Syllabus for

M.Sc., Applied Geography

(For the candidates admitted from the academic year 2023-2024 onwards)

Choice Based Credit System (CBCS)

Post Graduate and Research Department of Geography
Govt. Arts College (Autonomous)
Re-Accredited (III Cycle) with B++ Grade by NAAC
Kumbakonam – 612 002

July 2023 and April 2024

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KUMBAKONAM

Course Structure under CBCS for Science (2023 - 2024 Onwards)

M.Sc., Applied Geography

Sl.No.	Code	Course	Credits	Instruction Hours/week	Marks		Total
					Int.	Ext.	
Semester I							
1	23P1G1	CC I: Principles of Cartography	5	6	25	75	100
2	23P1G2	CC II: Applied Geomorphology	5	6	25	75	100
3	23P1G3EC	Elective I: Population and Settlement Geography	3	6	25	75	100
4	23P1G4EC	Elective II: Principles of GIS	3	6	25	75	100
5	23P1GP1	CP I: Techniques of Mapping and Map Analysis	4	6	25	75	100
Total			**20**	**30**	**Total Marks**		**500**
Semester II							
6	23P2G5	CC III: Applied Climatology	5	6	25	75	100
7	23P2G6	CC IV: Hydrology and Oceanography	5	6	25	75	100
8	23P2G7EC	Elective III: Biogeography	3	4	25	75	100
9	23P2G8EC	Elective IV: Remote Sensing and GNSS	3	4	25	75	100
10	23P2G9SEC	SEC I: Research Methodology	2	4	25	75	100
11	23P2GP2	CP II: Geospatial Lab.	4	6	40	60	100
Total			**22**	**30**	**Total Marks**		**600**
Semester III							
12	23P3G10	CC V: Geographical Thought	5	6	25	75	100
13	23P3G11	CC VI: Economic Geography	5	6	25	75	100
14	23P3G12	CC VII: Agricultural Geography	5	6	25	75	100
15	23P3G13EC	Elective V: Political Geography	4	3	25	75	100
16	23P3G14SEC	SEC II: Urban Geography	2	3	25	75	100
17	23P3GP3	CP III: Remote Sensing and Modern Surveying	4	6	40	60	100
18	23P3GIS	Internship / Industrial Activity	2				
Total			**27**	**30**	**Total Marks**		**600**
Semester IV							
19	23P4G15	CC VIII: Geography of India and Planning	5	6	25	75	100
20	23P4G16EC	Elective VI: Natural Hazards and Disaster Management	4	4	25	75	100
21	23P4G17SEC	SEC III: Regional Planning	2	4	25	75	100
22	23P4GP4	CP IV: Spatial Analysis and Modelling	5	6	40	60	100
23	23P4G18PW	Project with Viva - Voce	7	10	20	80	100
24	23P4GEA	Extension Activity	1				
Total			**24**	**30**	**Total Marks**		**500**
Net Total Credits			**93**	**120**	**Net Total Marks**		**2200**

M.Sc., Applied Geography

Course Pattern Summary

Subject	Total Courses	Credits
Core Course	8	40
Core Practical	4	17
Elective	6	18
Skill Enhancement Course SEC	3	6
Project with Viva- Voce	1	7
Internship / Industrial Activity		2
Extension Activity		1
Total	**22**	**91**

Name of the Programme: M.Sc., Applied Geography

Programme Outcomes

PO.1: Student will be able to analyses the problems of physical as well as human / cultural environments and to find out the possible measures to solve those problems.

PO.2: They will be eligible to conduct the physical as well as social survey to measure the status of a natural resources and the development of the society.

PO.3: They will be capable to develop their observation power through filed experiences and to identify the physical and socio-economic problems of the locality.

PO.4: Understanding the management principles and apply these to their own work and multidisciplinary settings and acquire knowledge in societal and environmental contexts.

PO.5: Application of geospatial technologies (Remote Sensing, Geographic Information System and Global Navigation Satellite System) to solve the physical as well as human / cultural problems through mapping techniques.

Programme Specific Outcomes

PSO.1. Design and conduct the independent research in their chosen field in the discipline.

PSO.2. Exhibit knowledge of concepts, theories and methods designed to enhance understanding of the natural world and human society.

PSO.3. Evaluate how historical events have been influenced by and have influenced physical and human geographic factors in local, regional, national and global settings.

PSO.4. Examine social and environmental processes with a particular focus on space and place, critical theory, practical application, analysis and intervention in the chosen field within the subject.

PSO.5. A geographer has better job opportunities in government departments, cartographer, researcher, teacher / professor, competitive examinations, Government employer and Surveyor.

CC: I	PRINCIPLES OF CARTOGRAPHY	Code: 23P1G1
Pre-requisite	Basic knowledge in Cartography	

Course Objectives

1. Exploring and defining principles of cartography, emerging trends in cartography and information age
2. Understanding the basics of geodesy and map projections
3. Gaining skills in map symbols, cartographic design, representation and production of maps, and map composition
4. Critically assessing online resources, software and its uses for interactive mapping
5. Discussing the importance of web mapping and geospatial data policy

Unit – 1	FUNDAMENTALS OF CARTOGRAPHY

History and future of cartography - Information age and mapping, Cartography as language and communication -visual thinking and visual communication-spatial information system.

Unit - 2	MAP PROJECTIONS AND COORDINATE SYSTEMS

Geodesy, coordinate systems, and map projections- geographical data – spatial objects and attributes – map scale and accuracy.

Unit - 3	MAP DESIGN AND LAYOUT

Map compilation - levels of data measurement, generalization, cartographic design principles - map symbolization- Qualitative and Quantitative symbols - graphic communication – map elements and layout

Unit - 4	TERRAIN AND SURFACE ANALYSIS

Production and Map output – Typography and Labeling - Thematic Map Forms - Animation – Isarithmic, Choropleth and Surface mapping-map reproduction, Publishing and Sharing – cartographic products

Unit - 5	ONLINE MAPPING AND WEB SERVICES

e-mapping, online map data sources - Geospatial web services- Dynamic/Interactive Mapping-cartography and spatial information policy.

Unit - 6	CONTEMPORARY ISSUES AND CHALLENGES

Cartography: Possibilities and issues in contemporary mapping

Expected Course Outcomes

1	Understand the cartographic concepts, recent trends and the use of information technology	**K1, K2**
2	Explain the fundamental importance of map scale and benefits and limitations of map projections	**K2, K3**
3	Demonstrate cartographic techniques, generalization regarding map design and layout, graphical and visual variables	**K3, K6**
4	Obtain the skills in creating reference and thematic maps using hard copies and web maps	**K4, K5**
5	Able to generate digital maps from open source data, analyse and interpret the interactive maps	**K4, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Text Books

1	Kraak, M.J. and F.J. Ormeling (1996). Cartography: Visualization of Spatial data, Longman Ltd., England.
2	Robinson, A.H., J.L. Morrison, P.C., Muehrcke, A.J. Kimerling and S.C. Guptill (1995). Elements of Cartography, 6th Edition. New York. John Wiley & Sons, USA.

Reference Books

1	Tyner, J. (1992). Introduction to Thematic Cartography, Prentice-Hall, Englewood Cliff, New Jersey.
2	Tyner, J.A. (2014) Principles of Map Design. New York, NY: Guilford Press.

3	Misra, R.P. and A. Ramesh (1989). Fundamentals of Cartography, Concepts Publishing Company, New Delhi.
4	Monkhouse, F.J. and Wilkinson, H.R., (1971). Maps and diagrams: their compilation and construction. Methuen.
5	Brewer, C. A. (2005). Designing Better Maps. Redlands, CA: ESRI Press. (ISBN 1- 58948-089-9)
6	Dent, B.D., Torguson, J.S. and Hodler, T.W. (2009). Cartography: Thematic Map Design. Boston: McGraw-Hill. 6th edition. (ISBN: 978-0-07-294382-5)
7	Jennings, Ken. (2011). Map head: Charting the Wide, Weird World of Geography Wonks. New York: Scribner
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://www.fes.uwaterloo.ca/crs/geog165/cart.htm
2	http://www.colorado.edu/geography/gcraft/notes/cartocom/cartocom_ftoc.html#3.0
3	http://www.earthsensing.com/cart/resources/carthelp.html)
4	www.esri.com

Mapping with Programme Outcomes (MPO)*

MPO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	2
CO2	1	1	3	1	1
CO3	2	1	1	2	2
CO4	1	1	2	1	1
CO5	1	2	1	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

CC: II	APPLIED GEOMORPHOLOGY	Code: 23P1G2
Pre-requisite	Basic knowledge in Physical Geography	

Course Objectives

1. To introduce the concepts in Geomorphology in adequate manner, many facets of surface relief features and to understand various aspects of their growth and evolution on the Earth.
2. To understand landscape evolution through time and space
3. To understand the processes that shapes the landforms around us.
4. To apply geomorphologic concepts to identify and analyze the environmental and resources issues for sustainable development
5. To suggest the tools for reading in the landscape the signs of geomorphologic hazards and risks, human interference and geomorphologic resources.

Unit – 1	SCOPE OF APPLIED GEOMORPHOLOGY

Definition – Nature and scope of applied geomorphology – Fundamental concepts in geomorphology – Geosynclines and mountain building process – Geological Time Scale - Geomorphic ideas of Davis, Penck and King.

Unit - 2	ENERGY FLOW IN GEOMORPHIC SYSTEM

System concepts in geomorphologic studies–Structure and composition of earth–Theories of Continental Drift – Plate Tectonics and Volcanism- climatic and tectonic changes and impacts.

Unit - 3	WEATHERING AND MASS WASTING

Weathering: Mechanical, Chemical and Biological weathering- structure, process and time in weathering- Soil: Soil formation - Mass wasting: Causes and types of mass wasting – Planning and control measures.

Unit - 4	PROCESS OF GEOMORPHOLOGY

Fluvial system: erosion, sedimentation and structural adjustments in the fluvial system; Waves: Waves dynamics - evolution of shores and construction and destruction of coastal region; Arid landforms and its evolution- Karst and topography; Glacial process, erosion and depositional landforms.

Unit - 5	APPLICATIONS OF GEOMORPHOLOGY

Mapping and statistical analysis: Landscape and land evaluation - Hazard analysis – application of geo-informatics in geomorphological mapping and modelling–Geomorphology and its applications in Agriculture, Water resources, hazard, urban and mineral exploration.

Unit - 6	CONTEMPORARY ISSUES

Expert lectures - online seminars – webinars – group discussions related to current issues in various landforms and landscapes.

Expected Course Outcomes

1	A clear understanding of the key concepts of geomorphology and dynamic aspects of landform development	**K1, K2**
2	Understand the relationship between geomorphologic processes, natural resources and environmental impacts	**K2, K5**
3	Ability to analyze the geomorphologic hazards and risks associated to geomorphic processes	**K4, K5**
4	Learn the various tools and techniques relevant to the applied aspects of Geomorphology in various fields.	**K3, K5**
5	Knowledge on landscape development and skill on the use of geomorphic process, features and event in resources and environmental planning and management	**K3, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

REFERENCE BOOKS

1	Abbas Farshad (2006), "Introduction to applied Geomorphology for soil scientists" Earth Systems Analysis (ESA) Surface Processes Group (Geo hazards), ITC, Enschede, The Netherlands.
2	Andrew Goudie (2003)," Encyclopedia of Geomorphology", Routledge, Tailor & Francis, New York.

3	Arthur L. Bloom (2002),"Geomorphology – A Systematic Analysis to Late Cenozoic Landforms; Prentice – Hall of India Pvt., Ltd., New Delhi.
4	Bridge, J.S., (2003),"Rivers and Floodplains: Forms, Processes, and Sedimentary Record", Blackwell Publishing, Oxford.
5	Grotzinger, J., Jordan, T., Press, F. and Siever, R., (2007), "Understanding Earth (5th ed.)", W.H. Freeman and Co., New York, ISBN 0-7167-6682-5
6	Ruhe, R.V. (1982), "Geomorphology", Boston: Honghton Mifflin Company
7	William D. Thornbury (1954),"Principles of Geomorphology", John Willy & sons, Inc., London.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://earthsurface.readthedocs.io/en/latest/
2	https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12 163-surface-processes-and-landscape-evolution-fall-2004/lecture-notes/

Mapping with Programme Outcomes (MPO)*

MPO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	1	2	1	1
CO 2	2	1	1	2	2
CO 3	1	2	1	1	1
CO 4	1	1	1	1	2
CO 5	1	2	1	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

EC: I	POPULATION AND SETTLEMENT GEOGRAPHY	Code: 23P1G3EC
Pre-requisite	Basic knowledge in population and settlement geography	

Course Objectives

1. To explain the arguments and assumptions of dominant theories of population change in time and space
2. understanding of nature, scope and evolution of population geography through spatial and temporal
3. It also helpful in knowing various kinds of demographic problems.
4. Study of population is an essential component in planning of various human related issues.
5. Population Geography also deals in population policies in developed & developing countries.

Unit - 1	SCOPE OF POPULATION GEOGRAPHY

Concepts, scope and methodology of population geography, Sources of population data (census, sample surveys and vital statistics, data reliability and errors). World Population Distribution (measures, patterns and determinants), World Population Growth (prehistoric to modern period).

Unit – 2	WORLD DISTRIBUTION OF POPULATION

World distribution of population – over population, under population and optimum population- growth of population – Theories of Population Growth (Malthus) – migration: Internal and international -

Unit – 3	POPULATION COMPOSITION AND CHARACTERISTICS

Fertility and Mortality Analysis (indices, determinants and world patterns). Migration (types, causes and consequences and models), Population Composition and Characteristics (age, sex, rural-urban, occupational structure and educational levels), Population Policies in Developed and Developing Countries.

Unit – 4	MORPHOLOGY OF RURAL AND URBAN SETTLEMENTS

Rural settlements – types of patterns – Urban settlements – Functional classification of towns and cities - Urban development's; Morphology of Indian cities - Conurbations and metropolitan regions; Urban sprawl; Slums and associated problems; Town planning; Problems of urbanization and remedies.

Unit – 5	THEORIES OF ORIGIN OF TOWNS

Theories of Origin of Towns (Lewis Mumford), Characteristics and Processes of Urbanization in Developed and Developing Countries (factors of urban growth, trends of urbanization, size, structure and functions of urban areas).

Unit – 6	CONTEMPORARY ISSUES

Contemporary Problems of Rural Settlements (rural-urban migration; land use changes; land acquisition and transactions).

Expected Course Outcomes	
On the successful completion of the course, student will be able to:	**K1, K2**
1. Understand population policies & its importance, Population distribution and its problems.	**K2, K3**
2. Assessment of vital statistics of population data	**K3, K6**
3. Acquire and interweave theoretical foundation for addressing research issues related to population dynamics in the real world	**K4, K5**
4. Acquiring, handling and analyzing population data both at the grassroots level and secondary sources	**K4, K6**
5. Recollect types and patterns of urban and rural settlement	**K1, K2**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Text Books

1. Beaujeu-Garnier, J. (1966). Geography of Population (Translated by Beaver, S.H.) Longmans, London.
2. Census of India (2001). Series-I India Provisional Population Totals. Published by Registrar General & Census Commissioner, India.
3. Census of India, (1991). India: A State Profile Published by office of the Registrar General of India, Census Operations, New Delhi
4. Chandna, R.C. (2000). Geography of Population: Concepts, Determinants and Patterns, Kalyani Publishers, New Delhi.
5. Clark J.1 (1965). Population Geography, Permagon Press, New York, 1965.

Reference Books

1. Mohammad Izhar Hassan (2020). Population Geography: A Systematic Exposition, Routledge, India.
2. Mohammed I. Hassan (2006). Population Geography. Rawat; New title edition.
3. Peters: G.L. and Larkim R.P (1979). Population Geography: Problems, Concepts and Prospects Kendele-Hunt Iowa.
4. Sundram K.V. & Nangia Sudesh, (editors) (1986). Population Geography, Heritage Publishers, Delhi.
5. Trewartha, G.T. (1969). Geography of Population: World Patterns, John Wiley & Sons, Inc., New York.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://ncert.nic.in/ncerts/l/legy201.pdf
2. https://www.amyglenn.com/geog-regional/geog1303population.htm
3. https://www.bdu.ac.in/cde/slm/slm_sample/msc-geography.pdf
4. https://mu.ac.in/wp-content/uploads/2021/04/t.y.b.a.-paper-7-population-and- economic-geography-e.pdf
5. https://ncert.nic.in/ncerts/l/legy201.pdf

Mapping with Programme Outcomes (MPO)*

MPO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	2
CO2	1	1	3	1	1
CO3	1	2	1	1	1
CO4	1	1	1	1	1
CO5	1	1	1	2	2

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

EC: II	PRINCIPLES OF GIS	Code: 23P1G4EC
Pre-requisite	Basic knowledge in GIS	

Course Objectives

1. Understanding the basic spatial concepts, approaches, history and development of GIS.
2. Obtain an understanding of spatial and non-spatial data models.
3. Understanding of data capturing methods and data accuracy and accessing publicly .available datasets.
4. Teaching basic spatial operations skills necessary to work with GIS project.
5. Develop a project requiring GIS as a management, analytical, and/or visualization tool using spatial analysis methods.

Unit - 1	**Basic Concepts of Spatial Science and GIS**

Basic concepts of spatial science and GIS: Geographic spaces, spatial data and information, reference systems and datums, GIS definition, approaches and components, history and development of GIS.

Unit - 2	**Data Models and Management**

Data Models and Management: Spatial data models – vector and raster data models, data models – object based – oriented data models – coding and encoding.

Unit - 3	**Data Capture and Geoprocessing**

Data Capture and Geoprocessing: Sources of geographic data, capturing methods, topology, geometric transformation, reprojection, scales in GIS, precision and accuracy of geographical data.

Unit - 4	**GIS: Spatial Operations**

Spatial operations: Basic operations and set theory basics - buffer, overlay, network, view shed and watershed analysis, interpolation, 3D visualization.

Unit - 5	**Spatial Modelling and its Applications**

GIS Modelling - multi-criteria analysis - network applications - LBS - Geocoding - suitability modelling - location allocation modelling - applications and case studies.

Unit - 6	**Contemporary Issues and Challenges**

Contemporary issues in GIS

Expected Course Outcomes

1	Developing an understanding of spatial concepts and spatial and non-spatial data models.	**K1, K2**
2	Learning skills in creating spatial data models using GIS software.	**K2, K6**
3	Gaining ability to access data in the GIS, compiles, analyse, and present geospatial data.	**K3, K4**
4	Performing GIS functions and demonstrate the skills in modelling.	**K4, K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Text Books

1	Aronoff, S. (1991). Geographic Information Systems: A Management Perspective, WDL Publications, Ottawa, Canada.
2	Ian Heywood, Sarah Cornelius and Steve Carver (2000). An Introduction to Geographical Information Systems, Addison Wesley Longman Limited, New York.

Reference Books

1.	Campbell, J. and M. Shin (2013). Essentials of Geographic Information Systems Online text available.
2.	David J Maguire, Michael F Goodchild, and David W Rhind ed. (1991), Geographical Information Systems, Longman Scientific & Technical Co-published in the USA with John Weiley & sons, Inc. New York.
3.	Dr. K. Elangovan (2006). GIS - Fundamentals, Applications and Implementations, New India Publishing Agency, New Delhi.

4.	Kang-tsung Chang (2002). Introduction to Geographical Information Systems, Tata McGraw-Hill Publishing Company Limited, New Delhi.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	www.esri.com
2.	http://www.unigis.org/resources/
3.	http://www.gsd.harvard.edu/pbcote/courses/gsd6322/lectures.htm
4.	http://www.soi.city.ac.uk/~dk708/part_1.htm
5.	www.ncgia.ucsb.edu/education/curricula/giscc

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	2	1	2	2
CO2	1	1	1	1	2
CO3	1	1	1	1	1
CO4	1	1	2	1	1
CO5	2	1	3	1	1
Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**					

CP: I	TECHNIQUES OF MAPPING AND MAP ANALYSIS	Code: 23P1GP1
Pre-requisite	Basic knowledge for mapping and interpretation	

Course Objectives

1. To introduce the concepts practically in mapping and map analysis
2. To understand the various aspects of map reading, interpretation and representation of various data through maps.
3. To provide a basic understanding in the field of interpretation and interpolation.
4. To understand the theoretical and practical methods pertaining to map making.
5. To understand the concepts and importance of various analysis used in mapping.

Unit - 1 MAP AND INTERPRETATION

1.1 Map appreciation and interpretation: Thematic, Topographic Sheets

1.2 Mapping and Analysis: Relative relief and Slope maps

1.3 Height and Hypsometric curves

1.4 Stream Analysis

Unit - 2 CLIMATE AND HYDROLOGY

2.1 Climate and Hydrology: Climograph and Climatograph

2.2 Rainfall variability, Intensity maps Temperature

2.3 Rainfall profiles; Deviation and Dispersion graph

2.4 Aridity and Water balance graphs

Unit - 3 POPULATION AND ECONOMIC DATA MAPPING

3.1 Population and economic data mapping: Dot maps, Density maps

3.2 Colour and Grey scale patterns

3.3 Index of concentration and Diversification; Crop Combination technique,

3.4 Spatial interaction, Measures of transport network analysis

Unit - 4 QUANTITATIVE SYMBOLISATION AND LOCATION MAP

4.1 Quantitative Symbolization and location Maps

4.2 Located representation of tourism and facilities

4.3 Point and line pattern analysis

4.4 Cartograms and 3D maps

Unit - 5 MAPPING AND INTERPOLATION

5.1 Choropleth and Isotherms maps

5.2 Class interval selection methods

5.3 Unipolar and bipolar graphs and colour patterns

5.4 Interpolation methods

Unit-6 CONTEMPORARY ISSUES AND CHALLENGES

Contemporary Issues related to latest techniques of mapping and map analysis

Expected Course Outcomes

1	Understanding the importance of various mapping techniques in geographical study	**K1, K2**
2	Understand the procedures and steps involved in the interpretation of thematic, topographic and atlas maps etc.	**K2, K3**
3	Learn the quantitative applications involved in mapping and interpolation.	**K3, K6**
4	Ability to analyze and perform analysis like network analysis, stream analysis, point and line pattern analysis.	**K4, K5**

5	Capable of creating maps based on appropriate cartographic knowledge.	**K5, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Reference Books	
1	Monkhouse, F.J., and Wilkinson, H.R. (1976): Maps and Diagrams, Methuen & Co., London.
2	Miller, Austin (1953): The skin of the Earth, Methuen & Co. Ltd. London
3	Pearson II, F. 1990. Map Projections: Theory and Applications 2nd Edition, CRC Press.
4	Kimberling, A.J., Buckley, A.R., Muehrcke, P.C., Muehrcke, J.O. 2011. Map Use: Reading, Analysis, Interpretation, 7th ed., ESRI Press.
5	Sarkar, A. 2015. Practical Geography: A Systematic Approach, 3rd Edition, Orient Blackswan Private Ltd.

Text Books	
1	Tamaskar, B. G., Deshmukh, V. M. (1974): Geographical Interpretation of Indian Topographical Maps, Orient Longman Ltd., Bombay
2	Lawrence, G.R.P. (1971). Cartographic Methods, Methuen & Co., Canada
3	Worthington, B.D.R. and Robert Gent (1975): Techniques in Map Analysis, Ebenzer Baylis and Sons, USA.
4	Singh, R.L., Singh, R.P.B. 2008. Elements of Practical Geography, Kalyani Publishers.
5	Ramamurthy, K. (1982): Map Interpretation, Rex Printers, Madras
6	Understanding Map Projection (2003-2004): GIS by ESRI, Redlands
7	Chrisman, N. (1997): Exploring Geographic Information systems, John Wiley & Sons., New York
8	*The ESRI Guide to GIS Analysis*, by Andy Mitchell, ESRI Press, 1999, 188 pp.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	www.sevenoaks.wa.edu.au/linkpage/geog/copy.html
2	http://www.esri.com/
3	www.gisdevelopment.net/books/mapping/bmap0010.html

Mapping with Programme Outcomes (MPO)*

MPO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	1
CO2	1	1	1	1	2
CO3	1	1	1	1	2
CO4	2	1	1	1	1
CO5	1	2	3	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

CC: III	APPLIED CLIMATOLOGY	Code: 23P2G5
Pre-requisite	Basic knowledge in Physical Geography	

Course Objectives

1. Gaining basic knowledge about weather elements
2. Learning patterns of global wind circulation
3. Understanding world climatic classification, climate change and global warming
4. Acquiring skills in micro level climate, weather forecasting methods and weather measurement techniques
5. Demonstrate applicable solutions for climate change

Unit-1 NATURE AND SCOPE OF APPLIED CLIMATOLOGY

Nature and scope of applied Climatology- the development of applied climatology Atmosphere: Its composition (gaseous) and structure; Insolation and Radiation, heating of land and water; temperature and pressure: variations in temperature and pressure; temperature zones, heat balance, and pressure belts.

Unit-2 GLOBAL WIND SYSTEMS

Global wind circulation: Tricellular meridional circulation; trade winds, easterlies and westerlies and polar winds; Air masses: continental and maritime; fronts and their types; clouds; precipitation: thunderstorms, cyclones (tropical and temperate) and anti-cyclones.

Unit-3 CLIMATE CHANGE AND GLOBAL WARMING

Climatic classifications; Indian climates and climatic zones; micro climates, agro-climates and urban climates; urban air pollution problems- global climate change; global warming and their likely impacts on human life- El Nino, La Nino.

Unit-4 URBAN CLIMATE

Urban climate and global environment change - the nature of the global environmental change, urban climates, impact of the urban climate on GEC.

Unit-5 WEATHER FORECASTING

Weather forecasting: short range and long-range forecasting – weather satellites and sensors – sounding techniques – weather maps – field instruments in forecasts**.**

Unit-6 CONTEMPORARY CHALLENGES

Contemporary Issues Regarding Climate Change and Solutions: Challenges to Sustainable Development

Expected Course Outcomes

1	To recall weather elements and its importance	**K1, K2**
2	Discuss various wind around the world	**K5, K3**
3	To compare climatic classification for global and regional level	**K3, K4**
4	Apply various weather forecasting methods	**K4, K5**
5	Analysing the Characteristics of Urban Heat Island	**K5, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Text Books

1	Perry, Allen, and Russell Thompson. Applied climatology: principles and practice. Routledge, 2013. Thompson, R. (1997). Applied climatology: principles and practice. Psychology Press.
2	Hobbs, John E. Applied climatology: a study of atmospheric resources. Elsevier, 2016.

3	Rohli, Robert V., and Anthony J. Vega. Climatology. Jones & Bartlett Learning, 2017.
4	Khan, A., Chatterjee, S., & Wang, Y. (2020). Urban Heat Island Modeling for Tropical Climates. Elsevier.
5	Hartmann, D. L. (2015). Global physical climatology (Vol. 103). Newnes.
Reference Books	
1	Ahrens, C. D. (2011). Essentials of meteorology: an invitation to the atmosphere. Cengage Learning.
2	Ahrens, C. D. (2012). Meteorology today: an introduction to weather, climate, and the environment. Cengage Learning.
3	Collins, M., An, S. I., Cai, W., Ganachaud, A., Guilyardi, E., Jin, F. F., & Wittenberg, A. (2010). The impact of global warming on the tropical Pacific Ocean and El Niño. Nature Geoscience, 3(6), 391-397.
4	Elizabeth Kolbert, (2006) Field Notes from A Catastrophe: Man, Nature and Climate Change, Bloomsbury Publishing Plc.
5	Howard J. Critch field (1995); General Climatology; Prentice, Hall of India Pvt. Ltd., New Delhi.
6	Huang, P., Xie, S. P., Hu, K., Huang, G., & Huang, R. (2013). Patterns of the seasonal response of tropical rainfall to global warming. Nature Geoscience
7	Kelkar, R. R. (2007). Satellite meteorology. BS Publications.
8	Kidder, S. Q., Kidder, R. M., & Haar, T. H. V. (1995). Satellite meteorology: an introduction. Gulf Professional Publishing.
9	Lisa F. Schipper and Ian Burton (Ed.) (2008) Adaptation to climate Change, Earthscan Reader Series,
10	Mather, J. R. (1974): Climatology: Fundamentals and Applications, Mc Graw Hill, New York.
12	Thompson, R. D. and Allen, P. (1997): Applied Climatology: Principles and Practice, Routledge, London and New York.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://public.wmo.int/en/resources/training
2	https://metnet.imd.gov.in/phps/imdweb_imdnews.php
3	https://www.un.org/en/climatechange/speeches
4	https://www.ipcc.ch/data/
5	https://www.greenclimate.fund/publications
6	https://mausam.imd.gov.in/imd_latest/contents/satellite.php

Mapping with Programme Outcomes (MPO)*

MPO	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	1
CO2	1	1	1	1	2
CO3	3	1	1	1	1
CO4	1	2	2	1	2
CO5	1	1	1	2	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

CC: IV	HYDROLOGY AND OCEANOGRAPHY	Code: 23P2G6
Pre-requisite	Basic knowledge in Physical Geography	

Course Objectives

1. To Understand the stages of Hydrological cycle
2. To introduce a sound scientific knowledge of how water cycles through the Earth's atmosphere, surface and groundwater systems.
3. To Understand Significance of oceanography and hydrology in earth and atmospheric science, Configuration of the ocean floor and variation of temperature and salinity of oceans and seas.

UNIT-1	HYDROLOGIC CYCLE

Hydrological cycle and its sub-cycle; Man's interference on hydrological cycle - elements of hydrological cycle: precipitation - intensity and duration; evaporation; infiltration, surface runoff, urban flooding.

Unit -2	CHARACTERISTICS AND FUNCTIONS OF FLUVIAL MORPHOLOGY

Drainage basin characteristics: human impact on hydrological system - Morphometric analysis – fluvial process and analysis

UNIT-3	AQUIFERS AND GROUNDWATER

Ground water - occurrence and types: movement - quality and quantity measures - Principles of water balance and their application, - its relevance in crop geography; water pollution, need for water management.

UNIT-4	MORPHOLOGY OF OCEAN FLOOR

Relevance of oceanography in earth and atmospheric sciences: Surface configuration of the ocean floor, continental shelf, continental slope, abyssal plain, mid-oceanic and oceanic trenches - relief of Atlantic, Pacific and Indian oceans - distribution of temperature and salinity of oceans and seas.

UNIT-5	MOVEMENT OF OCEAN WATER

Circulation of oceanic waters: waves, tides and currents; currents of the Atlantic, Pacific and Indian oceans. Marine deposits and coral reefs; coastal environment - Oceans as storehouse of resources for the future.

UNIT-6	CONTEMPORARY CHALLENGES

Current challenges and emerging issues of ocean

Expected Course Outcomes:

1	Recall hydrological cycle, surface runoff and urban flooding	**K1, K2**
2	Knowledge on fluvial process and morphometry of drainage basin	**K2, K5**
3	Explain groundwater occurrence, types, movement, pollution and need for water management	**K3, K5**
4	Recall ocean waters movements, ocean deposits, coastal environment and coral reefs and discuss the global warming and Sea level rising	**K5, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 -Analyse; K5 -Evaluate; K6 - Create

Text Books	
1	Thurman, H. V. (2019): Essentials of oceanography.
2	Talley, L. D. (2011): Descriptive physical oceanography: an introduction. Academic press.
3	Donnet, S., & Canadian Science Advisory Secretariat. (2018): Coast of bays metrics: Geography, hydrology and physical oceanography of an aquaculture area of the South Coast of Newfoundland. Canadian Science Advisory Secretariat (CSAS).
4	Cracknell, A. P. (1981). Remote sensing in meteorology, oceanography and hydrology.
5	Park, S. K., & Xu, L. (Eds.). (2013). Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications (Vol. II) (Vol. 2). Springer Science & Business Media.
6	Diaz, H. F. (2000). El Niño and the Southern Oscillation: multi scale variability and global and regional impacts. Cambridge University Press.
Reference Books	
3	Anikouchine, W.A. and Sternberg, R.W. (1973). The World Oceans - An Introduction to Oceanography, Englewood Cliffs, N.J.
4	Chorley, R.J. (ed) (1969). Introduction to Physical Hydrology, Methuen, London.
5	Chorley,R.J. (1967). Water, Earth and Man, methuen, London.
6	Grald, S. (1980). General Oceanography - An Introduction, John Wiley & Sons, New York.
7	Sharma, R.C. Vatel M (1970). Oceanography for Geographers, Chetnya Publishing House, Allahabad
8	Singh, R.A. and Singh, S.R. (1972). Water Management: Principles and Practices. Tara Publication, Varanasi.
9	Thurman, H.B. (1984). Introductory Oceanography, Charles Webber E. Merril Publishing Co.
10	Todd, D.K. (1959). Ground Water Hydrology, John Wiley, New York.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://online-learning.tudelft.nl/courses/introduction-to-water-and-climate/
2	https://www.mooc-list.com/tags/hydrology
3	https://www.usgs.gov/special-topic/water-science-school/science/what-hydrology
4	https://www.nationalgeographic.org/encyclopedia/hydrology/
5	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/hydrology

Mapping with Programme Outcomes (MPO)*

MPO	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	1	1	2
CO2	1	2	1	1	1
CO3	1	1	2	1	1
CO4	1	1	1	1	1
CO5	1	1	3	2	2

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

EC: III	BIOGEOGRAPHY	Code: 23P2G7EC
Pre-requisite	Basic Knowledge in Biogeography	

Course Objectives

1. *To teach the history of biogeography and ecosystem.*
2. *To understand the factors affecting the flora and fauna.*
3. *To train the students about the biomes.*
4. *To identify the various biogeograohical regions of the world.*
5. *To conserve the biosphere and biodiversity.*

Unit I	Introduction of Biogeography

Meaning, Scope and History of Biogeography - Seres and Climax Vegetation - Ecosystem: Energy Flows and Biogeochemical Cycles.

Unit II	Flora, Fauna and Soil

Factors Affecting Distribution of Flora and Fauna Atmospheric, Edaphic and Biotic Factors - Soils: Formation, Properties, and Profile - Soil Classification: Zonal, Azonal and Intra-Zonal Soils - Soil Erosion and Conservation.

Unit III	Biomes

Tropical Rainforests - Monsoon Forests - Tropical Grasslands - Hot Deserts - Mediterranean - Temperate Grasslands - Temperate Deciduous Forests - Coniferous Forests - Tundra.

Unit IV	Biogeographical Regions

Biogeograohical Regions: Phytogeographical and Zoogeographical Regions of the World - Biodiversity: Concept, Recent Trends and Impact of Climatic Change.

Unit V	Wildlife Management and Conservation

Wildlife Management and Conservation: Problems of Deforestation and Conservation Measures: Social Forestry - Agroforestry - Wildlife: Major Gene Pool Centres - Conservation - Wildlife in India and Management.

Unit VI	Contemporary Issues

Sustainable development, environmental footprints and ecosystem services and management.

Expected Course Outcomes	
After completing the course, the student should be able to	
1. Vegetation and ecosystem.	**K1, K2**
2. Role of physical to determine the distribution of flora and fauna.	**K2, K3**
3. Various types of biomes.	**K3, K6**
4. Biodiversity and its future possibilities.	**K4, K5**

5. Wild management and conservation.	**K4, K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create	

Text Books

1. Mathur, H. S. (2003): Essentials of Biogeography, Pointer Publishers, Jaipur.

Reference Book (s)

1. Barry C., (1977): Biogeography-An Ecological and Evolutionary Approach, Cox, Blackwell, Oxford.
2. Hagget R.J., (1988): Fundamentals of Biogeography, Routledge, London.
3. Panna Lal (2015): Biogeography, Anmol Publications Pvt. Ltd.
4. Robinson H., (1982): Biogeography, McDonald and Evans, London.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://catdir.loc.gov.
2. http://ndl.ethernet.edu.
3. http://veerwajekarascc.in

Mapping with Programme Outcomes (MPO)*

MPO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	2	2
CO2	1	1	1	1	2
CO3	1	1	1	1	1
CO4	1	1	2	1	1
CO5	2	1	3	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3 - Point scale of **1,2, 3 (Strong, Medium and Low)**

EC: IV	REMOTE SENSING AND GNSS	Code: 23P2G8EC
Pre-requisite	Basic knowledge in Remote sensing	

Course Objectives

1. Understand the purpose and importance of RS, GIS and GNSS
2. To provide background knowledge and understanding of principles of RS and GNSS Systems
3. To enhance student's capacity to interpret images and extract information on the earth surface from multi-resolution imagery at multi-scale level.

Unit - 1 Introduction to Remote Sensing

Remote Sensing Process - Analog to Digital data – Digital image data formats - Image processing system characteristics - Initial statistical extraction: histograms, univariate and multivariate statistics – Scientific visualization – Image Pre-processing: calculating radiance from DNs - atmospheric, radiometric and geometric correction.

Unit- 2 Image Enhancement

Contrast enhancement: linear, non-linear and level slicing – Spatial feature enhancement: spatial filtering, edge enhancement and Fourier and wavelet transform – multi-image enhancement – band rationing, principal component analysis, vegetation indices, IHS and texture transformations and image fusion

Unit- 3 Image Classification

Supervised classification: classification algorithm and training site selection - Unsupervised classification – Hybrid classification – Classification of mixed pixels: spectral mixture analysis and fuzzy classification – Post classification smoothing – Ancillary data - Classification accuracy assessment - Artificial Neural Networks – Contextual Classification – Object-Oriented Classification using softwares

Unit - 4 Basics of GNSS

Introducing Global Navigation Satellite System: GNSS Components, Satellite Orbit, Satellite Position on Orbital Plane, Signals, Reference System and Observation Techniques.

Unit - 5 Aerial and Satellite Remote Sensing

Aerial Remote Sensing: Aerial photographs: Classifications based on Camera, Film and Orientation –Photo scale - Parallax – Stereo model - Flight planning – Marginal information – Interpretation keys - LIDAR – Drone Satellite Remote Sensing: Satellite – Types, Orbits and Sensors – Resolution: types - aspects of LANDSAT, SPOT, IRS, IKONOS, QUIKBIRD and recent satellites – Marginal information and Interpretation – Applications of Microwave and Thermal Remote Sensing.

Unit - 6 Remote Sensing Image processing & Applications in Geography

Applications of Remote Sensing in Geography: Geomorphology, Water Resources, Disaster studies, Forestry, Agriculture, Land use and Land cover and Urban planning.

Expected Course Outcomes

1	Understand the basics of spatial structure of transportation network	**K2, K6**
2	Gain insights on processing methods and techniques for handling radiometric and geometric properties of remotely sensed	**K4, K5**
3	Developing data processing automation skills necessary to analyze high level remote sensing and GIS Products.	**K3, K6**
4	Familiarize with principles and methods of multi-resolutions and multi-spectral data fusion, multi- temporal processing and accuracy assessment.	**K1, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

References	
1	Peter A. Burrough and Rachael A. McDonnell, 2011, Principles of Geographic Information Systems, Oxford University Press.
2	Ian Heywood, Sarah Cornelius and Steve Carver, An Introduction to Geographic Information System, 2010, third edition, Pearson Education Ltd.
3	David O' Sullivan and David J. Unwin, 2010, Geographic Information analysis, second edition, John Wiley & Sons.
4	Kang – Tsung Chang, 2018, Introduction to Geographical Information System, New York: McGraw-Hill Education, ISBN 9781259929649
5	Stephen R. Galati, 2006, Geographic Information Systems Demystified, ARTECH HOUSE, INC., ISBN-13: 978-1-58053-533-5.
6	Michael N. DeMers, 2009, GIS For Dummies, Wiley Publishing, Inc., ISBN: 978-0-470- 23682-6
7	Bhatta, Basudeb. Remote Sensing and GIS. India, OUP India, 2011.
8	Campbell, James B. Introduction to Remote Sensing. United Kingdom, Taylor & Francis, 2002. Joseph, George. Fundamentals of Remote Sensing. India, Universities Press, 2005.
9	Digital Image Processing. India, Tata McGraw Hill Education, 2009.
10	Jain, Anil K. Fundamentals of digital image processing. India, Prentice Hall, 1989.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Fundamentals of Remote Sensing Canadian Book : Free Download, Borrow, and Streaming : Internet Archive
2	Fundamentals_of_RS_Edited_SC.pdf (nasa.gov)
3	1-88 Veripos Book Complete | PDF | Global Positioning System | Radio Propagation (scribd.com)

Mapping with Programme Outcomes (MPO)*

MPO	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	1	1	2	1	2
CO2	1	1	3	1	1
CO3	1	2	1	1	1
CO4	1	1	1	1	1
CO5	1	1	1	2	2

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

SEC: I	RESEARCH METHODOLOGY	Code: 23P2G9SEC
Pre-requisite	Basic Knowledge in Research Activities	

Course Objectives

1. *To understand the approaches to geographical research.*
2. *To evaluate the implications of geographical research.*
3. *To identify the types of research.*
4. *To gain the knowledge of data collection and analysis.*
5. *To impart the knowledge to write the report and thesis.*

Unit I	Research

Meaning, Need for Scientific Research - Types of Research - Approaches to Geographical Research - Identification of Fields - Sub -Fields and Themes - Research Ethics.

Unit II	Logic in Research

Concepts and Facts, Principles, Hypothesis, Theory, Model, Law and their Implications in Geographical Research - the Science of Geography - Research Trends in Geography.

Unit III	Research Design

Meaning and Need - Features of Good Design - Types of Research Design: Exploratory, Descriptive and Experimental.

Unit IV	Data Acquisition and Analysis

Collection of Data, Sources of Data: Primary and Secondary, Structuring the Data, Data Transformation - Sampling Techniques - Simple Quantitative Techniques: Correlation, Regression and Hypothesis Testing

Unit V	Report and Thesis Writing

Structure and Components of Scientific Repots – Types of Report: Technical Reports and Thesis – Different Steps in the Preparation: Layout, Structure and Language of typical Reports – Citation Methods: Foot Note, Text Note, End Note, References.

Unit VI	Contemporary Issues

Contemporary issues have political, economic, social, historic and geographic components.

Expected Course Outcomes

After completing the course, the student should be able to

1. *Types of research and approaches to geographical research.*	**K1, K2**
2. *Concepts and facts, principles, hypothesis, theory, model, law and their implications.*	**K2, K3**
3. *Types of research design in terms of exploratory, descriptive and experimental.*	**K3, K6**
4. *Specific statistical techniques for data analysis - correlation, regression and hypothesis testing.*	**K4, K5**
5. Report / thesis writing.	**K4, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

Text Books

1. Kothari C.R., (1990): Research Methodology, Methods and Techniques, Wishwa Prakasan Pvt. Ltd., New Delhi.
2. Kothari C.R. and Garg G., (2019): Research Methodology, Methods and Techniques, New Age International Publishers, Delhi.

3. Mishra R.P., (1998): Research Methodology in Geography, Concept Publishing Company, New Delhi.
4. Najma Khan, (1998): Quantitative Methods in Geographical Research, Concept Publishing Company, New Delhi.

Reference Books

1. John A. Mathews (1981): Quantitative and Statistical Approaches to Geography, Pregamon Press, Oxford.
2. Drwajma Khan (1998): Quantitative Methods in Geographical Research, Concept Publications, New Delhi.
3. Amodeo D and C. College (1975): An Introduction to Scientific Reasoning in Geography, John Willy and Sons, New York.
4. Davi K.D., (1971): Conceptual Revolution in Geography, University of London, London.
5. Hang I. L. and J. P., Leonenburg (1973): An Introduction to Scientific Geographic Research, Brown Co., Iowa.
6. Lal Das, D.K., (2000): Practice of Social Research, Rawat Publications, Jaipur.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.cambridgescholars.com
2. https://library.fiu.edu/hottopics
3. https://elearn.moe.gov.et.

Mapping with Programme Outcomes (MPO)*

MPO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	2	1	2	2
CO2	1	1	1	1	2
CO3	1	1	1	1	1
CO4	1	1	2	1	1
CO5	2	1	3	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3 - Point scale of **1,2, 3 (Strong, Medium and Low)**

CP: II	GEOSPATIAL LAB.	Code: 23P2GP2
Pre-requisite	Prior knowledge in Geography	

Course Objectives

1. To introduce the concepts of Geographic Information Systems practically and to understand the various aspects of map reading, design and evaluation of digital maps.
2. To understand the theoretical and practical concepts pertaining to map making.
3. To obtain a comprehensive understanding of the spatial models, applications and tools currently available in the field of GIS.
4. To apply the GIS concepts to create, analyse and interpret the spatial maps in the field of geospatial technology.
5. To suggest tools and techniques for execution of spatial operations.

UNIT - 1	FUNDAMENTALS OF MAPPING AND EXPLORATION

1.1 Map exploration - Georeferencing – map projection and transformation
1.2 Spatial entity creation – digitization – symbolization
1.3 Attribute data editing – labelling and annotation
1.4 Map design and layout editing

UNIT - 2	SPATIAL DATA EDITING AND ANALYSIS

2.1 Attribute data management and thematic mapping
2.2 Quantitative and qualitative mapping
2.3 Dot map, located pie chart and bar chart
2.4 Proximity analysis

UNIT - 3	SPATIAL ANALYSIS AND SPATIAL STATISTICS

3.1 location and allocation models
3.2 Spatial statistics: mean center
3.3 Median center
3.4 Standard distance

UNIT - 4	TERRAIN AND SURFACE ANALYSIS

4.1 Surface analysis and Interpolation techniques: creation of contours
4.2 Slope, Aspect
4.3 Kriging, Spline,
4.4 Inverse distance weighted (IDW)

UNIT - 5	SPATIAL APPLICATIONS AND MODELLING

5.1 3D visualization: DEM
5.2 TIN and visibility analysis
5.3 3D Visualization
5.4 Web GIS

UNIT - 6	CONTEMPORARY ISSUES

Local field observations - Group Discussions related to current issues and challenges in Geographic Information System (GIS) applications

Expected Course Outcomes

1	A clear understanding in key concepts of cartography, GIS and the aspects in reading, designing, and evaluating digital cartographic maps	**K1, K2**
2	Understand the relationship between map projections, coordinate systems and geospatial layers including map algebra and spatial statistics.	**K2, K3**
3	Learn the skills in data collection, storage, analysis and interpretation of spatial data in GIS interface.	**K3, K6**
4	Ability to analyse and evaluate the maps and perform spatial operations like overlay analysis, landscape analysis, terrain analysis, suitability analysis and spatial modelling.	**K4, K5**

5	Create tools and models for developing and solving complex geospatial problems in GIS	**K4, K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 -Create		
Text Books		
1	Aronoff, S. (1991). Geographic Information Systems: A Management Perspective, WDL Publications, Ottawa, Canada.	
2	Bernhardsen, T. (2002). Geographic information systems: an introduction. John Wiley & Sons	
3	Chrisman, N. (1997). Exploring Geographic Information systems, New York: John Wiley & Sons., Inc.	
4	Ian Heywood, Sarah Cornelius and Steve Carver (2000). An Introduction to Geographical Information Systems, Addison Wesley Longman Limited, New York.	
5	Kang-tsung Chang (2002). Introduction to Geographical Information Systems, Tata McGraw-Hill Publishing Company Limited, New Delhi.	
6	Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2005). Geographic information systems and science. John Wiley & Sons.	
Reference Books		
1	Ballas, D., Clarke, G., Franklin, R. S., & Newing, A. (2017). GIS and the social sciences: Theory and applications. Routledge.	
2	Zhu, X. (2016). GIS for environmental applications: a practical approach. Routledge.	
3	Whyatt, D., Clark, G., & Davies, G. (2011). Teaching geographical information systems in geography degrees: A critical reassessment of Vocationalism. Journal of Geography in Higher Education, 35(2), 233-244	
4	Argles, T. (2017). Teaching practical science online using GIS: a cautionary tale of coping strategies. Journal of Geography in higher education, 41(3), 341-352.	
5	Gould, M. (2018). Tailoring GIS courses for employment. In GIS (pp. 189-195). CRC Press	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	www.ncgia.ucsb.edu/education/curricula/giscc	
2	http://www.esri.com/	
3	https://www.le.ac.uk/ar/arcgis	

Mapping with Programme Outcomes (MPO)*

MPO	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	2	1
CO2	1	2	1	1	1
CO3	1	1	1	1	2
CO4	2	1	1	1	1
CO5	1	1	3	1	1

Map **Course Outcomes (CO)** for each Course with **Programme Specific Outcomes (PSO)** in the 3-Point scale of **1,2, 3 (Strong, Medium and Low)**

CC: V	GEOGRAPHICAL THOUGHT	Code: 23P3G10

Course Objectives

1. *The course is aimed at presenting a comprehensive, integrated and empirically based profile of the origin.*
2. *Gain the knowledge of development of geographical thought from ancient to modern period by the student.*

Course Outcomes

After completing the course, the student should be able to:
Knowledge and understanding the

1. *The pre-history of geographical ideas of Greeks, Romans, Arabs and Indians.*
2. *The contributions of Modern Geographers to the development of Geography.*
3. *Dualism and Dichotomies in Geography.*
4. *Recent trends and approaches in geographical studies.*
5. *The theories related to global strategic views.*

Unit I: Pre History of Geographical Ideas: Greeks, Romans, Arabs and Ancient Indians - Impact of Explorations and Discoveries.

Unit II: Founders of Modern Geography: (i) Alexander Von Humboldt, (ii) Carl Ritter, (iii) Friedrich Ratzel, (iv) Vidal de la Blache, (v) Halford J. Mackinder, (vi) W. M. Davis, (vii) Ellen Churchill Sample and (viii) Richard Hartshorne.

Unit III: Dualism and Dichotomies in Geography: (i). Determinism vs. Posssiblism, (ii). Physical vs. Human, (iii). General vs. Regional and (iv). Quantitative vs. Qualitative.

Unit IV: Recent Trends in Geography: Four Traditions in Geography: (i). Man-Land, (ii). Area studies, (iii). Spatial and (iv). Earth Science, Quantitative Revolution, Paradigms in Geography, Systems Approach, Regional Concept.

Unit V: Political Geography: Development of Political Geography - Geopolitics, Global Strategic Views: Heartland and Rimland Theories - Concept of Nation - State and Intra-State - Boundaries and Frontiers - Politics of World Resources - Geography of Federalism.

Unit V: Contemporary Geography: Geography in the Face of Modern World Challenges.

Text Books

1. Dikshit, R.D., (1996): Political Geography: A Contemporary Perspective. Tata McGraw Hill, New Delhi.
2. Dikshit, R.D., (2015): Geographical Thought – A Contextual History of Ideas, Asoke K Ghosh, Delhi.
3. Majid Hussain, (2001): Evolution of Geographical Thought, Rawat Publication, Jaipur.
4. Majid Hussain, (2015): Evolution of Geographical Thought, 6th Edition, Rawat Publication, Jaipur
5. May J.A., (2019: Kant's Concepts of Geography and its relation to Recent Geographical Thought, University of Toronto Press.
6. Negi B. S., (1994): Geographical Thought, Kedar Nath and Ram Nath Publications, Meerut, Uttra Pradesh.

References

1. Dikshit R.D., (1997): Geographical Thought, Prentice Hall of India, New Delhi.
2. Eayne K. Davis, (1972): Conceptual Revolution in Geography, Edward Arnold Publications, London.
3. Johnston R., 2018): A Student's Introduction to Geographical Thought: Theoeies, Philosophies, Methodologies.

4. Sudeepta Adhikari, (2004): Fundamentals of Geographical Thought, Chaitanya Publishing House, Allahabad.

Web Sources

1. https://www.tandfonline.com/doi/full/10.1080/2325548X.2014.901849

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓			✓		✓
CO2			✓			✓			✓	
CO3		✓			✓		✓			✓
CO4				✓				✓	✓	
CO5					✓					✓

CC: VI	ECONOMIC GEOGRAPHY	Code: 23P3G11

Course Objectives

1. *The objectives of this course to give an overview of type and distribution of mineral resources, energy resources, indusial resources, trade and transportation at global level.*
2. *It gives a broader outlook about the availability of renewable and non-renewable resources to the student.*

Course Outcomes

After completing the course, the student should be able to:
Knowledge and understanding the

1. *Importance of economic activities.*
2. *Significance of conventional and non conventional energy sources.*
3. *Locational factors of industries.*
4. *Role of transport systems to develop the economy and Trade*
5. *Economic activities and theories*

Unit I: Nature and Scope of Economic Geography - Resources - Types - Mineral Resources: Types - Distribution and Production of Iron Ore, Bauxite, Copper and Gold.

Unit II: Significance of Conventional and Non-Conventional Energy Resources - World Distribution and Production of Coal, Petroleum, Hydel and Nuclear Power - Production and Distribution of Wind - Solar and Tidal Energy.

Unit III: Classification and Location Factors of Manufacturing Industries - Distribution and Production of Iron and Steel, Cotton Textile, Ship Building and Automobile - Major Industrial Regions of the World.

Unit IV: Transport System and Trade: Types, Commodities - Economic Significance of Road Ways, Railways, Air and Sea Routes - Importance of Pipeline Transport - International Trade - Functions of WTO.

Unit V: Economic Activity Theories: Primary - Location and Interaction Mechanism - Von-Thunen Location Theory - Manufacturing Activity- Smith, Weber and Isard; Tertiary Activity – Christaller and Losch.

Unit V: Assessment Unit.

Text Books

1. Alexander J.W., (1964): Issue online (2008): Economic Geography, Prentice Hall lnc. New Jersy.
2. Jeganathan L.R., (2012): Economic Geography, Dominant Publication Pvt. Ltd., New Delhi.
3. Khanna, K.K. and Gupta, V.K., (1988): Economic and Commercial Geography, Sultan Chand and Sons, New Delhi.
4. Mamoria C. B., (1980): Economic and Commercial Geography of India, Shiva Lal Aggarwal.
5. Saxena H.M., (2018): Economic Geography (2nd Edition), Rawat Publication, Jaipur.
6. Sharma T.C., (2017): Economic Geography of India, Rawat Publication, Jaipur.

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1. Durand L., (1961): Economic Geography, Crowell.
2. Janaki, V.A., (1983): Economic Geography, Concept Publishing, New Delhi.
3. Sadhukhan, S.K., (1984): Economic Geography – An Appraisal of Resources, Sultan Chand and Sons., New Delhi.

4. Maurya S.D., (2018): Economic Geography, Paravalika Publications, Allahabad.

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1. https://www.tandfonline.com/toc/recg20/current
2. https://library.oapen.org/bitstream/id/ecf6e3e2-91ba-4cf4-952d-04d4bbe4704/1005865.pdf
3. http://www2.clarku.edu/econgeography/
4. https://transportgeography.org/
5. https://unstats.un.org/unsd/trade/globalforum/publications/tva/World%20Bank%20-%20Changing%20the%20Industrial%20Geography%20in%20Asia.pdf

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓						✓		
CO2		✓					✓			
CO3			✓						✓	
CO4		✓						✓		
CO5				✓					✓	

CC: VII	AGRICULTURAL GEOGRAPHY	Code: 23P3G12

Course Objectives

1. *This course designed to impart the knowledge to the students of the development, characteristics and regionalization agricultural activities.*
2. *Gain the knowledge mainly in the significance of agricultural geography with emphasizing Indian context.*

Course Outcomes

After completing the course, the student should be able to:

Knowledge and understanding the

1. *Historical perspectives and various approaches in agriculture.*
2. *Role of physical and socio-economic factors in agriculture.*
3. *Identify various agricultural systems of the world.*
4. *Land capability, suitability and its classification, models in geography.*
5. *Role of green revolution in Indian agriculture.*

Unit I: Nature of Agricultural Geography: Objectives and Historical Perspective - Approaches to Agricultural Geography: Empirical (Inductive) and Normative (Deductive) - Major Gene Centres - Domestication of Animals - Diffusion of Crops - Pastoralism and Development.

Unit II: Physical Factors: Topography, Altitude, Climatic Elements: Temperature, Sunshine, Frost, Moisture, Snow and Winds, Soil: Characteristics and Types, **Socio-Economic Factors:** Land tenancy, Size of Land Holdings and Fragmentation, Co-Operative Farming Methods and Operational Efficiency, Labour, Capital, Mechanization and Government Policy.

Unit III: Agricultural Systems of the World: Nomadic Herding, Livestock Ranching, Commercial Grazing, Shifting Cultivation, Sedentary Agriculture, Subsistence, Intensive, Extensive Agriculture, Mixed Farming, Dairy Farming, Horticulture, Collective Farms and State Farms.

Unit IV: Agricultural Regionalization: Models in Agricultural Geography: Vonthunen and Jonoson - Crop Combination, Crop Diversification and Land Capability - Land Suitability and Land Use Classification - Agro-climatic Regions of India – Applications of Remote Sensing for Crop Management.

Unit V: Agriculture in India: Characteristics of Indian Agriculture - Rural Development in India - Policy and Programme - Green Revolution I and II - Socioeconomic Constraints - Social Tension and Ecological Implications of the Green Revolution.

Text Books

1. Alka Gautam (2016): Agricultural Geography, Sharda Pustak Bhawan, Allahabad.
2. Majid Hussain, (1999): Systematic Agricultural Geography, Rawat Publications, Jawahar Nagar, Jaipur.
3. Hussain, M., (1979): Agricultural Geography, Inter India Publications, New Delhi.
4. Singh J and Dhillon S.S., (2006): Agricultural Geography, Tata McGraw Hill Publication Company, New Delhi.

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1. Morgan, W.B. and Munton, R.J., (1972): Agricultural Geography, Methuen & Co., London.
2. Sing, Jasbir and S.S. Dhillon, (1994): Agricultural Geography, Tata McGraw-Hill Publications, New Delhi.

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓						✓			
CO2		✓						✓		
CO3			✓					✓		
CO4		✓						✓		
CO5			✓					✓		

EC: V	POLITICAL GEOGRAPHY	Code: 23P3G13EC

Course Objectives

1. *To elaborate the spatial distribution of core areas of political geography.*
2. *To discuss the importance of boundaries and frontiers of India.*

Course Outcomes

After completing the course, the student should be able to:

Knowledge and understanding the

1. *Geopolitics and its state categories.*
2. *Morphological and genetic classifications.*
3. *Boundaries and frontiers of India.*
4. *Geography of election process in India.*
5. *Illustrate the political geography of India.*

Unit I: Political Geography: Definition, Scope, Content and Development – Geopolitics - State: Categories - Powers and Functions - Nations and Nationalism.

Unit II: Core Areas: Types – Capitals: Types - Morphological Classification - Factors of Development, Federal Capitals – New and Neutral Capitals – Capitals in Post -1945 Federations.

Unit III: Boundaries and Frontiers: Definition – Classification: Genetic and Functional – Morphological Classification (Buffer Zone – Land locked Countries) – Border Disputes.

Unit IV: Electoral Geography: Geography of Elections – Election Campaigning - Voting Pattern - Voters' Participation – Gerry Mandering – Election Commission.

Unit V: Political Geography of India: Integration of Indian States: Integration of Sikkim – India's Bilateral Relationship with Pakistan and Sri Lanka – SAARC Countries - India's Foreign Policies.

Text Books

1. Dwivedi, R.L. (2014): *Fundamentals of Political Geography,* Chaitanya Publishing House, Allahabad.
2. Adhikari, Sudeepta. (2009): *Political Geography of India- A Contemporary Perspective*. Sharada Pustak Bhavan, Allahabad.
3. Sudeeptha Adhikari, (2004): Political Geography, Rawat publications, New Delhi.
4. Dikshit, R.D. (1982): Political Geography: A contemporary perspective, McGraw Hill Publishing co., New Delhi.

References

1. Alexander, L.M., 1963. World Political Patterns Ran McNally, Chicago,

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1. https://www.opengeography.org/ch-10-political-geography.html
2. https://www.ou.edu/faculty/T/Gary.L.Thompson/links.html
3. https://www.journals.elsevier.com/political-geography
4. www.geography.about.com/od/politicalgeography
5. https://www.ou.edu/faculty/T/Gary.L.Thompson/links.html
6. https://www.journals.elsevier.com/political-geography

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		✓		✓	✓	✓		✓		
CO2				✓						
CO3		✓	✓	✓	✓			✓	✓	
CO4		✓						✓	✓	
CO5			✓			✓		✓	✓	

SEC: II	URBAN GEOGRAPHY	Code: 23P3G14SEC

Course Objectives

1. *This course examines the process of urbanization and origin, growth, classification of urban settlements with relevant theories and models.*
2. *Understand the changing economic base, structure of the cities, contemporary urban issues by emphasizing new urban planning and urban policy perspectives.*

Course Outcomes

After completing the course, the student should be able to:

Knowledge and understanding the

1. *Approaches of urban geography and its developments.*
2. *Theories of urban growth.*
3. *Morphology and land use structure of urban place.*
4. *Distinctiveness of urban issues.*
5. *Urban policy and planning.*

Unit I: Nature and Scope of Urban Geography: Approaches and Recent Trends in Urban Geography - Urban Places - Bases and Process of Urbanization and Development - Classification of Urban Settlements on the basis of Size and Function.

Unit II: Organization of Urban Space: Urban Morphology and Land Use Structure: City Core, Commercial, Industrial and Residential Areas, Cores-Country Variations - City-Region Relations - Modern Urban Landscape - Morphology of Urban Settlements of India and its Comparison with Western Countries - Urban Expansion - Umland and Periphery.

Unit III: **Theories of Urban Growth**: Central Place Theory - Theories of Peroux and Boudeville- Concentric Zone Theory - Sector Theory and Multiple Nuclei Theory.

Unit IV: Contemporary Urban Issues: Urban Poverty - Urban Renewal - Urban Sprawl – Slums – Transportation – Housing - Urban Infrastructure - Urban Finance - Environmental Pollution: Air, Water, Noise, Solid Waste - Urban Crime - Issues of Environmental Health.

Unit V: Urban Policy and Planning: Development of Small and Medium Sized Towns - Planning for New Wards - City Planning - Green Belts, Garden Cities - Urban Policy - Contemporary Issues in Urban Planning - Globalization and Urban Planning in the Third World - Urban Land Use Planning.

Unit VI: Assessment Unit.

Text Books

1. Carter H., (1972): The study of Urban Geography, Edward Arnold, London.
2. Misra R.P and K.V. Sundaram, (1971): Regional Planning and Development, University of Mysore, Mysore.
3. Northam R.M., (1975): Urban Geography, John Wiley sons, New York.
4. Robert G. Putnam, Frank J. Taylor, (1970):A Geography of Urban Places, Methuen Publications, Tornato, London.
5. Singh R. Y., (1994): Geography of Settlements, Rawat Publications, Jaipur and New Delhi.
6. Verma L.N., (2016): Urban Geography, Rawat Publications, Jaipur.

References

1. Berry B. J. L and Horton F.F., (1970): Geographic Perspectives on Urban Systems, Prentice Hall, Englewood Cliffs, New Jersey.
2. Chorley R. J. O., Haggett P., (1966): Models in Geography, Methuen, London.
3. Dickinson R. E., (1964): City and Region, Routledge, London.
4. Rao V. L. S. P., (1983): Urbanisation in India: Spatial Dimensions, Concept Publishing Co. New Delhi.

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1. https://www.eolss.net/sample-chapters/C01/E6-14-03-06.pdf
2. https://www.aag.org/groups/urban-geography/
3. https://www.my-mooc.com/en/categorie/urban-planning
4. https://nagalanduniversity.ac.in/files/nep2020/CoreCourses/2023-GeographyCoreCourse.pdf
5. https://ciet.nic.in/swayam_geography03_module06.php

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1			✓	✓	✓	✓			✓	✓
CO2	✓		✓	✓	✓	✓	✓	✓	✓	✓
CO3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CO4	✓	✓		✓	✓	✓	✓	✓	✓	✓
CO5	✓	✓		✓	✓	✓	✓	✓	✓	✓

CP: III	REMOTE SENSING AND MODERN SURVEYING	Code: 23P3GP3

Course Objectives

1. *Introduce the students to the recent advances in the application of remote sensing techniques in geography.*
2. *Impart the training using simple remote sensing instruments, visual and digital interpretation of aerial photographs, satellite imageries and GNSS survey.*

Course Outcomes

After completing the course, the student should be able to:
Knowledge and understanding the

1. *Scales, parallax and height measurement of aerial photographs.*
2. *Aerial photo interpretation for physical and cultural features.*
3. *Principles and methods of satellite data products.*
4. *Principles of digital image process.*
5. *GNSS survey and digital analysis.*

Unit I: Aerial Remote Sensing

1.1 Marginal Information of Aerial Photograph
1.2 Scale of Aerial Photographs
1.3 Parallax and Height Measurement

Unit II: Interpretation of Aerial Photographs

2.1 Elements of Aerial Photo Interpretation
2.2 Interpretation of Physical Features
2.3 Interpretation of Cultural Features

Unit III: Satellite Remote Sensing

3.1 Path and Row Identification
3.2 Digital data sources and downloading
3.3 Band Identification and combinations

Unit IV: Digital Image Processing

4.1 Lookup table, Image Histogram and Pixel Table
4.2 Image to Image Registration
4.3 Image sub setting and Area of Interest

Unit V: GNSS Survey and Digital Analysis

1.1 GNSS survey
1.2 Un-supervised classification
1.3 Supervised classification
1.4 Accuracy Assessment

Unit VI: Contemporary Issues

Group discussions related to current issues in remote sensing applications.

Text Books

1. Congalton R.G and K. Green (2009): Assessing the Accuracy of Remotely Sensed Data: Principles and Practices, Second Edition, Boca Raton, CRC.
2. Floyd F. Sabins (2020): Remote Sensing: Principles of Interpretation and applications, 4th Edition, Waveland Press, Inc., Long Grove, Illinois, USA.
3. John A. Richards (2013): Remote Sensing Digital Image Analysis – An Introduction, (Fifth Edition), Springer-Verlag Berlin.
4. John R. Jensen (2017): Introductory Digital Image Processing: A Remote Sensing Perspective, 4th Edition, Pearson Series in Geographic Information Science.
5. Robert, A. Schowengergt (1983): Techniques for Image Processing and Classification in Remote Sensing, Office of Arid Lands Studies, University of Arizona, Tucson, Arizona.

6. Lilesand and Keifer (2000): Introduction to Remote Sensing and Image Interpretation; John Willy & sons Ltd., New York.

References

1. Annadurai (2007): Fundamentals of Digital Image Processing, Pearson Education.
2. Chang, Kang-tsung (2002): Introduction to Geographic Information Systems. New Delhi:
3. Chouhan T. S. and Joshi K. N., (1996): Applied Remote Sensing and Photo Interpretation, John Wiley and Sons, New York.
4. Lawrence H. L and Ray G. R., (1965): Aerial Photographs in Field Geography, Holt. Rinehart and Winston, New York.
5. Rafael C. Gonzalez, Richard Eugene Woods (2008),"Digital Image Processing, Pearson / Parentice Hall.
6. Richards (1003): Remotes Sensing Digital Image Analysis – An Introduction, Springer, Verlag.
7. Robert G Reeves (1983): Manual of Remote Sensing. Vol., I and II, Americal Society of Photogrammetry, Fall, Church, USA.

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc)

1. http://mohua.gov.in/upload/uploadfiles/files/guideline_satellite.pdf
2. https://onlinecourses.nptel.ac.in/noc19_ce38/preview

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓				✓	✓	✓		✓
CO2				✓	✓					
CO3		✓	✓					✓	✓	✓
CO4							✓			✓
CO5	✓	✓	✓	✓	✓	✓		✓	✓	✓

CC: VIII	GEOGRAPHY OF INDIA AND PLANNING	Code: 23P4G15

Course Objectives

1. *This course is introduced to the students for the physical setting of Indian topography, climatic condition, soil characteristics and agriculture distribution.*
2. *Impart the knowledge to the students of population characteristics and distribution, trades and transport systems of India and disaster zones of India.*

Course Outcomes

After completing the course, the student should be able to:
Knowledge and understanding the

1. *Physical, cultural, economic and demographic aspects with reference to India and pursue it for further research.*
2. *Soil types and variation of vegetation.*
3. *Various transport network system of India.*
4. *The distinctiveness of geographic regions as the field of learning in geographical studies.*
5. *Apply the sustainable concept to natural resource.*

Unit I: Physical and Climate Settings of India: Major Physiographic Regions and their Characteristics - Drainage System (Himalayan and Peninsular) - Climate: Seasonal Weather Characteristics - Climatic Divisions - Indian Monsoon (Mechanism and Characteristics) - Jet Streams and Himalayan Cryosphere.

Unit II: Soil and Agriculture: Types and Distribution of Natural Resources: Soil, Vegetation, Water, Mineral and Marine Resources - Agriculture (Production, Productivity and Yield of Major Food Crops) - Major Crop Regions - Regional Variations in Agricultural Development and Environmental.

Unit III: Population Characteristics**:** Population Characteristics (Spatial Patterns of Distribution), Growth and Composition (Rural-Urban, Age, Sex, Occupational, Educational, Ethnic and Religious) - Determinants of Population - Population Policies in India**.**

Unit IV: Transport and Economy**:** Development and Patterns of Transport Networks (Railways, Roadways, Waterways, Airways and Pipelines) - Internal and External Trade (Trend, Composition and Directions) - Regional Development Planning In India - Globalisation and its Impact on Indian Economy - Trade Policy: Export Processing Zones - Developments in Communication and Information Technology and their Impacts on Economy and Society - Indian Space Programme.

Unit V: Natural Disaster**:** Natural Disasters in India (Earthquake, Drought, Flood, Cyclone, Tsunami) - Himalayan Highland Hazards and Disasters.

Unit VI: Assessment Unit.

Text Books

1. Deshpande, C.D. (1992): India – A Regional Interpretation. , New Delhi, ICSSR and Northern Book Centre.
2. Nag, P., and Sengupta, S. (1992): Geography of India. Concept Publishing Company
3. R.L. Singh (1989) India: A Regional Geography. Delhi: UBSPD.
4. Sen Gupta, P. and Sdaysuk, Galina. (1968): Economic Regionalisation of India – Problems Approaches, Monograph No.8, New Delhi: Census Commissioner, Govt. of India.
5. Spate, O.H.K (1967): India and Pakistan, (3rd edition) London: Methuen.
6. Kapur, Anu, Indian Geography (1998): A Future with a Difference, Allied Publishers.

References

1. Oldham, R. D., (1894): The evolution of Indian Geography. The Geographical Journal, 3(3), 169-192.
2. Raza, M., & Aggarwal, Y. (1986): Transport geography of India: commodity flows and the regional structure of the Indian economy. Concept Publishing Company.
3. Lee, C. J. (2013): The Indian Ocean during the Cold War: Thinking through a Critical Geography. History Compass, 11(7), 524-530.
4. Kapur, A. (2004): Geography in India: A languishing social science. Economic and Political Weekly, 4187-4195.
5. Singh, S. (2007): Indian Geography, Murari Lal & Sons.
6. Sutton, I. (1991): Preface to Indian country: geography and law. American Indian Culture and Research Journal, 15(2), 3-36.
7. Jennings, Ken. (2011): Map head: Charting the Wide, Weird World of Geography Wonks. New York: Scribner.
8. MacEachren, Alan, M., (1995): How Maps Work, Representation, Visualization and Design, Guilford Press.

Web Sources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc)

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2. https://www.india.gov.in/india-glance/profile
3. https://www.insightsonindia.com/indian-geography//
4. https://www.jstor.org/stable/1773463
5. https://www.nature.com/articles/001413a0

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓	✓	✓		✓	✓	✓	✓	✓
CO2	✓	✓	✓			✓	✓	✓	✓	
CO3	✓	✓	✓			✓	✓	✓	✓	✓
CO4	✓	✓	✓			✓	✓	✓	✓	✓
CO5	✓	✓	✓				✓		✓	

EC: VI	NATURAL HAZARDS AND DISASTER MANAGEMENT	Code: 23P4G16EC

Pre-requisite: *Basic knowledge in Geography*

Course Objective

1. *To familiarize the students about various natural and man-made disasters.*
2. *Also, create the awareness about disasters and provide insight of disaster management.*

Course Outcomes

After the completion of this course, the students will,

1. *Know about the principles of disasters*
2. *Learn various natural disasters and their effects on environment*
3. *Understand man-made disasters and its effects on environment*
4. *Get awareness about various disasters*
5. *Gain knowledge of disaster management*

Unit I: Principles of Natural Disasters: Hazards and Disasters - Basic Concepts of Disaster, Risk and Vulnerability in Disasters - Types of Disasters - Natural Forces and Life Increasing Importance of Disasters.

Unit II: Natural Disasters: Definition, types and effects of Natural disasters - Earthquakes, Volcanic eruptions, Landslides, Avalanches, Flood, Drought, Cyclone, Strom, Tsunami, Climatic Change, Global warming, Ozone Depletion.

Unit III: Man-Made Disasters: CBRN - Chemical disasters, Biological disasters, Radiological disasters, Nuclear disasters, Pollution: Land pollution, Water pollution, Air pollution, Noise pollution and Industrial Pollution - Deforestation.

Unit IV: Disaster Preparedness: Disaster Preparedness and Mitigation - Training and Drills for Disaster Preparedness - Early Warning Systems - Building Design and Construction in Highly Seismic Zones - Retrofitting of Buildings - Managing Natural and Anthropogenic Disasters - Risk Assessment and analysis.

Unit V: Disaster Management: Basic Principles of Disasters Management – Disaster Management Cycle - Disaster Management Policy - National and State Bodies for Disaster Management - Awareness Generation Program – International strategy for Disaster management - Applications of Remote Sensing and GIS Techniques in Disaster Management.

Text Books

1. Gupta H.K., (2003): Disaster Management, Indian National Science Academy, Orient Blackswan.
2. Savindra Singh (1991): Environmental Geography, Kalyan Publications, New Delhi.
3. Sharma V.K., (2001): Disaster Management, National Centre for Disaster Management, India.
4. Ghosh G.K., (2006): Disaster Management, APH Publishing corporation, Delhi.
5. Singh R.B., (2006): Natural Hazards and Disaster Management. Rawat Publications, New Delhi.

References

1. Bryant Edwards (2005): Natural Hazards, Cambridge University Press, U.K.
2. Carter W. Nick, (1991): Disaster Management, Asian Development Bank, Manila.
3. Government of India (1997): Vulnerability Atlas of India, New Delhi.

4. National Disaster Management Division, Ministry of Home Affairs, Government of India http://www.ndmindia.mha.gov.in/
5. Sahni, Pardeep et. al., (eds.) (2002): Disaster Mitigation Experiences and Reflections, Prentice Hall of India, New Delhi.
6. Kumar Arvind., (2010): Disaster Management: Recent Approaches, Anmol Publications, New Delhi.
7. https://www.esri.com/en-us/home
8. https://www.edshare.soton.ac.uk/19460/

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓		✓			✓				✓
CO2		✓			✓			✓	✓	✓
CO3			✓				✓			✓
CO4				✓						✓
CO5					✓				✓	✓

SEC: III	REGIONAL PLANNING	Code: 23P4G17SEC

Course Objectives

1. *This course is committed to study the region, planning, significance and various planning methods.*
2. *Impart the knowledge to understand the evolution of planning activities in India and Tamil Nadu.*

Course Outcomes

After completing the course, the student should be able to:

Knowledge and understanding the

1. *Region and its planning, regional imbalances, how to analyse the regions using different theories, planning in India and Tamil Nadu.*
2. *Govt. plans like five year plans, annual plans and multi level plan.*
3. *Role of Indian planning commission, State planning commission and planning regions of India and Tamil Nadu.*
4. *Regional planning in different level.*
5. *Development of regions and its management.*

Unit I: Region and Planning: Meaning - Elements and Types of Regions: Homogeneous, Nodal and Administrative Regions - Planning Region: Objectives and Characteristics of Planning Region - Regional Processes - Regionalism vs. Sectionalism.

Unit II: Regional Imbalances and Problems in India: Problem in the Distribution of Natural Resources (Soil, Forest, Water and Mineral) - Agricultural Development - Industrial Concentration and Population Distribution - Social and Infrastructure Indicators of Regional Disparities.

Unit III: Regional Analysis: Theories of Spatial Interaction and Regional Disparities: Spread and Backwash theory of Myrdal - Trickle Down and Polarization Effect theory of Hirschman - Urban Hierarchy theory of Berry - Growth Pole theory of Perraux - Spatial Diffusion of Haggerstrand and Growth Foci of Misra.

Unit IV: Planning in India: History of Regional Planning Activity in India - Indian Planning Commission and its Role - Planning Regions in India - Five-Year Plans - Annual Plans and Multi Level Planning - Objectives and Achievements of Special Development Programs: Drought Prone Area, Tribal and Hill Area, Backward Area and Watershed Development.

Unit V: Planning in Tamil Nadu: Sate Planning Commission - Planning Regions of Tamil Nadu - District Planning - Metropolitan Area Planning - Panchayat Raj System - Power and Functions of Town Panchayat - Municipality and Corporation.

Unit V: Assessment Unit

Text Books

1. Abler, R., Hall, Englewood Cliffs, N.J, (1971): Spatial Organisation: The Geographer's View of the World.
2. Bhat, L.S., (1973): Regional Planning in India, Statistical Publishing Society, Calcutta.
3. Friedmann, J. Alonso, W., (1967): Regional Development and Planning - A Reader, M.I.T. Press, Cambridge, Mass.
4. Jayasri Ray Chandhuri (2015): An Introduction to Development of Regional Planning with Special Reference to India, Published by Orient Blackswan Pvt. Ltd., New Delhi.
5. Kuklinski, A.R., (ed.) (1972): Growth Poles and Growth Centres in Regional Planning Mouton, The Hague.
6. Mishra, R.P., (1980): Multi-Level Planning Heritage Publishers, Delhi.

7. Misra R. P, Sundaram K. V and Prakasarao V. L. S., (1947): Regional Development Planning in India, Vikash Publishing House, New Delhi.
8. Misra R.P., (1992): Regional Planning: Concepts, Techniques, Policies and Case Studies, Concept Publishing Company, New Delhi.
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10. Nath V (2011): Administration and Development Planning in India, Concept Publishing Company Pvt. Ltd. New Delhi.

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1. Allen G. Noble, Frank J. Costa, Robert B. Kent, (1998): Regional Development and Planning for the 21st Century, Routledge.
2. Janki Jiwan (2021): Regional Development and Planning. Rawat Publication.
3. Mahesh Chand and Vinay Kumar Puri, (1985): Regional Planning in India Allied Publishers Pvt. Ltd., Delhi.
4. Misra, R.P., (1969): Regional Planning: Concepts, Techniques and Policies, University of Mysore, Mysore.
5. Misra, R.P. (1974): Regional Development Planning in India-A Strategy, Institute of Development Studies, Mysore.
6. Mitra, A., (1965): Levels of Regional Development, Census of India, Vol. I, Part I A(I) and (ii), New Delhi.
7. Myrdal, G., (1957): Economic Theory and Under-Development Regions, Gerald Duckworth, London.
8. Prakasa Rao, V.L.S., (1963): Regional Planning, Asia Publishing House, Calcutta.
9. Rengasamy S., (2009): Regional Planning and Development, Madurai Institute of Social Sciences.
10. Vishwambhar Nath (2009): Regional Development and Planning in India. Concept Publishing Company.

Web Sources

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc)

1. https://www.researchgate.net/publication/245381193_Regional_Development_Theory_Conceptual_Foundations_Classic_Works_and_Recent_Developments/link/546f4bdb0cf2d67fc03109fe/download
2. http://www.dspmuranchi.ac.in/pdf/Blog/Regional-Planning-All_Part-Conc.pdf
3. http://www.dspmuranchi.ac.in/pdf/Blog/Regional_Planning_Techniques.pdf.

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓	✓		✓			✓	✓	✓	✓
CO2	✓	✓		✓		✓	✓		✓	✓
CO3				✓			✓			✓
CO4	✓	✓		✓	✓	✓		✓	✓	✓
CO5	✓	✓	✓		✓	✓		✓		✓

CP: IV	SPATIAL ANALYSIS AND MODELLING	Code: 23P4GP4

Course Objectives

1. *Introduce the concepts practically in Geographic Information Systems and to understand the various aspects of map reading, design and evaluation of digital maps.*
2. *Provide an understanding of basic skills necessary to work with GIS environment and understand the theoretical and practical concepts pertaining to map making.*

Course Outcomes

After completing the course, the student should be able to:
Knowledge and understanding the

1. *Key concepts of fundamentals of mapping.*
2. *The relationship between spatial data and attribute data.*
3. *The skills of surface analysis.*
4. *The terrain and hydrological analysis.*
5. *The spatial applications and modeling.*

Unit I: Fundamentals of Mapping

1.1 Data Conversion
1.2 Symbolization
1.3 Map Design
1.4 Map Layout

Unit II: Spatial Data Editing and Analysis

2.1 Spatial Data Editing
2.2 Join and Relate Attribute Data
2.3 Creating Thematic Map
2.4 Overlay Analysis

Unit III: Surface Analysis

3.1 Creation of Contour
3.2 Creation of TIN
3.3 Slope and Aspects
3.4 Hill Shade

Unit IV: Terrain and Hydrological Analysis

4.1 Creation of Contour for Watershed Delineation
4.2 Stream Ordering
4.3 Stream Density
4.4 Flow Direction

Unit V: Spatial Applications and Modelling

5.1 Crime Analysis
5.2 Environmental Pollution Modelling
5.3 Hydrological Modelling
5.4 Web GIS

Unit VI: Assessment Unit.

Text Books

1. Aronoff, S. (1991): Geographic Information Systems: A Management Perspective, WDL Publications, and Ottawa, Canada.
2. Chang, Kang-Tsung (2006): Introduction to Geographic Information Systems. Boston: McGraw-Hill Higher Education.

3. Longley, P. A., Goodchild, M. F., Maguire, D. J., and Rhind, D. W. (2005): Geographic Information Systems and Science. John Wiley & Sons.
4. Bernhardsen, T. (2002): Geographic Information Systems: An Introduction. John Wiley & Sons.
5. Ian Heywood, Sarah Cornelius and Steve Carver (2010): An Introduction to Geographical Information Systems. Prentice Hall - Pearson Education limited.
6. Chang, Kang-tsung (2002): Introduction to Geographic Information Systems, McGraw-Hill Companies, Inc.

References

1. Ballas, D., Clarke, G., Franklin, R. S., and Newing, A. (2017): GIS and The Social Sciences: Theory and applications. Routledge.
2. Zhu, X. (2016): GIS for Environmental Applications: A Practical Approach. Routledge.
3. Whyatt, D., Clark, G., & Davies, G. (2011): Teaching Geographical Information Systems in Geography Degrees: A Critical Reassessment of Vocationalism, Journal of Geography in Higher Education, 35(2), 233-244.
4. Argles, T. (2017): Teaching Practical Science Online Using GIS: A Cautionary Tale Of Coping Strategies. Journal of Geography in higher education, 41(3), 341-352.
5. Gould, M. (2018): Tailoring GIS Courses for Employment. In GIS (pp. 189-195). CRC Press.

Web Sources

1. www.ncgia.ucsb.edu/education/curricula/giscc
2. http://www.esri.com/
3. https://www.le.ac.uk/ar/arcgis
4. https://www.researchgate.net/publication/301561923_Introduction_to_GIS_A_practical_based_Lab_work_for_beginners
5. http://edshare.soton.ac.uk/19460/

Outcomes Mapping (Course Articulation Matrix)

Course Outcomes	Programme Outcomes					Programme Specific Outcomes				
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	✓			✓	✓	✓			✓	✓
CO2										
CO3		✓		✓	✓		✓		✓	✓
CO4		✓					✓			
CO5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

M.Sc., Applied Geography 2023-24 Onwards

PROJECT WORK (Code: 23P4G18PW)

1. In the IVth semester 10 hours per week have been allotted as per the course structure.

2. The students have to submit an individual project report by selecting a specific topic in Geography and allied fields by means **field work and field techniques**.

3. The project work should be based on either primary data or secondary data or both as required.

4. The project report should be between 20 and 25 pages.

5. Sufficient maps, diagrams and graphs with precise interpretation are the mandatory components of the project report.

6. The project report should be divided as:
   - I. Problem and Procedure
   - II. Aims and Objectives
   - III. Review of Literature
   - IV. Data and Techniques used
   - V. Result and discussion
   - VI. Summary and Conclusion
   - VII. References

7. Evaluation and Viva -Voce:
   Candidates have been evaluated individually by means of viva-voce exam using the following marking pattern both by Internal and External Examiners. The average mark has been taken into account for the award of mark for the project.

Sl.No.	Area of Work	Maximum Marks
1.	Plan of the Project	10
2.	Execution of the Plan / Collection of Data / Organization of Materials / Application of Tools / Experiment / Study / Hypothesis Testing etc., and Presentation of Report	50
3.	Individual Initiative	20
4.	Viva – Voce Performance	20
Total Marks		**100**