pacific, Atlantic, & Indian Ocean; Properties of oceanic water: chemical composition, salinity, temperature, and density; Biological productivity in the Ocean; Origin and growth of coral reefs; Ocean deposits: origin, type and distribution; Major water masses of the World's Ocean; Thermohaline circulation and the oceanic conveyor belt; Sea level changes; Oceanic regions; Marine resources; Marine pollution.

### References:

#### Books & Reports:

1. **Cech, T.V. (2009):** *Principles of Water Resources: History, Development, Management, and Policy (3rd Ed.)*, Wiley, Hoboken, New Jersey, 576pp.
2. **Chow, V.T., Maidment, D.R., and Mays, L.W. (1988):** *Applied Hydrology*, McGraw-Hill, New York, 540pp.
3. **Christopherson, R.W. (2012):** *Geosystems: An Introduction to Physical Geography (8th Ed.)*, Prentice Hall, New Jersey, 693pp.
4. **Davis, R., and Fitzgerald, D. (2003):** *Beaches and Coasts*, Wiley-Blackwell, Hoboken, New Jersey, 432pp.
5. **Day, T. (2008):** *Oceans (Rev. Ed.)*, Facts on File, New York, 337pp.
6. **Fitts, C.R. (2002):** *Groundwater Science*, Academic Press, 450pp.
7. **Garrison, T. (2009):** *Essentials of Oceanography (5th Ed.)*, Brooks/Cole, Belmont, California, 463pp.
8. **Han, D. (2010):** *Concise Hydrology*, Dawai Han and Ventus Publishing, 145pp.
9. **Pinder, G.F., and Celia, M.A. (2006):** *Subsurface Hydrology*, Wiley, Hoboken, New Jersey, 485pp.
10. **Pinet, P.R. (2009):** *Invitation to Oceanography (5th Ed.)*, Jones and Bartlett Publishers, Sudbury, Massachusetts, 609pp.

11. **Raghunath, H.M. (2006):** *Hydrology: Principles, analysis and Design (2nd Ed.)*, New age International, New Delhi, 477pp.
12. **Schwartz, F.W., and Zhang, H. (2002):** *Fundamentals of Ground Water*, Wiley, Hoboken, New Jersey, 592pp.
13. **Skinner, B.J., and Murck, B.W. (2011):** *The Blue Planet: An Introduction to Earth System Science (3rd Ed.)*, Wiley, Hoboken, New Jersey, pp. 221-319.
14. **Sverdrup, K., and Armbrus, V. (2008):** *Introduction to the World's Oceans (10th Ed.)*, McGraw-Hill, New York, 528pp.
15. **Todd, D.K., and Mays, L.W. (2012):** *Groundwater Hydrology (3<sup>rd</sup> Ed.)*, Wiley India, New Delhi, 636pp.
16. **Trujillo, A.P., and Thurman, H.V. (2010):** *Essentials to Oceanography (10th Ed.)*, Prentice Hall, New Jersey, 576pp.
17. **Viessman, W., and Lewis, G.L. (2002):** *Introduction to Hydrology (5th Ed.)*, Prentice Hall, New Jersey, 612pp.

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*Advances in Water Resources* (<https://www.sciencedirect.com/journal/advances-in-water-resources>)  
*Annual Review of Marine Science* (<https://www.annualreviews.org/journal/marine>)  
*Hydrology and Earth System Sciences*: <https://www.hydrol-earth-syst-sci.net/>  
*Hydrogeology Journal*: <https://www.springer.com/journal/10040>  
*ICES Journal of Marine Science*: <https://academic.oup.com/icesjms>  
*Indian Journal of Geo-Marine Sciences*: <http://nopr.niscair.res.in/handle/123456789/3>  
*Journal of Geophysical Research*: <https://agupubs.onlinelibrary.wiley.com/journal/21562202>  
*Journal of Hydrology*: <https://www.sciencedirect.com/journal/journal-of-hydrology>  
*Journal of Water Resource Planning and Management*: <https://ascelibrary.org/journal/jwrmd5>  
*Limnology and Oceanography*: <https://aslopubs.onlinelibrary.wiley.com/journal/19395590>  
*Marine and Petroleum Geology*: <https://www.sciencedirect.com/journal/marine-and-petroleum-geology>  
*Nature Geoscience*: <https://www.nature.com/geo/>  
*Oceanography*: <https://www.tos.org/oceanography/>  
*Progress in Oceanography*: <https://www.sciencedirect.com/journal/progress-in-oceanography>  
*Water Research*: <https://www.sciencedirect.com/journal/water-research>  
*Water Resources Research*: <https://agupubs.onlinelibrary.wiley.com/journal/19447973>

#### Websites:

*Central Ground Water Board (CGWB), India*: <http://cgwb.gov.in/>  
*Central Water Commission, India*: <http://cwc.gov.in/>  
*National Ocean Service (NOAA)*: <https://oceanservice.noaa.gov/>  
*UN Atlas of the Oceans*: <http://www.oceansatlas.org/>  
*NGDC-NOAA, Marine Geology & Geophysics*: <https://www.ngdc.noaa.gov/mgg/>  
*Indian National Centre for Ocean Information Services*: <https://www.incois.gov.in/>

## CCS-302: Fundamentals of Remote Sensing and DIP

### Course Outcomes (COs):

1. To understand the basic concept and principles of remote sensing and digital image processing.
2. To understand the role of remote sensing and DIP in data collection and analysis.
3. To know the different types of sensor and digital image processing techniques.
4. To understand the use and importance of satellite images and aerial photographs to assess the geographical phenomena.
5. To apply the knowledge of remote sensing and DIP in various thematic studies.

### Unit-1: Introduction & Principles of Remote Sensing

**20 Lectures**

Definition and scope of remote sensing; History and development of remote sensing technology; Electromagnetic radiation (EMR) and electromagnetic spectrum; EMR interaction with atmosphere and earth surface; Atmospheric window and spectral reflectance curve; Resolutions in remote sensing; Types of remote sensing; Principles and applications of optical, thermal & microwave remote sensing; Introduction to hyper-spectral remote sensing.

### Unit-2: Aerial Photography

**12 Lectures**

Aerial photographs: types, scale, & resolution; Types of aerial cameras and photographic films; Geometry of aerial photographs; Parallax, relief displacement, and orthophotos; Elements of visual image interpretation

### Unit-3: Satellite Remote Sensing

**14 Lectures**

Satellite: types and their characteristics; Types of Sensors; Orbital and sensor characteristics of major earth resource satellites: LANDSAT, SPOT, IRS, Sentinel & Quickbird; Recent developments of Indian remote sensing satellite programme;

### Unit-4: Digital Image Processing

**14 Lectures**

Introduction to digital image and image processing; Sources of Errors: Geometric and radiometric; Image rectification; Image enhancement: methods and techniques; Image classification: supervised and unsupervised; Image accuracy assessment.

### References:

#### Books & Reports:

1. Aber, J.S., Marzloff, I., and Ries, J. (2010): *Small-Format Aerial Photography: Principles, Techniques and Geoscience Applications*, Elsevier, Amsterdam, 268pp.
2. Campbell, J.B., and Wynne, R.H. (2011): *Introduction to Remote Sensing (5th Ed.)*, Guilford Press, New York, 667pp.
3. Jensen, J.R. (2006): *Remote Sensing of the Environment: An Earth Resource Perspective (2nd Ed.)*, Prentice Hall, New Jersey, 608pp.
4. Konecny, G. (2003): *Geoinformation: Remote sensing, Photogrammetry and Geographic Information Systems*, Taylor & Francis, London, 266pp.
5. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2007): *Remote Sensing and Image Interpretation (6th Ed.)*, Wiley, New Jersey, 804pp.
6. Morgan, D., and Falkner, E. (2001): *Aerial Mapping: Methods and Applications (2nd Ed.)*, CRC Press, Boca Raton, Florida, 216pp.
7. Quattrochi, D.A., and Goodchild, M.F. (1997): *Scale in Remote Sensing and GIS*, CRC Press, Boca Raton, Florida, 432pp.
8. Reddy, M.A. (2008): *Textbook of Remote Sensing and Geographical Information System (3rd Ed.)*, BS Publications, Hyderabad, 476p

9. Sabins, F.F. (2007): *Remote Sensing: Principles and Interpretation (3rd Ed.)*, Waveland Press, Long Grove, Illinois, 512pp.
10. Schowengerdt, R.A. (2006): *Remote Sensing: Models and Methods for Image Processing (3rd Ed.)*, Elsevier, Amsterdam, 560pp.
11. Wolf, P., DeWitt, B., Wilkinson, B. (2012): *Elements of Photogrammetry with Application in GIS (4th Ed.)*, McGraw-Hill, New York, 640pp.

**Research Journals:**

*Remote Sensing of Environment*

*ASPRS Photogrammetric Engineering and Remote Sensing*

*IJPRS Journal of Photogrammetry and Remote Sensing*

*International Journal of Remote Sensing*

*IEEE Transactions on Geosciences and Remote Sensing*

*IEEE Letters on Geosciences and Remote Sensing*

*Journal of the Indian Society of Remote Sensing*

**Websites:**

*Indian Space Research Organisation (ISRO), India: <http://www.isro.org>*

*National Remote Sensing Centre (NRSC), India: <http://www.nrsc.gov.in>*

*National Aeronautics and Space Administration (NASA), USA: <http://www.nasa.gov>*

*National Oceanic and Atmospheric Administration (NOAA), USA: <http://www.noaa.gov>*

*United States Geological Survey (USGS), USA: <http://www.usgs.gov>*

*International Society for Photogrammetry and Remote Sensing (ISPRS): <http://www.isprs.org>*

*Wikimapia: <http://www.wikimapia.org>*

*Bhuvan: <http://www.bhuvan.nrsc.gov.in>*



**DSE-303: Geography of Environment****Course Outcomes (COs):**

1. To educate students in the contents and methods of Geography of Environment as an academic and professional discipline.
2. To understand elements of environment and acquire knowledge about biodiversity
3. To get knowledge about natural hazards and management
4. To understand the various environmental issues and policies

**Unit-1:****15 Lectures**

Concept of environment: Major elements of environment; Functioning of environmental systems: role of biotic and abiotic elements; Biodiversity: meaning, factors influencing biodiversity.

**Unit-2:****15 Lectures**

Ecosystem (geographic classification) terrestrial and aquatic ecosystems - location, types and characteristics; Energy flow in an ecosystem; food chain, food web and Ecological pyramids; succession; Biogeochemical cycles (carbon, nitrogen and oxygen).

**Unit-3:****15 Lectures**

Environmental hazards and disasters: earthquakes, tsunamis, tropical cyclones, droughts, floods, forest fires: distribution, causes and consequences; Global warming, Disaster management in Maharashtra and India.

**Unit-4:****15 Lectures**

Conservation and management of environment; Concept of sustainable development; environmental pollution ( water, Air, Noise), Land degradation; Environmental impact assessment; Environmental issues, policies and efforts in India, International programmes and Policies (Brundtland commission, Kyoto protocol, agenda 21, Sustainable development goals, Paris agreement).

**References:****Books & Reports:**

1. Abbott, P.L: Natural Disasters, McGraw-Hill, London.
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3. Cunningham, W. Cunningham, Mary: Environmental Science: A Global Concern (2010). MacGraw-Hill, London.
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7. McKinney, M.L., Schoch, R.M. (2003): Environmental science: Systems and Solutions. Jones & Bartlett Learning.
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9. Raven, P.H, Berg, L.R, Hassenzahl, D.M Peter: Environment. John Wiley, New Delhi.
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11. R.B. Singh (1990): Environmental Geography, Heritage Publishers, New Delhi
12. R. B. Singh (Ed): Disaster Management, Rawat Publication, New Delhi,
13. Saxena, H.M (2000): Environmental Geography, Rawat publication, New Delhi



14. H. K. Gupta (2003) (Ed): Disaster Management, University Press, India
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16. Cunningham, W. P. and Cunningham, M. A. (2004): Principles of Environmental Science: Inquiry and Applications, Tata McGraw Hill, New Delhi
17. Goudie, A. (2001): The Nature of the Environment, Blackwell, Oxford
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19. MoEF (2006): National Environmental Policy-2006, Ministry of Environment and Forests, Government of India, New Delhi
20. Singh, S. (1997): Environmental Geography, PrayagPustakBhawan, Allahabad
21. UNEP (2007): Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme

**Research Journals:**

*Energy & Environmental Science*

*Frontiers in Ecology and the Environment*

*Global Environmental Change-Human and Policy Dimensions*

*Annual Review of Environment and Resources*

*Environment International*

*Review of Environmental Economics and Policy*

*Environmental Research Letters*

## DSE-303: Biogeography

### Course Outcomes (COs):

1. To understand the concepts and historical development of biogeography
2. To get comprehensive knowledge of different classification of animal and plants
3. To know about pattern of biogeography
4. To understand different processes in biogeography
5. To get detail knowledge about influencing factors on biogeography

### Unit-1: Concepts and Theories in Biogeography

15 Lectures

Nature of Biogeography, History of Biogeography – Development of Concepts (Linnaeus, Humboldt, Darwin, Wallace, Wegner, Heming, Brudin, Croizat), Plate tectonic and biotic change, Communities and patterns in biogeography – Biomes, Hotspots, biodiversity, alpha beta diversity and niche. Importance to society,

### Unit-2: Influencing Factors

15 Lectures

Influencing factors on life- physical, climatic and biological. Influence of humans, disturbance factors – physical and biological, changing continents and climates, conservation of biogeography

### Unit-3: Classification of Animal and Plants

15 Lectures

Classifications of animals and plants taxonomical, ecological and geographical, equilibrium theory, neutral theory, species area relationship. Latitudinal and altitudinal distribution.

### Unit-4: Processes in Biogeography

15 Lectures

Processes – evolution (life of origin theory, evolution theory), dispersal and vicariance, speciation, extinction, invasion, and colonization. Biological interactions – predations, competition, mutualism, parasitism and mimicry.

### References:

1. Barry C. (1977): Biogeography – An ecological & evolutionary Approach, Oxford.
2. Cole M.M. (1975): Recent developments in Biogeography, Longman, London.
3. Danserau P. (1957): Biogeography- An Ecological perspective, Renold Press, New York.
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7. Mathur H.S. (1986): Elements of Biogeography, Pointer Jaipur.
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12. Watts, d. (1971): Principles of Biogeography, McMillan, London.
13. Simms T. G.: Biogeography, Natural & Cultural, Arnold & Heinemann, London.

**DSE-304: Settlement Geography****Course Outcomes (Cos):**

1. To study the fundamentals of settlement geography
2. To understand the approaches to rural settlement geography; rural services; hierarchy; morphology etc.
3. To know the concept and processes of urban settlement studies; urban problem & their planning; concept smart cities, urban agriculture, etc.
4. To study the theories and models of settlement geography to understand the structure of settlements.

**Unit-1: Fundamentals of Settlement Geography****10 Lectures**

Settlement Geography – The nature, scope and significance; evolution and growth of human settlements; Definition and types of settlements; Site, situation and locational factors of settlements. Spacing, dispersion and localization.

**Unit-2: Geography of Rural Settlements****15 Lectures**

Introduction to rural settlement geography, Approaches to rural settlement geography; Morphology of rural settlements; Rural-service centers-nature, hierarchy, service area and interaction; Indian villages-evolution and multiplicity, regional characteristics, transformation of Indian villages, Rural planning and challenges.

**Unit-3: Geography of Urban Settlements****20 Lectures**

Introduction to urban settlement geography, Concept and processes of urbanization, suburbanization, Rural-urban fringe, urban sprawl, Functional classification of urban settlements; Conurbation, Size and spacing of cities- rank-size rule, law of primate city, urban hierarchies; Urban problems, Urban planning and challenges, Concept of smart city, Garden city movement, Urban agriculture.

**Unit-4: Theories and Models in Settlement Geography****15 Lectures**

Multiple nuclei theory; Central place theory; Concentric zone model; Sector model.

**References:**

1. Carter, H. (1975): The study of urban geography. Edward Arnold, London.
2. David, P., Hopkinson M. (1983): The Geography of Settlements, Oliver & Boyd; 2<sup>nd</sup> Revised edition.
3. Deniel, P. (2002): Geography of Settlements. Rawat Publications, Jaipur and New Delhi.
4. Gosh, S. (1998): Introduction to Settlement Geography. Orient Longman.
5. Haggett, Peter (1991): Geography-A Modern Synthesis, Harper & Row, New York.
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10. Mandal, R.B. (2000): Urban Geography, Concept Publishing Co., New Delhi.
11. Mayer, H.M., Cohen (1967): Readings in Urban Geography, Central Book Depot. Allahabad.
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Delhi.

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22. Singh, R. L. and Singh, Rana P. B. (eds.) (1978): *Transformation of Rural Habitat in Indian Perspective*, National Geographical Society of India, Varanasi, Pub. 19.
23. Singh, R.L. and Singh, Rana P.B., (eds.) (1979): *Place of Small Towns in India*. National Geographical Society of India, Varanasi.
24. Singh, R.L., Singh, K.N and Singh Rana P.B., (eds.) (1976): *Geographic Dimensions of Rural Settlements*. National Geographical Society of India, Varanasi.
25. Wood, M. (2005): *Rural Geography: Processes, Responses and Experiences of Rural Restructuring*. Sage Publication, London.
26. Yeates & Garner (1971): *Readings in Urban Geography. The North American City*. Harper & Row. New York

**DSE-304: Geography of India****Course Outcomes (COs):**

1. To understand the main regions of the India in terms of both their uniqueness and similarities.
2. Identifying and explaining the Indian Geographical Environment, from global to local scales.
3. To generate an awareness and responsibility for the environment and India.
4. To Study the impacts of human activities on natural environments of India

**Unit-1: Physical Setting of India****15 Lectures**

India – Location & space relationship of India with neighboring countries, Physiography – Structure, relief, divisions, Natural drainage system, Problems and prospects of Interlinking of rivers, Natural vegetation; Soil types and their distributions.

**Unit-2: Agriculture in India****15 Lectures**

Agriculture & live stock in India, Irrigation, Green and White Revolution, Agro-climatic zones Problems of Agricultural Development.

**Unit-3: Resources and Industries in India****15 Lectures**

Location and Distribution of major industries in India; textile, aluminum, iron and steel, Industrial regions of India, Conventional and Non-Conventional Energy Resources, Energy crisis in India.

**Unit-4: Transport Communication and Trade of India****15 Lectures**

Transport in India-Roadways, Railways, Waterways and Airport, Major ports. Information Technology and Communication Development in India, Trade in India- Import and Export.

**References:**

1. Chapman, G. and Baker, K.M. (eds.) (1992): The Changing Geography of Asia. Routledge, London.
2. Farmer, B.H. (1983): Introduction to South Asia. Methuen and Company Ltd. and Company Ltd., London.
3. Gole, P. N. (2001): Nature Conservation and Sustainable Development in India. Rawat publications, Jaipur and New Delhi.
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5. Khullar, D. R. (2006): India. A Comprehensive Geography. Kalyani Publishers., New Delhi.
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7. Nag, P. and Gupta S. S. (1992): Geography of India. Concept Publishing. Company, New Delhi.
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10. Singh, R. L. (ed.) (1971): India. A Regional Geography. National Geographical Society of India, Varanasi.
11. Spate, O.H.K., Learmonth, A.T.A. and Farmer, B. H. (1979): India and Pakistan. Methuen and Company Ltd. and Company Ltd., London.
12. Subbarao, B. (1959): The Personality of India. University of Baroda Press, Baroda.
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15. Wadia, D. N. (1959): Geology of India. MacMillan and Company, London and Madras. Student edition.

**Websites:**

Ministry of Jal Shakti, Govt. of India (<http://mowr.gov.in/>)  
 Indian Water Resources Society (<https://iwrs.org.in/>)  
 Soil and Land Use Survey of India (<http://slusi.dacnet.nic.in/>)

*Farmer's Portal, Govt. of India (<https://farmer.gov.in/>)*

*National Bureau of Soil Survey and Land Use Planning (<https://www.nbsslup.in/>)*

*National Portal of India (<https://www.india.gov.in/>)*

*Indian Trade Portal (<https://www.indiantradeportal.in/>)*

*Department of Commerce, Govt. of India (<https://commerce.gov.in/>)*

**DSE-304: Political Geography****Course Outcomes (COs):**

1. To identify the geostrategic locations and areal extent of countries in the world
2. To understand the correlation between geography and political actions and processes
3. To get familiar with the electoral system in India
4. To evaluate intrastate and interstate conflicts and disputes of India

**Unit-1:****15 Lectures**

Definition, nature, scope and significance of Political Geography, Approaches to Political Geography, Elements of Political Geography: Spatial elements-location, size and shape; Economic elements-food, minerals and power resources; Human elements- population, race, religion and language.

**Unit-2:****15 Lectures**

Concept of state, nation and nation-state, Centripetal and centrifugal forces in state formation, Federalism, Frontiers and boundaries, Classification of boundaries, Geopolitics of climate change; world resources and Indian ocean, Neopolitics of world natural resources, Geo-strategic views: Heartland and Rimland.

**Unit-3:****15 Lectures**

Citizenship, Geographic influences on voting pattern, Determinants of electoral behaviour, Electoral reforms in India, Electoral system in India

**Unit-4:****15 Lectures**

Regional organisations of cooperation (SAARC, ASEAN, OPEC, EU), Geopolitical conflicts with reference to India, Reorganization of Indian states, Statehood demands and reorganization possibilities in India, Inter-state conflicts in India, Internal security threats.

**References:****Books & Reports:**

1. Adhikari S., 1997: Political Geography, Rawat Pub. Jaipur.
2. Blij De H.J., 1972: Systematic Political Geography. Wiley, New York.
3. Cohen S.B., 1973: Geography and Politics in a divided world. Oxford, New York.
4. Cox K. (): Political geography: Territory, State and Society, Blackwell Publishers Ltd, 108, Cowely Road, Oxford.
5. Dixit R. D., 1982: Political Geography. Tata McGraw Hill New Delhi.
6. Dwivedi R.L., 1996: Political Geography. Chaitanya Prakashan Allahabad.
7. Fahrer C., Glassner M. (2001): Political geography, Wiley.
8. Moor R., 1981: Modern Political Geography. McMillan, London.
9. Pounds N.G., 1972: Political Geography. McGraw Hill, London.
10. Taylor P. (1998): Political Geography, Prentice Hall.
11. Valkenberg S.U. & Stoz C., 1963: Elements of Political Geography. Prentice Hall of India, New Delhi.

**Research Journals:**

1. Political Geography (<https://www.journals.elsevier.com/political-geography>)
2. Journal of Geography, Politics and Society (<https://http://www.ejournals.eu/JGPS/>)
3. Geopolitics - Journal of Political Geography, Geopolitics and Geostrategy

**Websites:**

Survey of India (<http://www.surveyofindia.gov.in/>)

Election Commission of India (<https://eci.gov.in/>)

South Asian Association for Regional Cooperation (<http://saarc-sec.org/>)

Association of Southeast Asian Nations (<https://asean.org/>)

OPEC (<https://www.opec.org/>)

EU (<https://europa.eu/>)

Legislative Department, Govt. of India (<http://legislative.gov.in/>)



**CCPr-305.1 Research Methodology and Geographical Excursion**

**Course Outcomes (COs):** After completing this course, the students will develop skill to:

1. Identify the objectives and significance of research in geography;
2. Prepare schedule and questionnaire in geography;
3. Collect data of physical and human elements;
4. Tabulate data, formulate research design and represent data by using most appropriate methods;
5. Effective writing, maintaining research ethics and academic integrity;
6. Organize and carry out geographical excursion and field visits;

**Unit-I: Research Methods****20 Hrs.**

Objective and significance of research; Research design; Data collection methods; Tabulation, graphical representation and interpretation of data.

**Exercise(s):**

- 1: Definition, meaning, objectives and significance of research
- 2: Formulation of research design
- 3: Preparation of schedule & questionnaire
- 4: Sampling methods
- 5: Use of instruments and other data collection methods
- 6: Tabulation of data
- 7: Graphical representation of data
- 8: Interpretation of data

**Unit-2: Effective Research Writing****20 Hrs.**

Literature review; Articulation of research findings; Referencing system; Proof-editing; Research ethics; Research database and Impact of Research publication.

**Exercise(s):**

- 9: Literature review; writing styles and manuals
- 10: Articulation of research findings and comparison of findings with published work
- 11: Referencing system, bibliography and acknowledgement
- 12: Proof-editing and revision of research writing
- 13: Research ethics and academic integrity in research practices
- 14: Research misconduct; Plagiarism; Fabrication of research
- 15: Research database, publishers, and journals
- 16: Publication metrics: citation and measuring impact of research

**Unit-3: Geographical Excursion / Study Tour****20 Hrs.****Exercise(s):**

- 17-24: Participation in Geographical excursion (study tour) and submission of report for evaluation.

**References:**

1. **Ahuja, R. (2001):** *Research Methods*, Rawat, New Delhi.
2. **Bhattacharyya, D. K. (2005):** *Research Methodology*, Excel Books, New Delhi.
3. **Bryman, Allan (2008):** *Social research methods* Oxford University Press, Oxford.
4. **Denzin, N.K. and Lincoln, Y.S. (eds.) (2000):** *Handbook of Qualitative Research*, Sage Publications, Thousand Oaks, CA.
5. **Flick, Uwe (2010):** *An Introduction to Qualitative Research*, Research Project Sage Publications, New Delhi.

6. **Flowerdew, R.** and **Martin, D. (2005):** *Methods in Human Geography: A Guide for Students Doing a Research Project*, Prentice Hall, Harlow.
7. **Gomez, B.** and **Jones, J. P. III (2010):** *Research Methods in Geography: A Critical Introduction*, John Wiley and Sons.
8. **Guthrie, Gerard (2010):** *Basic Research Methods*, Sage Publications, New Delhi.
9. **Hay, I. (ed.) (2000):** *Qualitative Research Methods in Human Geography*. Oxford University Press, New York.
10. **Henn, M., Mark W., and Nick F. (2006):** *A Short Introduction to Social Research*, Vistaar Publications, New Delhi.
11. **Kitchin, R.** and **Fuller, D., (2003):** *The Academic's Guide to Publishing*, Vistaar Publications, New Delhi.
12. **Kitchin, R.** and **Tate, N., (2001):** *Conducting Research into Human Geography. Theory, Methodology and Practice*. Prentice-Hall, London.
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15. **Montello, D.** and **Sutton, P. (2013):** *An Introduction to Scientific Research Methods in Geography and Environmental Studies*, SAGE Publications, New Delhi.
16. **Parsons, A. J.** and **Knight, P. G. (2005):** *How to Do Your Dissertation in Geography and Related Disciplines*, Routledge, Abingdon.
17. **Stoddard, R. H (1982):** *Field Techniques and Research Methods in Geography*, Kendall/Hunt.

**Useful Web Resources:**

*Elsevier Journals:* <https://www.elsevier.com>

*Google Scholar:* <https://scholar.google.co.in/>

*Web of Science:* <https://clarivate.com/products/web-of-science/>

*Scopus:* <https://www.scopus.com/home.uri>

*JSTOR:* <https://www.jstor.org/>

*Directory of Open Access Journals (DOAJ):* <https://doaj.org/>

*Science Open:* <https://www.scienceopen.com/>

*Microsoft Academic:* <https://academic.microsoft.com/home>

### 305.2 Dissertation/ Project

#### Course Outcomes (COs):

1. Recognize the objectives and significance of research work;
2. Formulate research design and methods;
3. Organize and carry out field visits, collect field data and/or conduct review of literature;
4. Effective writing, maintaining research ethics and academic integrity;
5. Preparation and dissemination of research output having scientific and/or social relevance.

**Topic:** Research topic should be related to finding, reporting and/or disseminating geographical knowledge having scientific and/or social relevance.

**Total Workload: 180 Hrs.**

#### Note (s):

1. Students are required to select a research topic of geographical importance based on empirical evidences of literature to fulfill the requirement of the society.
2. They are expected to carry out field work and use primary and/or secondary data, analyze it and prepare / submit the dissertation / project report for evaluation.
3. Students are also expected to present / publish the research output.
4. Allotment of guides / supervisor (teaching faculty) will be made at the end of the semester II.

## CC-401: Development of Modern Geographical Thought

**Course Outcome (COs):** After completion of this course, the students will

1. Acquire knowledge about the historical development of the subject during different time scales.
2. Apprehend the place of geography in the field of science, social science and natural science.
3. Understand all the concepts of philosophy in geography.
4. Recognize different types of dualism and find solutions to terminate them by applying various types of scientific explanations.

### Unit-1 Historical Development

**20 Lectures**

General nature of geographic knowledge during the Ancient and Medieval period; Field of Geography; its place in classification of science; geography as a social and natural science; concepts in philosophy of geography; Areal differentiation and Spatial organization.

### Unit-2 Modern Geography

**10 Lectures**

Founders of Modern geography with special reference to: i) Bernhardus Varenius, ii) Immanuel Kant, iii) Alexander Von Humboldt, iv) Friedrich Ratzel, v) Carl Ritter, vi) Richard Hartshorne. Trends in development of geography as a discipline in India.

### Unit-3 Dualism in Geography

**10 Lectures**

Dualism in Geography: systematic and regional; physical and human; idiographic and nomothetic; concept of determinism and possibilism.

### Unit-4 Scientific Explanations and Approaches

**20 Lectures**

Scientific Explanations: routes to scientific explanations (inductive / deductive); types of explanations (cognitive, description, cause and effect, temporal); theories, laws and models; quantitative revolution; Approaches: Humanism, Radicalism, Behaviouralism, Post modernism and Feminism; Recent trends in Geography.

## References:

### Books & Reports:

1. **Abler**, Adams, J. & Gould, P. (1971): Spatial Organization. The Geographer's View of the World, Prentice Hall, New Jersey.
2. **Adhikari**, Sudepta (1972): Fundamentals of Geographic Thought, Chaitanya Publishing House, Allahabad.
3. **Amedeo**, Douglas (1971): An Introduction to Scientific Reasoning in Geography, John Wiley, U.S.A., 1971.
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8. **Dikshit**, R. D. (2018): Geographical Thought: A Contextual History Of Ideas, PHI Learning, Delhi.
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12. **Gregory**, et. al (eds.) (2009): The Dictionary of Human Geography, Wiley-Blackwell, London.
13. **Hartshorne**, R. (1939): The Nature of Geography, Lancaster, Association of American Geographers.
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15. **Harvey, D. (1969):** Explanation in Geography, London, Edward Arnold.
16. **Harvey, David (1989):** The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change, Basil Blackwell, Oxford.
17. **Holt Jensen, Arid (1998) :** Geography: History and Concepts, Sage Publication, New Delhi.
18. **James P.E. ed. (1972):** All Possible Worlds, John Wiley and Sons, New York
19. **Johnston R. J. & Sidaway, J. D. (2004):** Geography and Geographers, 6th Edition, Edward Arnold, London.
20. **Johnston, R.J. (1988):** The Future of Geography, Methuen, London.
21. **Johnston, R.J., Gregory, D., Smith, D.M. (Ed) (1986):** The Dictionary of Human Geography, Blackwell.
22. **Kapur Anu (ed.) (2001):** Indian Geography – Voice of Concern, Concept Publishing Company, Delhi.
23. **Ley, D Samuel, M.S. (ed.) (1978):** Humanistic Geography: Prospects and Problems, Croom Helm.
24. **Majid, Hussain (1999):** Geographic Thought, Rawat Publishing House, Jaipur.
25. **Minshull, R. (1970):** The Changing Nature of Geography, Hutchinson University Library, London.
26. **Peet R. And Thirft, N. (Eds.):** New Models in Geography, Vo. I & II Unwin Hyman.
27. **Peet, R. (1977):** Radical Geography - Alternative View Points on Contemporary Social Issue. Methuen & Co. Ltd. London.
28. **Peet, R. (1998):** Modern Geographical Thought, Blackwell Publishers Inc. Massachusetts.
29. **Pickles, I. (1985):** Phenomenology, Science and Geography: Spatiality and The Human Sciences, Cambridge, Cambridge University Press.
30. **Singh, R.L. (2008):** Fundamentals of Human Geography, Sharada Pustak Bhawan, Allahabad.
31. **Soja, E.W. (1977):** Postmodern Geographies, Rawat Publications, Jaipur.
32. **Taylor, G (1951):** Geography in the 20th Century, Methuen and Co. Ltd., London
33. **Unwin, T. (1992):** The Place of Geography, Longman, UK.

**Journal Articles:**

1. **Brosseau, M. (1994)** 'Geography's literature', *Progress in Human Geography*, 18: 333-53.
2. **Bunge, W. (1979)** The Science of Geography, *Annals, Association of American Geographers*, 69:128-32.
3. **Bunting, T.E, Guelke, L. (1979):** Behavioral and Perception Geography: A Critical Appraisal, *Annals, Association of American Geographers*, 69:448-62.
4. **Burton, I (1963):** The Quantitative Revolution And Theoretical Geography, *The Canadian Geographer* 7:151-62.
5. **Peet, R. (1985):** The Social Origin of Environmental Determinism, *Annals of Association of American Geographers*, 75:309-83.
6. **Garrison, W. (1956)** 'Applicability of statistical inference to geographical research', *Geographical Review*, 46, 427-9.

## CCS-402: Regional Planning and Development

### Course Outcomes (COs):

1. To understand the basic concepts in regional planning
2. To study different methods in order to compute regional development
3. To get acquainted with theories and models for regional development
4. To get a specialized knowledge of policies and experiences of regional planning in India.

### Unit-1: Concepts in Regional Planning

15 Lectures

Region-Concept, types and hierarchy of regions - planning- concept and types, Planning region- concept and characteristics of a planning region, Delineation of planning region, Indicators for measuring development, Development- meaning, growth versus development, Measurement of regional development.

### Unit-2: Theories and Models for Regional Development

15 Lectures

Theories and models for regional development: spread and backwash concept. Core and periphery concept, Central place theory, Growth pole, Growth foci approach.

### Unit-3: Policies and Experiences of Regional Planning

15 Lectures

Policies and experiences of regional planning in India, Institutional framework from national planning level to regional development plans, Tennessee valley authority (USA), Damodar valley corporation (India),

### Unit-4: Regional planning in India

15 Lectures

Regional planning in India- rural and urban planning. Regional disparities in India, Planning for tribal area, Hilly area, Command area, and Drought-prone area development.

### References:

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#### **Web Sites**

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<http://www.kmdaonline.org/>  
<http://www.bmrda.kar.nic.in/>

**DSE-403: Fundamentals and Applications of GIS and GPS****Course Outcomes (COs):**

1. To understand the basic concepts of Geographical Information System and GPS.
2. To know various components of GIS and to learn about map projection and coordinate system.
3. To know various applications of GIS and GPS in various fields.
4. Students will become familiar with modern techniques of geography.
5. Students will be prepared to apply their skills in professional careers.

**Unit 1: Introduction to GIS****20 Lectures**

Definition of GIS, History and development of GIS, Components and Future of GIS, Types of Geographic data; Raster and Vector data model: Advantages and Disadvantages; Spatial data input: Digitization and Conversion; Point, line and polygon; Concept of Arc, node and vertices; Digitization errors; Topology and topological relationship.

**Unit 2: GIS Analysis****12 Lectures**

Spatial analysis: Overlay and Buffer Analysis, Interpolation techniques in GIS; Terrain analysis: DEM, DTM and TIN; Non-spatial data: Data quality Issues, Database Management system (DBMS).

**Unit 3: Introduction to GPS****12 Lectures**

Introduction to GPS; types of GPS System; Space, Control and User Segment; GPS satellite; Working principle of GPS; Source of GPS errors; Differential GPS; GNSS & GIS Integration, Applications of GPS.

**Unit 4: Applications of Geospatial Technology****16 Lectures**

Geospatial Technology in Urban and Regional planning, Water resource management, Soil resource Management, Agricultural Management, Forestry and Environment, Land use/ and Land cover mapping, Natural hazards assessment.

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**Research Journals:**

*GeoInformatica*

*Journal of Geographic Information System*

*Journal of Geographical Sciences.*

*Geo-environmental Disasters*

*Geo- spatial Information Science*

*Agricultural Water Management*

*Land Use Policy*

**Websites:**

<https://www.esri.com/en-us/what-is-gis/overview>

<https://gisgeography.com/what-gis-geographic-information-systems/>

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<https://gisgeography.com/100-earth-remote-sensing-applications-uses/>

<https://www.gps.gov/systems/gps/>

## DSE-403: Fundamentals of Soil Geography

### Course Outcomes (COs):

1. To understand the concepts and principles of soil formation.
2. To study the role of essential nutrient for plant growth and development.
3. To determine the physical and chemical properties of soils.
4. To enable the students to realize the Soil and environmental problems;
5. To know the significance of soil conservation and methods of Soil reclamation.

### Unit-1:

**15 Lectures**

Introduction to soil geography: Concepts and definitions, origin, soil profile and categories of soil taxonomy-major groups. Soil forming processes and factors, Weathering and soils, Soil as a medium for plant growth, Essential nutrient elements, Plant roots and soil relations. Soil fertility and soil productivity.

### Unit-2:

**15 Lectures**

Physical properties of soil: Soil texture, Soil Structure; Genesis and Types of structure, Soil consistence, Soil:- moisture, colour, porosity and permeability; Effects of tillage on structure and porosity.

### Unit-3:

**15 Lectures**

Chemical properties of soil: chemical composition of soils, Ion exchange, Cation exchange, Determination of soil pH, Management of soil pH, Soil clays, humus, organic matter, and NPK.

### Unit-4:

**15 Lectures**

Soil and environmental problems: Classification of tropical soils, Soil erosion, Universal soil loss equation (USLE), Nature and management of saline and sodic soils. Soil Contamination, Micronutrients and Toxic Elements in soils: Iron, manganese, Copper and zinc. Conservation of soil, Methods of Soil reclamation.

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### Research Journals:

*Journal of Soils and Sediments (JSS)* (<https://www.springer.com/journal/11368>)

*Soil and Sediment Contamination: An International Journal* (<https://www.tandfonline.com/toc/bssc20/current>)

*International Journal of Sediment Research* (<https://www.journals.elsevier.com/international-journal-of-sediment-research>)

**DSE-404: Agricultural Geography****Course Outcomes (COs):**

1. To educate students about nature, scope and significance of agricultural geography as an academic and professional discipline.
2. To understand the fundamental concept, crop combination, diversification, agricultural productivity and study the determinants of agricultural patterns.
3. To get knowledge about agricultural systems of the world.
4. To understand the agrarian revolution, socio-economic constraints, agricultural problems and policies

**Unit-1:****15 Lectures**

Definition, nature and scope of agricultural geography; Origin and dispersion of agriculture; Approaches to the study of agricultural geography.

**Unit-2:****15 Lectures**

Determinants of agricultural patterns-physical, economic and technological; Agricultural systems of the world - location, distribution, types & characteristics of agriculture.

**Unit-3:****15 Lectures**

Concept & techniques of delimitation of agricultural regions- Crop combination, Crop diversification; Measurement and determinants of agricultural Productivity, Agricultural land use theory- Von Thunen's model of Land Use planning; spatial diffusion Process.

**Unit-4:****15 Lectures**

Agricultural Revolution in India (Green, White) Nature, Socio-economic constraints in the adoption, performance, Problems & prospects. Land use survey, Land classification and land capability, Dry land Agriculture, Food Security, Organic farming, Agricultural Policies in India.

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**Research Journals:**

*Global Food Security - Agriculture Policy Economics and Environment*

*Agriculture Ecosystems & Environment*

*Journal of the Science of Food and Agriculture*

*Agricultural Systems*

*Journal of Agricultural and Food Chemistry*

*Agricultural Water Management*

*Journal of Agricultural Economics*

*Agricultural Economics*

*International Journal of Agricultural Sustainability*

*Journal of Agricultural & Environmental Ethics*

**DSE-404: Tourism Geography****Course Outcomes (COs):**

1. To understand the concepts and components in tourism geography
3. To get comprehensive knowledge of different types of infrastructure and tourism
4. To know about pattern & tourism in the world and impact of globalization
5. To understand different elements of marketing in tourism
6. To get detail knowledge about planning process in tourism

**Unit-1: Concept of Tourism****15 lectures**

Definition, components of tourism, significance of tourism, history of tourism, growth and development of tourism, Natural, Economic and Social significance and impacts of tourism - Tourism as a foreign exchange earner.

**Unit-2: Resources for Tourism and Trends****15 lectures**

Resources for tourism industry – natural, man made, cultural, historical, types of transportation, types of accommodation, types of tourism. New trends in tourism. Globalization and tourism.

**Unit-3: Marketing in Tourism****15 lectures**

Concept of marketing, product, marketing mix, segmentation, Promotion. Tour and travel agency management. Ticketing, passport, visa other formalities, Itinerary Planning.

**Unit-4: Planning in Tourism Management****15 lectures**

Tourism planning and development: Tourism Planning - Planning for tourism - Coordination in planning - assessment of tourist demand and supply - basic infrastructure planning for finance, human resources & environment maintenance of tourist centres - time factor - regional planning consideration - tourism promotional planning - advertisement, media, public relations & publicity. Tourism Policy Issues; strategic tourism planning; planning for tourism growth in India.

**References:**

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## DSE-404: Geography of Health and Nutrition

**Course outcome (COs):** After completing the course, the students will develop an aptitude to:

1. Acquaint the students with the role of geographical factors, viz., physical, demographic, social and economic, influencing the spatial distribution of diseases;
2. Highlight the relation of health with nutrition, environmental degradation and urbanization;
3. Decipher the causes of the changing disease pattern, and
4. Make the students abreast of existing health-care facilities, so as to train them with better health care planning for the country.

### Unit-1 Geography of Health Introduction

**10 Lectures**

Nature, scope and significance; Geographical factors affecting human health with special reference to physical, social, economic, environmental and diseases arising from them.

### Unit-2 Classification of Diseases

**15 Lectures**

Classification of diseases: genetic, communicable and non-communicable; occupational and nutritional deficiency diseases; WHO classification of diseases, Pattern of World distribution of major diseases.

### Unit-3 Human Ecology of Diseases

**15 Lectures**

Ecology, etiology and transmission of major diseases: cholera, malaria, tuberculosis, hepatitis, leprosy, cardiovascular, cancer, COVID-19, AIDS and STDS; Diffusion of diseases and its causes. Deficiency disorders and problems of micro and meso nutrients, mal-nutrition in India.

### Unit-4 Health Care

**20 Lectures**

Health Care - International level, with special reference to WHO, UNICEF and National level, with special reference to Government and NGOs; Availability, accessibility and utilization of health care services; Primary health care; Inequalities in health care services in India; family welfare, immunization, national disease eradication, and Health for All programmes, Health care response to COVID-19.

### References:

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2. **Cliff, A. and Haggett, P. (1989):** Atlas of Disease Distribution. Basil Blackwell, Oxford.
3. **Curtis, S & Taket, A. (1996):** Health and Societies: Changing Perspectives, London, Arnold.
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29. **Woods E.J. (1983)**: Social Geography of Medicine & health, CroonHelm London.
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**Websites:**

*Global Nutritional Report:* <https://globalnutritionreport.org/reports/global-nutrition-report-2018/>

*National Digital Library of India:* <https://ndl.iitkgp.ac.in/>

*National Health Programs, India:* <https://nhm.gov.in/>

*WHO International Classification of Diseases:* <https://www.who.int/classifications/icd/en/>

**CCPr-405.1: Photogrammetry, Remote Sensing and DIP****Course Outcomes (COs):**

1. To apply photogrammetry & Remote Sensing techniques to generate geospatial data.
2. To understand digital data analysis techniques of remote sensing data
3. To know about different types of digital image processing techniques
4. To understand the use and importance of satellite images and aerial photographs
5. To apply the knowledge of remote sensing and DIP in various thematic studies and problem solving

**Unit-1: Practicals in Photogrammetry****60 Hrs.**

- Exercise-1: Indexing of aerial photographs.
- Exercise-2: Introduction to stereoscopes
- 2.1: Orientation & construction of 3-D model under Pocket stereoscope
  - 2.2: Orientation & construction of 3-D model under Mirror stereoscope
  - 2.3: Stereoscopic Vision test
- Exercise-3: Determination of scale
- 3.1: By establishing relationship between Photo distance and Ground distance
  - 3.2: By establishing relationship between Photo distance and Map distance
  - 3.3: By establishing relationship between Focal length and Flying height
  - 3.4: Determination of Average Scale of Vertical Aerial Photograph
- Exercise-4: Relief Displacement
- 4.1: Calculation of Relief Displacement
- Exercise-5: Parallax
- 5.1: Object height determination from Parallax
- Exercise-6: Calculation of Photo Coverage Area
- Exercise-7: Visual Interpretation and Mapping of Aerial photographs
- 7.1: Land use / Land cover mapping

**Unit-2: Practicals in Satellite Remote Sensing****15 Hrs.**

- Exercise-8: Study of satellite image browsing system
- Exercise-9: Visual interpretation of satellite images (True Color, FCC, Thermal and Microwave)

**Unit-3: Practicals in DIP****45 Hrs.**

- Exercise-10: Introduction to DIP software
- Exercise-11: Loading of image data, study of histogram and layer information
- Exercise-12: Layer stacking and Interpretation of FCC image
- Exercise-13: Supervised Classification
- Exercise-14: Unsupervised classification
- Exercise-15: Accuracy assessment

**References:**

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**CCPr-405.2: Introduction to GIS Software and GPS****Course Outcomes (COs):**

1. To learn the graphical user Interface and tools of GIS software.
2. To apply the knowledge of GIS software in various application fields.
3. To apply Comprehensive knowledge of GIS software and GPS for analysis of geographical data and to solve real world problems.
4. To understand the role of GIS as decision support system.
5. To understand and develop the different types of models for GIS spatial analysis
6. To examine the various functions of GPS for surveying and mapping.

**Unit-1: Introduction to QGIS** **30 Hrs.**

Exercise 1: Introduction of QGIS.

Exercise 2: Projection and Reprojection.

Exercise 3: Georeferencing: Toposheet

**Unit-2: Basics of QGIS** **30 Hrs.**

Exercise 4: Image Registration.

Exercise 5: Digitization of Toposheet.

Exercise 6: Map preparation or Map Layout.

Exercise 7: Working with Google Earth.

**Unit-3: Data Exploration** **30 Hrs.**

Exercise 8: Data query: Spatial

Exercise 9: Data query: Attribute.

Exercise 10: Data exploration &amp; working with tables.

**Unit-4: Introduction to GPS instrument** **30 Hrs.**

Exercise 11: GPS instrument

Exercise 12: Basic functions

Exercise 13: GPS surveying: Setting of GPS coordinates, Waypoints demarcation, Area Calculation through GPS, Navigation by Mobile GPS application.

Exercise 14: Transfer of data in GIS software

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**CCPr-405.2: Soil and Water Analysis****Course Outcomes (COs):**

1. To study about the soil sample collection during the soil survey/ field work.
2. To analyse the physical properties of soils.
3. To analyse the chemical properties of soils
4. To determine the physical and chemical properties of water samples.

**Unit-1: Soil Survey****30 Hrs.**

- 1: Field sample collection and preparation.
- 2: Site selection and geomorphic considerations.
- 3: Equipment and reagents.
- 4: Field assessment: saline soils and high pH soils.
- 5: Laboratory sample collection and preparation.
- 6: Field-Moist preparation and Air-Dry preparation.

**Unit-2: Physical Analyses of Soil****30 Hrs.**

- 7: Analysis of Soil morphology.
- 8: Analysis of Soil colour,
- 9-10: Analysis of soil Structure and Consistence.
- 11-12: Particle-size distribution analysis
- 13-16: Determine soil textural classes using sieves and shakers

**Unit-3: Chemical Extractions and Analysis of Soil****30 Hrs.**

- 17-18: Determination of soil pH.
- 19-20: Measurement of electrical conductivity (EC).
- 21-22: Determination of organic matter and Calcium carbonate.
- 23-25: Determination of sodium, calcium and magnesium.

**Unit-4: Analysis of Water Samples:****30 Hrs.**

- 26-27: Determination of pH.
- 28-29: Determination of electrical conductivity.
- 30-31: Determination of carbonates and bicarbonates.
- 32-33: Determination of salinity.
- 34-35: Determination of turbidity.

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## **GE:407 Fundamentals of Geographical Information System and GPS**

### **Course Outcomes (COs):**

- 1. To understand concepts of Geographical Information System.*
- 2. To understand basic functioning of GPS.*
- 3. To know various applications of GIS and GPS in various fields.*
- 4. Students will be prepared to apply their skills in professional careers.*

### **Unit 1: Basics of GIS (15)**

Definition of GIS, Development of GIS, Components and Future of GIS, Types of Geographic data; Raster and Vector data model: Advantages and Disadvantages; Spatial analysis: Overlay and Buffer Analysis, Interpolation techniques in GIS, Applications of GIS in various fields.

### **Unit 2: Introduction to GPS (15)**

Introduction to GPS; types of GPS; Space, Control and User Segment; GPS satellite; Working principle of GPS; Source of GPS errors; Differential GPS; GNSS & GIS Integration, Applications of GPS.