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With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416 004,
MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४, महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी ०२३१-२६०९०९३/९४



SU/BOS/Science/480

Date: 01/07/2023

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

The Head/Co-ordinator/Director
All Concerned Department (Science)
Shivaji University, Kolhapur.

Subject: Regarding syllabi of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of M.Sc. Part-II (Sem. III & IV) as per NEP-2020 degree programme under the Faculty of Science and Technology.


M.Sc. Part-II (Sem. III & IV) as per NEP-2020			
1.	Mathematics	8.	Botany
2.	Mathematics (Distance Mode)	9.	Electronics
3.	Mathematics (Online Mode)	10.	Zoology
4.	M.Sc. Tech (Industrial Mathematics With Computer Application)	11.	Agro Chemical and Pest Management (AGPM)
5.	Geography	12.	Alcohol Technology
6.	Statistics	13.	Sugar Technology
7.	Applied Statistics and Informatics	14.	Geology

This syllabus, nature of question and equivalence shall be implemented from the academic year 2023-2024 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2023 & March/April 2024. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,


Dy Registrar
Dr. S. M. Kubal

Copy to:

1	The Dean, Faculty of Science & Technology	8	P.G. Admission/Seminar Section
2	Director, Board of Examinations and Evaluation	9	Computer Centre/ Eligibility Section
3	The Chairman, Respective Board of Studies	10	Affiliation Section (U.G.) (P.G.)
4	B.Sc. Exam/ Appointment Section	11	Centre for Distance Education

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



Revised Syllabus (CBCS) (as per NEP 2020) of
M.A./M.Sc. in Geography (2 Years) (Level 8 & 9)

Implemented From...

Part I (Level 8): Academic Year 2022-23 onwards
(i.e., from June 2022)

Part II (Level 9): Academic Year 2023-24 onwards
(i.e., from June 2023)

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Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP – 2020)
M.A./M.Sc. Geography Programme Structure
M.A./M.Sc. Part – I (Level 8)

SEMESTER-I (Duration- Six Month)											
	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
CGPA	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	*	--	--	*
Total (A)			--	--	24	520	--	--	80	--	--
Non-CGPA	1	AEC-106	2	2	2	--	--	--	50	20	2
SEMESTER-II (Duration- Six Month)											
CGPA	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	*	--	--	*
Total (B)			--	--	24	520	--	--	80	--	--
Non-CGPA	1	SEC-206	2	2	2	--	--	--	50	20	2
Total (A+B)					48	1040	--	--	160	--	--

Note(s):

<ul style="list-style-type: none"> •Student contact hours per week : 32 Hours (Min.) •Theory and Practical Lectures : 60 Minutes Each •CC- Core Course •CCS- Core Course Specialization •CCPr- Core Course Practical •AEC- Mandatory Non-CGPA compulsory Ability Enhancement Course •SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course 	<ul style="list-style-type: none"> •Total Marks for M.A./M.Sc.-I : 1200 •Total Credits for M.A./M.Sc.-I (Semester I & II) : 48 •Practical Examination is annual. •Practical courses are divided into 2 or 3 sections. •*Duration of practical examination as per respective BOS guidelines. •Separate passing is mandatory for Theory, Internal and Practical examination.
<p>•Requirement for Entry at Level 8: Completed all requirements of the Bachelor's Degree (Level 7) with Geography as principal / major subject.</p>	
<p>•Exit Option at Level 8: Students can exit after Level 8 with Post Graduate Diploma in Geography if he/she completes the course equivalent to minimum of 48 credits.</p>	

Choice Based Credit System with Multiple Entry and Multiple Exit Option (NEP – 2020)
M.A./M.Sc. Geography Programme Structure
M.A./M.Sc. Part – II (Level 9)

SEMESTER-III (Duration- Six Month)											
	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
CGPA	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	*	--	--	*
Total (C)			--	--	24	520	--	--	80	--	--
Non-CGPA	1	AEC-306	2	2	2	--	--	--	50	20	2
	2	EC (SWM MOOC)-307 /OE-307	Number of lectures and credit shall be as specified on SWAYAM-MOOC or as specified in OE								
SEMESTER-IV (Duration- Six Month)											
CGPA	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	*	--	--	*
Total (D)			--	--	24	520	--	--	80	--	--
Non-CGPA	1	SEC-406	2	2	2	--	--	--	50	20	2
	2	GE-407	2	2	2	--	--	--	50	20	2
Total (C+D)					48	1040	--	--	160	--	--

Note(s):

<ul style="list-style-type: none"> •Student contact hours per week : 32 Hours (Min.) •Theory and Practical Lectures : 60 Minutes Each •CC- Core Course •CCS- Core Course Specialization •CCPr- Core Course Practical and Project •DSE- Discipline Specific Elective •AEC- Mandatory Non-CGPA compulsory Ability Enhancement Course •SEC- Mandatory Non-CGPA compulsory Skill Enhancement Course •EC (SWM MOOC) - Non-CGPA Elective Course •OE- Open Elective •GE- Multidisciplinary Generic Elective 	<ul style="list-style-type: none"> •Total Marks for M.A./M.Sc.-II : 1200 •Total Credits for M.A./M.Sc.-II (Semester III & IV): 48 •Practical Examination is annual. •Practical courses are divided into 2 or 3 sections. •*Duration of practical examination as per respective BOS guidelines. •Separate passing is mandatory for Theory, Internal and Practical examination.
<p>Requirement for Entry at Level 9:</p> <ol style="list-style-type: none"> 1) Completed all requirements of the relevant Post Graduate Diploma (Level 8) in Geography 2) Bachelor's Degree (Honours / Research) (Level 8) in Geography 	
<p>Exit Option at Level 9: Students can exit after Level 9 with Master's Degree in Geography if he/she completes the course equivalent to minimum of 96 credits.</p>	

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

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 Course (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. If there is no compatible SWAYAM MOOC course then OE shall be offered.
5. There shall be one Multidisciplinary Generic Elective (GE) course of 02 credits. Each student has to take generic elective preferably from the department other than parent department.
6. For Non-CGPA courses the total credits shall be of 10 + the credits of EC or OE as per availability.
7. The credits assigned to the course and the programme are 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 2022-23.

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 Assessment	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)

Course Structure (CBCS):

Paper No.	Course Title	Teaching hours per week	Credits
M.A./M.Sc. Geography Sem. I (Level 8)			
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 Practicals in Geomorphology and Surveying	16	8
	105.2 Analysis of Climatic Data		
	105.3 Analysis of Socio-economic Data		
CGPA - Total Credit (Cumulative)			24 (24)
AEC-106	Ability Enhancement Course	--	2
Non-CGPA - Total Credit (Cumulative)			02 (02)
M.A./M.Sc. Geography Sem. II (Level 8)			
CC-201	Development of Modern Geographical Thought	4	4
CC-202	Geohydrology and Oceanography	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		
CGPA - Total Credit (Cumulative)			24 (48)
SEC-206	Skill Enhancement Course	--	2
Non-CGPA - Total Credit (Cumulative)			02 (04)
M.A./M.Sc. Geography Sem. III (Level 9)			
CC-301	Applied Climatology and Climate Change	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		
CGPA - Total Credit (Cumulative)			24 (72)
AEC-306	Ability Enhancement Course	--	2
EC-307	Elective Course (SWAYAM MOOC)	--	2/4
Non-CGPA - Total Credit (Cumulative)			4/6 (8/10)
M.A./M.Sc. Geography Sem. IV			
CC-401	Applied Geomorphology	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		
CGPA - Total Credit (Cumulative)			24 (96)
SEC-406	Skill Enhancement Course	--	2
GE-407	Generic Elective Course	--	2
Non-CGPA - Total Credit (Cumulative)			4 (12/14)

5. 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
Total = 05	--	--	--	--	80

II(a). 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
Q.8.	Viva-voce (External)	01	25
Total = 08	--	--	200

II(b). 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
Q.8.	Viva-voce based on Dissertation/ Project Report (External)	01	50
Total = 08	--	--	200

II(c). 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
Total = 08	--	--	200

*Nature of question paper may be different than specified here in case of online assessment.

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

Sr. No.	Title of Old Course (2022-23)	Title of New Course (2023-24)
1.	CC-101: Fundamentals of Geomorphology	CC-101: Fundamentals of Geomorphology
2.	CC-102: Principles of Climatology	CC-102: Principles of Climatology
3.	CC-103: Economic Geography	CC-103: Economic Geography
4.	CC-104: Geography of Population and Human Resource Development	CC-104: Geography of Population and Human Resource Development
5.	CC-401: Development of Modern Geographical Thought	CC-201: Development of Modern Geographical Thought
6.	CC-301: Geohydrology and Oceanography	CC-202: Geohydrology and Oceanography
7.	CCS-203: Advanced Cartography and Surveying	CCS-203: Advanced Cartography and Surveying
8.	CCS-204: Social and Cultural Geography	CCS-204: Social and Cultural Geography
9.	CCPr-105: Practical I 105.1 Practicals in Geomorphology and Surveying 105.2 Analysis of Climatic Data 105.3 Analysis of Socio-economic 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.	CCPr-205: Practical II 205.1 Computer Applications in Geography 205.2 Statistical Techniques in Geography 205.3 Quantitative 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.	CC-202: Applied Climatology and Climate Change	CC-301: Applied Climatology and Climate Change
12.	CCS-302: Fundamentals of Remote Sensing and Digital Image Processing	CCS-302: Fundamentals of Remote Sensing and DIP
13.	DSE-303(a): Geography of Environment	DSE-303(a): Geography of Environment
14.	DSE-303(b): Biogeography	DSE-303(b): Biogeography
15.	DSE-304(a): Settlement Geography	DSE-304(a): Settlement Geography
16.	DSE-304(b): Geography of India	DSE-304(b): Geography of India
17.	DSE-304(c): Political Geography	DSE-304(c): Political Geography
18.	CC-201: Applied Geomorphology	CC-401: Applied Geomorphology
19.	CCS-402: Regional Planning and Development	CCS-402: Regional Planning and Development
20.	DSE-403(a): Fundamentals and Applications of GIS and GPS	DSE-403(a): Fundamentals and Applications of GIS and GPS
21.	DSE-403(b): Fundamentals of Soil Geography	DSE-403(b): Fundamentals of Soil Geography
22.	DSE-404(a): Agricultural Geography	DSE-404(a): Agricultural Geography
23.	DSE-404(b): Tourism Geography	DSE-404(b): Tourism Geography
24.	DSE-404(c): Geography of Health and Nutrition	DSE-404(c): Geography of Health and Nutrition
25.	CCPr-305: Practical III (Dissertation) 305.1 Research Methodology and Geographical Excursion 305.2 Dissertation/ Project	CCPr-305: Practical III (Dissertation) 305.1 Research Methodology and Geographical Excursion 305.2 Dissertation/ Project
26.	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	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

7. 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.

8. 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): After completing the course, students will be able to

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

Unit: 1

15 Lectures

Nature and scope of geomorphology, Evolution of geomorphological thought, Contribution of American and European school of Geomorphology, Brief review of geomorphic concept, 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 Convictional current theory, Theory of Isostasy.

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5. Briggs, K. (1985): Physical Geography Process and System, Hodder and Stoughton, London.
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15. Robinson, Harry (1969): Morphology and Landscape, University Tutorial Press Ltd. London.
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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): After completing the course, students will be able to

1. Distinguish the weather and climate with an understanding of structure and composition of Atmosphere;
2. Understand the variations of weather systems in terms of Stability and Instability of atmosphere;
3. Enable the students to understand the vertical and horizontal distribution of atmospheric air;
4. Get complete information about Atmospheric Disturbances in terms of cyclones and anti-cyclones;
5. Know the significance of synoptic Climatology in pollution studies and navigation;

Unit - 1:

15 Lectures

Introduction to Climatology: Significance of Climatology, Modern Climatological studies, Origin and evolution of the earth's 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, Processes that cause changes of state, Humidity, Humidity measurements, Adiabatic temperature change in atmosphere, 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, Classification of Wind, 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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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/clin/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): After completing the course, students will be able to

1. Understand the concepts and basis of economic processes
2. Get acquainted with theories and models in economic geography
3. Get comprehensive knowledge of World energy resources, situation and distribution
4. Know about the Nature, scope and Principles of Industrial Geography
5. Understand transport and Trade policies of country
6. 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; Global city.

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, India: Current Energy Scenario.

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; Indian Transnational Corporations (TNCs).

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.

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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 growth.
2. Acquire skill to describe regional patterns of population composition.
3. Compute and explore fertility, mortality, migration 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: Introduction

15 Lectures

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

Unit-2: Population Processes

20 Lectures

Fertility: Concepts, Determinants, Measures, Trends and Methods of estimation - India; Mortality: Concepts, Determinants, Measures, Trends and Methods of estimation - India; Migration: Types, Determinants and consequences; 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: Concepts, Pillars, Approaches; Human development pattern - World & India, Gender Equity; Social well-being and quality of life, Status of Women – social, economic and health; Population Policies - perspectives from developed and developing world, National Population Policy of India.

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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/>

National Commission for Women: <http://ncwapps.nic.in/default.aspx>

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

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

Population Reference Bureau: www.prb.org

The World Bank: www.worldbank.org

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

CCPr-105.1: Practicals in Geomorphology and Surveying

Course Outcomes (COs): After completing the course, students will be able to

1. Know the methods of representation of relief.
2. Understanding the topographical maps.
3. Identification and mapping of drainage patterns.
4. Look into the drainage basin morphometry.
5. Understand the field surveying methods.

Unit-1: Maps, Relief Representation and Mapping of Landforms**25 Hrs.**

1. Map definition and types of maps.
2. Classification of maps based on scale.
3. Classification of maps based on purpose.
4. Indexing of Topographical sheets.
5. Methods of Representation of Relief: Pictorial, Hachures, Hill shading, Shadow method.
6. Mathematical. Spot height, Bench marks, Trigonometrical station, Contours, Formlines etc.
7. Identification and Mapping of Landforms from Topographical Maps: Ridge; Saddle; Col.; Pass; Spur; Plateau; Escarpment; Cliff; Waterfall; River Terraces; 'U' shaped Valley; 'V' shaped Valley.
8. Profiles: Analysis of Cross Profiles, Profile projected, Profile superimposed, Profile composite.
9. Longitudinal Profile.

Unit-2: Drainage Basin Analysis**25 Hrs.**

- 10-14. Identification & Mapping of Drainage Patterns: Dendritic; Trellis, Radial Drainage Patterns.
15. Sinuosity Index of Straight Channel.
16. Sinuosity Index of Sinuous Channel.
17. Sinuosity Index of meandering channels.
18. Drainage Basin Morphometry.
19. Strahler Stream Order system.
20. Calculation of Bifurcation Ratio.
21. Calculation of Drainage density.
22. Calculation of Stream Frequency.

Unit-3: Field Surveying**30 Hrs.**

23. Introduction to field surveying.
- 24-27. Theodolite survey: Components and working principle of instrument, Measurement of Distance, Height and Area.
- 28-31. Total Station Survey: Components and working principle of instrument, Measurement of Distance, Height and Area.
- 32-35. DGPS Survey: Components and working principle of instrument, Measurement of Distance, Height and Area.
36. Introduction to drone surveying.

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CCPr-105.2: Analysis of Climatic Data

Course Outcomes (COs): After completing the course, students will be able to

1. Identify various sources of climate data
2. Understand the formats of Indian daily weather report and reading of weather signs and symbols
3. Represent meteorological elements diagrammatically and interpretation of results.
4. Know methods of measurement of meteorological elements
5. Analyse interrelationship between various meteorological elements
6. Analyse present and future trends of meteorological elements.

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

- 1-2: Climatic data: Sources and measurements.
- 3: Weather details: Weather Signs & symbols.
- 4-6: Reading and interpretation of weather maps of representative seasons.

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

- 7-10: Construction and interpretation of Wind Rose Diagrams- Simple, Compound, Octagonal.
- 11: Interpolation of Isoleth.
- 12-14: Depiction and Interpretation of Comfort diagrams- Climograph, Hythergraph, Climatograph.
- 15-17: 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):**

- 18: Spatial correlation of climatic variables: Graphical analysis.
- 19: Water budget: Graphical analysis.
- 20: Hydrograph.
- 21: Analysis of upper air data- Tephigram (Temperature Height diagram).
- 22: Ergographs (Crop Calendar).
- 23-24: Dispersion graphs: Temperature and rainfall dispersion Diagram.

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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): After completing the course, students will be able to

1. Identify the importance of population studies regarding the fertility, mortality.
2. Understand the socio-economic structure of population.
3. Study various statistical methods for analysis of Agricultural activities.
4. Determine the agriculture productivity and analyze results.
5. 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.
- 12-13: Measures of population Growth.
- 14-15: Age & Sex Pyramid: Compound and Superimposed pyramid.

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

- 16-17: Calculation of Crop Concentration index: Locational quotient method by Bhatia, Jasbir Singh Method.
- 18: Calculation of Crop Diversification index: Bhatia's Method.
- 19-20: Identification and interpretation of Crop Combination index by Weaver and Doi methods.

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

- 21-22: Trade area delimitation- Breaking Point Theory, Law of Retail Gravitation.
- 23: Construction of Flow line charts & maps of transport flows.
- 24-25: Logarithmic & Semi-logarithmic graphs.

References:

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CC-201: 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 Introduction

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; relationship of geography with other disciplines; concepts in philosophy of geography; Areal differentiation and Spatial organization.

Unit-2 Dualism in Geography

10 Lectures

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

Unit-3 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-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, Behaviouralism, and Feminism; Recent trends in Geography.

References:

Books & Reports:

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2. **Adhikari**, Sudeepa (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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30. **Taylor, G (1951)**: Geography in the 20th Century, Methuen and Co. Ltd., London
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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.
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5. **Fennemen, N.M. (1919)** The circumference of Geography, *Annals of Association of American Geographers*, IX. Pp 3-11
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CC-202: Geohydrology and Oceanography

Course Outcomes (COs): After completing the course, students will be able to

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

Unit-1: Groundwater and 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; Major water masses of the World's Ocean; Thermohaline circulation and the oceanic conveyor belt; Biological productivity in the Ocean; Origin and growth of coral reefs; Ocean deposits: origin, type and distribution; Sea level changes; Oceanic regions; Marine resources; Marine pollution.

References:

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1. **Cech, T.V. (2009):** *Principles of Water Resources: History, Development, Management, and Policy (3rd Ed.)*, Wiley, Hoboken, New Jersey, 576pp.
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4. **Davie, T.,** and Quinn, N.W. (2019): *Fundamentals of Hydrology (3rd Ed.)*, Routledge, New York, 285pp.
5. **Davis, R.,** and Fitzgerald, D. (2003): *Beaches and Coasts*, Wiley-Blackwell, Hoboken, New Jersey, 432pp.
6. **Day, T. (2008):** *Oceans (Rev. Ed.)*, Facts on File, New York, 337pp.
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8. **Garrison, T. (2009):** *Essentials of Oceanography (5th Ed.)*, Brooks/Cole, Belmont, California, 463pp.
9. **Garrison, T.** and Ellis, R. (2016): *Oceanography: An Invitation to Marine Science (9th Ed.)*, Cengage Learning, Boston, 604pp.
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17. **Sverdrup, K.A., and Kudela, R.M (2020):** *Investigating Oceanography (3rd Ed.)*, McGraw-Hill, New York, 511pp.
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20. **Viessman, W., and Lewis, G.L. (2002):** *Introduction to Hydrology (5th Ed.)*, Prentice Hall, New Jersey, 612pp.

Research Journals:

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>
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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/ngeo/>
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-203: Advanced Cartography and Surveying

Course Outcomes (COs): After completing the course, students will be able to

1. Understand basic principles of cartography and surveying
2. Gain understandings of various cartographic methods and techniques
3. Acquaint with the skills of digital cartography
4. Identify sources and types of errors occurs during surveying
5. Get familiar with the basic aspects of linear, vertical and angular measurements of surveying.

Unit - 1: Fundamentals of Cartography

15 Lectures

Definition, nature and scope of cartography, History of cartography, Basics of geodesy, 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

20 Lectures

Introduction to digital cartography, Manual cartography vs. Digital cartography, Cartographic data and its sources, Cartographic database, Design principles of cartography, Map design, Symbolization, Visualization and generalization, 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, Nature 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.

References:

1. Bailey, T. and Gatrell, A. C. (1995): Interactive Spatial Data Analysis. Longman, Harlow.
2. Dorling, D. and Fairborn, D. (1997): Mapping. Ways of Representing the World. Longman, Harlow.
3. Duggal, S. K. (2014): Surveying McGraw Hill Education (India) Private Limited, Fourth edition, Delhi
4. Fraser Taylor, D.R. (1980): The Computer in Contemporary Cartography. John Wiley and Sons, New York.
5. FraserTaylor, D.R. (ed.) (1983): Graphic Communication and Design in Contemporary Cartography. John Wiley and Sons, New York.
6. Kanetkar, T.P. and Kulkarni, S.V. (1967): Surveying and Levelling, Part II, A.V.G. Prakashan, Poona.
7. Keates, J.S. (1973): Cartographic Design and Production, Longman Group Ltd.
8. Mailing, D.H. (1973): Co-ordinate Systems and Map Projections. George Philip and Sons Ltd.
9. Misra, R.P. and Ramesh, A. (1999): Fundamentals of Cartography. Concept Publishing Company, New Delhi.
10. Monkhouse, F.J. and Wilkinson, H. R (1962): Maps and Diagrams, Methuen and Company Ltd. and Company Ltd., London.
11. Nag, P. (ed.) (1984): Census Mapping Survey, Concept Publishing Company, New Delhi.

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18. Singh, R. L. and Singh, Rana P.B. (1993): Elements of Practical Geography. Kalyani Publishers, Ludhiana and New Delhi. (English and Hindi editions).
19. Strahler, A.N. (1971): The Earth Sciences. Harper and Row Publishers; New York.
20. Thrower, N. (1996): Maps and Civilisation. Cartography, Culture and Society. University of Chicago Press, Chicago.
21. Unwin, D. (1982): Introductory Spatial Analysis. Methuen and Company Ltd., London.
22. Walford, N. (1995): Geographical Data Analysis. John Wiley and Sons, Chichester.

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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): After completing the course, students will be able to

1. Study and identify the philosophical base, problems associated with society & its culture.
2. Know about the culture, cultural regions, hearths and their diffusion, realms, and distribution of races.
3. Study and knowing of socio-cultural diversity of India, and processes of social changes.
4. 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: Races and Culture

15 Lectures

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

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, Women empowerment, Social status of women in India.

References:

1. Ahmad, Aijazuddin (1999): Social Geography, Rawat Publications, Jaipur.
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.
4. Cater, Hohn & Jones, Trevor (1989): Social Geography-An Introduction to Contemporary Issues, Arnold Publishers, New Delhi.
5. Jackson, Peter (1989): Maps of meaning- An Introduction to cultural Geography, Unwin Hyman, and London.
6. Jackson, Richard H. & Loyd E. Hudman (1990): Cultural Geography-People, Places and Environment West publishing co., New York.
7. Jones, Emrys & Eyles, John (1977): An Introduction to social Geography, Oxford University Press, Oxford.
8. Jordan, Terry G. & Rowntree, Lester (1976): The Human Mosaic-A Thematic Introduction to Cultural Geography, Canfield press, San Francisco Co., Harper & Row Publisher, New York.
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12. Singh, Joginder (): Sanskritization in India.
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): After completing the course, students will be able to

1. Learn the representation of geographic data using various computational methods;
2. Develop writing, editing, and presentation skill for representation of geographical information;
3. Compute statistical parameters with the help of computer;
4. Prepare and design maps and graphs with the help of computer software;
5. Apply computational techniques relevant in the discipline of Geography;
6. Know about sources and uses of online educational resources and e-learning methods;

Unit-1: Geographic data: types and sources; Computer hardware and software; 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. **40 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: Writing / formatting of text paragraphs.
- 5: Inserting, creating, and editing of text box, smart art, pictures and graphs.
- 6: Construction and editing of tables (with and without formatting).
- 7: Reference writing styles using MS word with examples.
- 8: Preparation of MS power point presentation.
- 9: Measures of central tendency: Computation of average, median and mode.
- 10: Measures of central tendency: Calculation of weighted mean.
- 11: Measures of position: Estimation of quartiles, deciles, and percentiles.
- 12: Measures of variation: Computation of range, variance, and standard deviation.
- 13: Calculation of co-relation coefficient.

Unit-2: 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):

- 14-18: Presentation and analysis of geographic data using MS Excel – preparation of graphs/charts (bar graph, line graph, pie diagram, scatter diagram and trend line).
- 19: Co-relation and regression analysis using MS Excel.
- 20: Presentation and illustration of geographic data – preparation of maps with labeling.
- 21-22: Presentation and analysis of geographic data using Origin and SPSS.

Unit-3: Online educational resources; E-learning.

15 Hrs.**Practical Exercise(s):**

- 23: Identification, browsing, and storing/ retrieving of online educational resources.
- 24: Comprehensive browsing and listing of useful geographical websites.
- 25: E-learning objectives, methods, and listing of open online e-learning websites.
- 26: E-learning through e-content: e-PG Pathshala.
- 27: E-learning through open online courses: MOOCS – SWAYAM.

References:

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3. **Freund, S.M.**, Hoisington, C.L., Last, M.Z., Pratt, P.J., Sebok S.L., and Vermaat, M.E. (2017): *Microsoft Office 365 Office 2016*, Cengage Learning, Boston, 973pp.
4. **Maguire, D.J.** (1989): *Computers in Geography*, Longman, London, 272pp.
5. **Mather, P.M.** (1991): *Computer Applications in Geography*, Wiley, New York, USA, 270pp.
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7. **McGrew, J.C.**, and Monroe, C.B. (2009): *An Introduction to Statistical Problem Solving in Geography (2nd Ed.)*, Waveland Pr Inc, 254pp.
8. **Miller, M.** (2007): *Absolute beginner's guide to computer basics (4th Ed.)*, Que/Pearson, Indianapolis, Indiana, USA, 430pp.
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10. **Morley, D.**, and Parker, C.S. (2017): *Understanding Computers – Today and Tomorrow*, Cengage Learning, Boston, 567pp.
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13. **Sarkar, A.** (2009): *Practical Geography: A Systematic Approach*, Orient BlackSwan, Hyderabad, India, 408pp.
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16. **Walkenbach, J.**, Tyson, H., Wempen, F., Prague, C.N., Groh, M.R., Aitken, P.G., Irwin, M.R., Powell, G., and Bucki, L.A. (2007): *Office 2007 Bible*, Wiley, Indianapolis, Indiana, USA, 1224pp.

Websites:

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): After completing the course, students will be able to

1. Understand the importance and use of statistical techniques in geography
2. Form frequency distributions tables and graphically interpret the results.
3. Measure central tendency and dispersion of data.
4. Examine relationship between two or more variables with correlation and regression analysis.
5. 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: Types and sources of statistical data in geography
- 4: Formation of frequency distribution table
- 5-8: 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):**

- 9-12: Measures of central tendency using simple, discrete and continuous data: Mean, Median and Mode.
- 13-15: Measures of position: Estimation of quartiles, deciles and percentiles.
- 16-19: Measures of dispersion: Absolute measurements- Mean deviation, Quartile deviation, and Standard deviation.
- 20-24: 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):**

- 25-26: Skewness: Karl Pearson's and Bowley's methods
- 27: Kurtosis
- 28-30: Correlation analysis: Spearman's rank order correlation and Pearson product moment correlation, Kendall rank correlation coefficient.
- 31-32: Regression analysis: Simple and Multiple Regression
- 33: Least square method.

References:

1. Alvi, Z. (1995): Statistical Geography: Methods and Applications, Rawat Publications, Jaipur
2. Cole, J.P. & King, C.A.M. (1968): Quantitative Techniques in Geography. John Wiley & sons Inc. New York.
3. Elhance, D.N. (1972): Fundamentals of statistics, Kitab Mahal, Allahabad.
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10. Singh R. L. (1979): Elements of Practical Geography.

CCPr-205.3: Quantitative Techniques in Geography

Course Outcomes (COs): After completing the course, students will be able to

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

Unit-1: Introduction to Quantitative Techniques and Probability Distribution**30 Hrs.**

1. Elementary Probability Theory
2. Random Variables and Probability Distribution
3. Normal Distribution
4. Binomial Distribution
5. Poisson Distribution
6. Baye's Theorem

Unit-2: Hypothesis Testing in a Geographical Context, Use of Non-parametric Tools in Spatial Analysis.**35 Hrs.**

7. Point and Interval Estimation
8. Key Steps in Testing Hypothesis
9. PROB-Value Method of Hypothesis Testing
10. Statistical Significance
11. Two Samples: The t Test
12. Analysis of Variance (ANOVA)
13. Sign Test
14. Man – Whitney test
15. Kruskal – Wallis analysis of variance
16. Chi-square test
17. Kolmogorov-Smirnov D. Contingency Tables

Unit-3: Models & Theories in Geography**15 Hrs.**

18. Importance of models in geography
19. Models as quantitative techniques
20. Simulation models
21. Gravity models
22. 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: Applied Climatology and Climate Change

Course Outcomes (COs): After completing the course, students will be able to

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

Unit - 1: Impact of Climate and Global Climatic Regions

20 Lectures

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

Unit - 2: Weather Systems of India

8 Lectures

Characteristics of general weather systems of India – spatial and seasonal variation of temperature 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

12 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

20 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 and extreme weather events; Future climate changes – risks and impacts; 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.
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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.
8. **Hobbs, J.E.** (1980): *Applied Climatology – A Study of Atmospheric Resources*, Dawson Publishing/Westview Press, Butterworth-Heinemann, 222pp.
9. **IPCC 5th Assessment report on Climate Change**: <http://www.ipcc.ch/report/ar5/>
10. **Jacobson, M.Z.** (2002): *Atmospheric Pollution – History, Science, and Regulation*, Cambridge University Press, Cambridge, 399pp.

11. Keller, E.A., and Devecchio, D.E. (2012): *Natural Hazards*, Prentice Hall, Boston, 554pp.
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13. Lal, D.S. (2011): *Climatology*. Sharda pustak Bhavan, Allahabad, 448pp.
14. Lutgens, F.K., and Tarbuck, E.J. (2013): *The Atmosphere – An Introduction to Meteorology*. Prentice Hall, Boston, 506pp.
15. McConnell, D., Steer, D., Knight, C., Owens, K., and Park, L. (2008): *The Good Earth – Introduction to Earth Science*, McGraw Hill, New York, 536pp.
16. Monroe, J.S., and Wicander, R. (2009): *The Changing Earth – Exploring Geology and Evolution*, Brooks/Cole, Belmont, 735pp.
17. Philander, S.G. (2008): *Encyclopedia of Global Warming and Climate Change*, Sage, London, 1283pp.
18. Ruddiman, W.F. (2008): *Earth's Climate – Past and Future*, W. H. Freeman, New York, 388pp.
19. Singh, S. (2009): *Climatology*, Prayag Pustak Bhawan, Allahabad, 504pp.
20. Stanley, S.M. (2009): *Earth System History*, W.H. Freeman, New York, 551pp.
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:

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Atmospheric Environment (<https://www.sciencedirect.com/journal/atmospheric-environment>)
Bulletin of the American Meteorological Society (<https://journals.ametsoc.org/toc/bams/current>)
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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-302: Fundamentals of Remote Sensing and DIP

Course Outcomes (COs): After completing the course, students will be able to

1. Understand the principles and concepts of remote sensing and its role in capturing and analyzing Earth's data.
2. Describe the different types of remote sensing platforms, sensors, and image acquisition systems used in the field.
3. Interpret and analyze aerial photographs and satellite images using visual interpretation techniques.
4. Apply digital image processing techniques for feature extraction, including texture, shape, and spectral indices.
5. Explore emerging trends and technologies in remote sensing and digital image processing.

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 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, 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, 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., Marzoff, 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 (3rdEd.)*, 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 (3rdEd.)*, 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>
Wikimania: <http://www.wikimania.org>
Bhuvan: <http://www.bhuvan.nrsc.gov.in>

DSE-303: Geography of Environment

Course Outcomes (COs): After completing the course, students will be able to

1. Know about contents and methods of Geography of Environment as an academic and professional discipline.
2. Understand elements of environment and acquire knowledge about biodiversity
3. Get knowledge about natural hazards and management
4. 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, tsunami, 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.
2. Botkin, D.B., Keller, E.A. (2007): Environmental science: Earth as a Living Planet. John Wiley and Sons, New York.
3. Cunningham, W. Cunningham, Mary: Environmental Science: A Global Concern (2010). MacGraw-Hill, London.
4. Government of India (2010): Status of Environment Report. New Delhi.
5. Keller, E.A, Vecchio, D.E.de: Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes. Prentice Hall, New York.
6. Marsh, W.M., Grossa, J. (2005): Environmental Geography: Science, land use, and Earth Systems. John Wiley, New York.
7. McKinney, M.L., Schoch, R.M. (2003): Environmental science: Systems and Solutions. Jones & Bartlett Learning.
8. Miller, G.T, Spoolman, Scott (2011): Environmental Science. Brooks Cloe, London.
9. Raven, P.H, Berg, L.R, Hassenzahl, D.M Peter: Environment. John Wiley, New Delhi.
10. Wright, R.T., Nebel, B.J. (2005): Environmental science: Toward a sustainable future. Pearson/Prentice Hall, New Jersey.
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

15. Chandna, R. C. (2002): Environmental Geography, Kalyani, Ludhiana
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
18. Miller, G. T. (2004): Environmental Science: Working with the Earth, Thomson Brooks Cole, Singapore
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): After completing the course, students will be able to

1. Understand the concepts and historical development of biogeography
2. Get comprehensive knowledge of different classification of animal and plants
3. Know about pattern of biogeography
4. Understand different processes in biogeography
5. Get detail knowledge about influencing factors on biogeography

Unit-1: Concepts and Theories in Biogeography

15 Lectures

Nature of Biogeography, History of Biogeography – Plate tectonic and biotic change, Communities and patterns in biogeography – Biomes, Hotspots, biodiversity, alpha beta diversity and niche. Importance to society, conservation biogeography, island biogeography, phytogeography, phylogeography.

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 Animals and Plants

15 Lectures

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

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.
4. Darlington P.J. (1957): Zoogeography – Methew, New York.
5. Furley P.A, & Newly W.N.(1983): Geography of the Biosphere : Butter Worth, London.
6. Joy T.V. (1997); Biogeography – study of plants in the ecosphere.
7. Mathur H.S. (1986): Elements of Biogeography, Pointer Jaipur.
8. Martin C. (1975): Plant Geography. Methuen, London.
9. Muller P. (1986): Biogeography; Harper & Row, New York.
10. New big in M.I. (1986): Plant & Animal Geography : Methuen, London.
11. Pears N. (1985): Basic Biogeography, Longman, London.
12. Watts, d. (1971): Principles of Biogeography, McMillan, London.
13. Simmms T. G.: Biogeography, Natural & Cultural, Arnold & Heinemann, London.

DSE-304: Settlement Geography

Course Outcomes (Cos): After completing the course, students will be able to

1. Know the fundamentals of settlement geography
2. Understand the approaches to rural settlement geography; rural services; hierarchy; morphology etc.
3. Know the concept and processes of urban settlement studies; urban problem & their planning; concept smart cities, urban agriculture, etc.
4. Understand 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; origin and growth of rural and urban 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, 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; 2nd 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.
6. Hornby, W.F., Jones M. (1991): An Introduction to Settlement Geography. Cambridge University Press.
7. Johnston, J.H. (1974): Urban Geography, Pergoman Press, Oxford.
8. Johnston, R. J. (1984): City & Society. Unwin, London.
9. King, L.J., Golledge R.G. (1978): Cities, Space & Behavior, Prentice Hall, Engle wood cliff, New Jersey.
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.
12. Mosely, M.J. (2005): Rural Development: Principles and Practice. Sage Publication, London.
13. Northamray, M. (1975): Urban Geography, John Willey & Sons, New York.
14. Pacione, M. (2009): Urban Geography-A Global Perspective. 3rd edition. Routledge, London.
15. Ramachandran, R. (1991): Urbanization and Urban Systems in India, Oxford Uni. Press. Delhi.
16. Robinson, Brian T. (1973): Urban growth, Mathuen & Company, London.
17. Rykwert, J. (2004): Settlements. University of Pennsylvania Press, University Park, USA.
18. Sidhartha, K. and Mukherjee, S. (2000): Cities-Urbanizations & Urban Systems. Kisalaya Pub. Pvt. Ltd., New Delhi.

19. Singh, R.Y. (1994): Geography of Settlements. Rawat Publications. New Delhi, Jaipur.
20. Singh, R.L. (eds.) (1973): Rural Settlements in Monsoon Asia, National Geographical Society of India, Varanasi.
21. Singh, R. L., Singh, K.N. and Singh, Rana P.B., (eds.) (1975): Readings in Rural Settlement Geography, National Geographical Society of India, Varanasi.
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): After completing the course, students will be able to

1. 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. Generate an awareness and responsibility for the environment and India.
4. Know about 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.
4. Johnson, B.L.C. (1983): Development in South Asia. Penguin Books, Harmondsworth.
5. Khullar, D. R. (2006): India. A Comprehensive Geography. Kalyani Publishers., New Delhi.
6. Krishnan, M. S. (1968): Geology of India and Burma. 4th edition. Higgin Bothams Private. Ltd., Madras.
7. Nag, P. and Gupta S. S. (1992): Geography of India. Concept Publishing. Company, New Delhi.
8. Sharma, T. C. (2003): India: Economic and Commercial Geography. Vikas Publication., New Delhi.
9. Singh, J. (2003): India: A Comprehensive and Systematic Geography. Gyanodaya Prakashan, Gorakhpur.
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.
13. Sukhwai, B.L. (1987): India. Economic Resource Base and Contemporary Political Patterns. Sterling Publication, New Delhi.
14. Tiwari, R. C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad
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): After completing the course, students will be able to

1. Identify the geostrategic locations and areal extent of countries in the world
2. Understand the correlation between geography and political actions and processes
3. Get familiar with the electoral system in India
4. 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, 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, Political stability and instability, 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.
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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/](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; Falsification; Fabrication of research
- 15: Research database, publishers, and journals; Predatory 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.
13. **Kumar, Ranjit (2011):** *Research Methodology: A Step by Step Guide for Beginners* Sage Publications, New Delhi.
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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): After completing the course, students will be able to

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 fulfil 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: Applied Geomorphology

Course Outcomes (COs): After completing the course, students will be able to

1. Establish the relationship between the tectonism and geomorphology with the knowledge of interior of the Earth.
2. Assess the impact of tectonism and diastrophism on the earth crust.
3. Verify the impact of dynamic agencies on denudation and their work.
4. Understand the cycle of erosion with different views with special reference to hill slope development.
5. See about 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.
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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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CCS-402: Regional Planning and Development

Course Outcomes (COs): After completing the course, students will be able to

1. Understand the basic concepts in regional planning
2. Understand different methods in order to compute regional development
3. Get acquainted with theories and models for regional development
4. 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, Garden city concept, green belt concept.

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.

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

DSE-403: Fundamentals and Applications of GIS and GPS

Course Outcomes (COs): After completing the course, students will be able to

1. Understand the basic concepts of Geographical Information System and GPS.
2. Know various applications of GIS and GPS in various fields.
3. Familiar with modern techniques of geography.
4. Apply these 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; 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; Network analysis; Terrain analysis: DEM, DTM and TIN; Data quality issues; Database Management system (DBMS); Types of attribute data, Relational Model, Normalization and SQL.

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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Agricultural Water Management

Land Use Policy

Websites:

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

DSE-403: Fundamentals of Soil Geography

Course Outcomes (COs): After completing the course, students will be able to

1. Understand the concepts and principles of soil formation.
2. Study the role of essential nutrient for plant growth and development.
3. Determine the physical and chemical properties of soils.
4. Enable the students to realize the Soil and environmental problems;
5. Know the significance of soil conservation and methods of Soil reclamation.

Unit-1:**15 Lectures**

Introduction to soil geography: Concepts and definitions, Process of origin of soil, pedogenesis, 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 morphology, 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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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): After completing the course, students will be able to

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

Unit-1:**15 Lectures**

Definition, nature, scope and significance 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.

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. Impact of climate change on agriculture. Agricultural Policies in India.

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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): After completing the course, students will be able to

1. Understand the concepts and components in tourism geography
3. Get comprehensive knowledge of different types of infrastructure and tourism
4. Know about pattern & tourism in the world and impact of globalization
5. Understand different elements of marketing in tourism
6. 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. Resources for tourism, Transportation, Types of accommodation, types of tourism, New trends in tourism.

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

Tourism resources in Asia, Europe and America, Tourism resources in India, Maharashtra. Planning for tourism growth in India.

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 and environment maintenance of tourist centres - time factor - regional planning consideration - tourism promotional planning - advertisement, media, public relations and publicity. Tourism policy issues; strategic tourism planning.

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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

10 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 and Nutrition

20 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. Food groups: balanced diet, food pyramid; Classification & types of nutrients; macro and micro nutrients; Role of nutrients in the body; Nutrient deficiencies and requirements for Indians. 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.

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

CCPr-405.1: Photogrammetry, Remote Sensing and DIP

Course Outcomes (COs): After completing the course, students will be able to

1. Understand the fundamental principles and concepts of photogrammetry, remote sensing, and digital image processing.
2. Describe the various sensors, platforms, and techniques used in photogrammetry and remote sensing.
3. Apply photogrammetric techniques to extract three-dimensional information from aerial photographs and digital images.
4. Apply digital image processing techniques for enhancing and analyzing remote sensing data.
5. To apply the knowledge of remote sensing and DIP in various thematic studies

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: 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: Visual Interpretation and Mapping of Aerial Photographs.

Unit-2: Practicals in Satellite Remote Sensing**20 Hrs.**

Exercise-7: Study of satellite image browsing system

Exercise-8: Visual interpretation of satellite images (True Color, FCC and Thermal)

Unit-3: Practicals in DIP**40 Hrs.**

Exercise-9: Introduction to DIP software

Exercise-10: Loading of image data, study of histogram and layer information

Exercise-11: Layer stacking and Interpretation of FCC image

Exercise-12: Supervised Classification

Exercise-13: Unsupervised classification

Exercise-14: Accuracy assessment

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CCPr-405.2: Introduction to GIS Software and GPS

Course Outcomes (COs): After completing the course, students will be able to

1. Familiarize with QGIS software and tools.
2. Apply Comprehensive knowledge of GIS software and GPS for analysis of geographical data and to solve real world problems
3. Understand the role of GIS as decision support system and to develop various model for GIS spatial analysis.
4. Examine the various functions of GPS for surveying and mapping.
5. Develop practical skills in spatial data acquisition, management, and analysis.
6. Learn to create and visualize maps using GIS techniques.

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 & 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): After completing the course, students will be able to

1. Know about the soil sample collection during the soil survey/ field work.
2. Analyse the physical properties of soils.
3. Analyse the chemical properties of soils
4. 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/tools and reagents.
- 4: Field assessment: saline soils with soluble salts 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: Soil Profile, and 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 Hydrometer, Sieves and shakers.

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

- 17-18: Determination of soil pH; Determination of soil Salinity.
- 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 turbidity.
- 32-33: Determination of salinity.
- 34-35: Determination of carbonates and bicarbonates.

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