M.A., GEOGRAPHY

MODEL SYLLABUS

AUGUST- 2022

**TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION,
CHENNAI – 600 005**

M.Sc.,
GEOGRAPHY

Programme:	M.Sc., GEOGRAPHY
Duration:	Two Years
Programme Objectives:	1. Orient the students towards identifying and analysing different geographical processes and features. 2. Developing the students' ability to acquire basic skills for conducting field research. 3. Intended to help students in learning the science and art of collecting, processing, and interpreting data. 4. Analyze various problems and resolve them through proper management, planning, and sustainability 5. To expose the students to the new technologies of Remote Sensing, GNSS, Geographical Information System (GIS) and GIScience.
Programme Outcomes:	1. Students will be oriented towards, learning, understanding, and analyzing geographical processes and provide spatial solutions.
	2. To expose students to the use of recent advancements in the field of Geospatial technologies and its application in geographical areas.
	3. Development of ethical aptitudes and dispositions necessary to obtain and hold leadership positions within industry, government, and professional organizations
	4. Capability to undertake research in interdisciplinary studies or on issues or problems beyond the purview of geography.
	5. Empowering students with knowledge and skills for spatial thinking and analysis, to navigate real world problems, and contribute to society in a meaningful way.

Programme Specific Outcomes:	1. Understand the major biophysical and social patterns in the planet, and the key drivers that give rise to those patterns.
	2. Demonstrate profound knowledge of theories, concepts, techniques, and technologies in human and physical geography and in geographic information science and technology using real-world applications at the local, regional, and global levels.
	3. Apply systems thinking and critical thinking in socio-economic-ecological systems on the human-environment interface to analyze problems and potential solutions.
	4. Practice to obtain, analyze, interpret complex geographic data and develop ethical aptitudes, dispositions necessary to acquire and hold leadership positions in industry, government, and professional organizations
	5. Capability to work with the latest geospatial technologies and handle modern instruments like drones, total stations, GPS and other field devices and also work effectively in interdisciplinary and multicultural real-world contexts to combine theory and practice in responding to local to global issues.

S.NO	Subject Code	Title of the Course	Credits
		FIRST YEAR	
		SEMESTER- I	
I.	Core 1	Principles of Cartography	4
II.	Core 2	Applied Geomorphology	4
III.	Core 3	Practical-I Techniques of Mapping and Map Analysis	4
IV.	Elective 1	Population and settlement Geography	3
V.	Elective 2	Transportation geography	3
VI.	PCC	Principles of GIS	2
VII.	AEC1	Seminar- (Communication and presentation skills)	2
		Total	22
		SEMESTER-II	
I.	Core 4	Applied Climatology	4
II.	Core 5	Hydrology and Oceanography	4
III.	Core 6	Practical– II: Geospatial lab	4
IV.	Elective 3	Fieldwork and mapping	3
V.	Elective 4	Geospatial statistics	3
VI.	SEC1	Remote sensing and GNSS	2
VII.	AEC2	Technical writing	2
VIII.	I	Internship*/industrial activity	-
		Total	22
		SECOND YEAR	
		SEMESTER- III	
I.	Core 7	Geographical Thought	4
II.	Core 8	Theoretical economic geography	4
III.	Core 9	Practical-III: Remote Sensing and modern surveying	4
IV.	Elective 5	Political geography	3
V.		Geospatial project planning management	3
VI.	SEC2	Geo database programming	2
VII.	AEC3	Emotional intelligence emotional intelligence and academic performance	2
VIII.	I	Internship*/industrial activity	2
		Total	24
		SEMESTER- IV	
I.	Core 10	Geography of India and resource development	4
II.	Core 11	Regional planning	4
III.	Core 12	Practical-I Spatial Analysis and modelling	4
IV.	Elective 6	Natural hazards and disaster management	3
V.	CP	Project work	3
VI.	SEC3	Geospatial intelligence	2
VII.	AEC4	Decision Making and Logical Thinking Skills	2
VIII.		Extension activity/Field Work	1
		Total	23

Credit Distribution for all PG Courses

S.NO	Course Details	Credits
1.	Core course [12 courses x 4 credits]	48
2.	Elective course [6 courses x 3 credits]	18
3.	Skill Enhancement course [3 courses x 2 credits]	06
4.	Professional competency course and industry module project work VIVA VOCE	08
5.	Ability Enhancement compulsory course [4 courses x 2 credits]	08
6.	Internship	02
7.	Extension activity / Field Work	01
	Total	**91**

SEMESTER – I

Course code:	C1	PRINCIPLES OF CARTOGRAPHY	L	T	P	C
Core/Elective	Core					
Pre-requisite	Basic knowledge in Cartography					

Course Objectives: 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 & Labelling - Thematic Map Forms - Animation – Isarithmic, choropleth & Surface mapping-map reproduction, Publishing, & 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

Cartography: Possibilities and issues in contemporary mapping

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

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, generalisation 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 opensource data, analyse and interpret the interactive maps	**K4, K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		

Text Book(s)

1.	Kraak, M.J. and F.J. Ormeling (1996). Cartography: Visualisation 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 Book(s)

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 PublishingCompany, 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	PSO 1	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)**

Course code:	C2	APPLIED GEOMORPHOLOGY	L	T	P	C
Core/Elective	**Core**					
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 – Hill slope evolution - Geomorphic ideas of Davis, Penk 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 Isostacy Seismicity and Volcanism- climatic and tectonic changes and impacts

Unit - 3	WEATHERING, MASS WASTING AND DEVELOPMENT OF HILL SLOPES

Weathering : Mechanical, Chemical and Biological weathering- structure, process and time in weathering- Soil: Soil formation – Types of soils – Soil conservation practices - Mass wasting : causes and classes of mass wasting – Planning and control measures

Unit - 4	PROCESS GEOMORPHOLOGY

Drainage: Drainage Basin – Basin morphometry – 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 speleology; 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	Uunderstand the relationship between geomorphologic processes, natural resources and environmental impacts	**K2, K5**

Mapping with Programme Outcomes (MPO)*

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

Course code:	C3	PRACTICAL-I: TECHNIQUES OF MAPPING AND MAP ANALYSIS	L	T	P	C
Core/Elective	**Core**					
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

Map appreciation and interpretation: thematic, topographic and atlas maps- mapping and analysis: Relative relief and slope maps; height and hypsometric curves; stream Analysis

Unit - 2	CLIMATE AND HYDROLOGY

Climate and Hydrology: climograph and climatograph; rainfall variability, intensity maps temperature and rainfall profiles; deviation and dispersion graph; aridity and water balance graphs

Unit - 3	POPULATION AND ECONOMIC DATA MAPPING

Population and economic data mapping: dot maps, density maps - colour and grey scale patterns; index of concentration and diversification; crop combination technique, spatial interaction, measures of transport network analysis

Unit - 4	QUANTITATIVE SYMBOLISATION AND LOCATION MAP

Quantitative symbolisation and location Maps: located representation of tourism and facilities; point and line pattern analysis; cartograms and 3D maps

Unit - 5	MAPPING AND INTERPOLATION

Choropleth and isorhythm maps - class interval selection methods – unipolar and bipolar graphs and colour patterns – 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
Text Book(s)
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.
Reference Book(s)	
1.	Monkhouse, F.J., and Wilkinson, H.R. (1976): Maps and Diagrams, Metheun & 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 ed, CRC Press.
4.	Kimerling, 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 ed, Orient Blackswan Private Ltd.
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	**PSO 1**	**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)**					

Course code:	E1	POPULATION AND SETTLEMENT GEOGRAPHY	L	T	P	C
Core/Elective		Elective				
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). Demographic Transition, Theories of Population Growth (Malthus, Sadler, and Ricardo).

Unit - 2	WORLD DISTRIBUTION OF POPULATION

World distribution of population – over population, under population and optimum population-growth of population – theories of population – migration: Internal and international - Rural settlements – types of patterns – Urban settlements – Functional classification of towns and cities.

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

Types, patterns and morphology of rural settlements; Urban developments; Morphology of Indian cities; Functional classification of Indian cities; Conurbations and metropolitan regions; Urban sprawl; Slums and associated problems; Town planning; Problems of urbanisation and remedies.

Unit - 5	THEORIES OF ORIGIN OF TOWNS

Theories of Origin of Towns (Gordon Childe, Henri Pirenne, Lewis Mumford), Characteristics and Processes of Urbanization in Developed and Developing Countries (factors of urban growth, trends of urbanisation, 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:	
1	Understand population policies & its importance, Population distribution and its problems.	**K1, K2**
2	Assessment of vital statistics of population data	**K2, K3**
3	Acquire and interweave theoretical foundation for addressing research issues related to population dynamics in the real world	**K3, K6**
4	Acquiring, handling and analysing population data both at the grassroots level and secondary sources	**K4, K5**
5	Recollect types and patterns of urban and rural settlement	**K4, K6**

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

Text Book(s)

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 Book(s)

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). A 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	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)**					

Course code:	E2	FIELD WORK AND MAPPING	L	T	P	C
Elective	Elective					
Pre-requisite	Basic knowledge in Field work					

Course Objectives:
1. To impart knowledge about basic principles of field surveying procedures and practices.   2. Geospatial applications and also to impart knowledge on advanced surveying, photogrammetry, remote sensing, and Geographic Information Systems (GIS).   3. The purpose of fieldwork is to prepare students for a professional career by providing them with a "real world" experience.   4. Writing report papers on the structure demonstrated analytical and research talents.

Unit - 1	**PLAN AND SCHEDULE**

This course work contains - Plan and schedule of the work carried out and comprehensive report on the field work.

Unit - 2	**FIELD DATA COLLECTION**

The Student should prepare an individual report based on primary and secondary data collected during field work. Field and digital techniques for map making including use of GIS, GPS, and digital tablets.

Unit - 3	**REPORT WRITING**

The maximum length of the report should not exceed 12000 words, excluding figures, tables, photographs, maps, references and appendices.

Unit - 4	**FIELD WORK**

The students will go for a field work in the Second and Fourth semester, which is compulsory and on the basis of that, each student has to submit a field work report as part of the second and fourth semester course work

Unit - 5	**SUBMISSION**

Each report must be accompanied by field notebook, a fair copy of map, related cross sections and other relevant documents.

Expected Course Outcomes:		
1	Understand various methods of Geospatial surveying	**K1, K2**
2	Estimate the observation outcomes based on field truth verification and getting exposure in field work documentation.	**K2, K5**
3	Calculate area and volume and to generate various cartographic techniques.	**K3, K4**
4	Adopt appropriate survey method to address various field problems.	**K5, K6**
5	In this course, students will perform credible and original geographical research.	**K4, K6**

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

Text Book(s)	
1	Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.

2	Punmia BC et al: Surveying Vol. I, II, Laxmi Publication
3	Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
4	Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002
5	Caton, D. 'Real world learning through geographical fieldwork' in Balderstone, D. (ed) (2006) Secondary Geography Handbook. Sheffield: Geographical Association.

Reference Book(s)	
1	Andersen, D. E. (2007). Survey techniques. Raptor research and management techniques. Hancock House Publishers, Blaine, WA USA, 89-100.
2	Roelfsema, C. M., Phinn, S. R., & Joyce, K. E. (2006, June). Evaluating benthic survey techniques for validating maps of coral reefs derived from remotely sensed images. In Proc 10th Int Coral Reef Symp (Vol. 1, pp. 1771-1780).
3	Demers, J. (2004). Depth of field: A survey of techniques. Gpu Gems, 1(375), U390.
4	A. M. Chandra, Plane Surveying, New Age International.
5	S. K. Duggal, Surveying Vol. I, Tata Mcgraw-Hill.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://flapflap.ep.mk16.de/rrmt/Chapter-5.pdf
	https://ascelibrary.org/doi/abs/10.1061/(ASCE)0733-9453(2004)130:2(56)
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9781119147770
3	https://cdnsciencepub.com/doi/abs/10.5623/geomat-1996-0046
4	https://ui.adsabs.harvard.edu/abs/2016EGUGA..18.7033M/abstract
5	https://flapflap.ep.mk16.de/rrmt/Chapter-5.pdf

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO1	2	1	1	1	2
CO2	1	2	1	1	1
CO3	2	3	1	1	1
CO4	1	1	2	2	3
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)**					

Course code:	PCC	PRINCIPLES OF GIS	L	T	P	C
PCC/CP	**Professional Competency Course & Industry Module**					
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 data sets
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 modeling - multi-criteria analysis - network applications - LBS - geocoding - suitability modelling - location allocation modeling - 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, compile, analyse, and present geospatial data	K3, K4
4	Performing GIS functions and demonstrate the skills in modelling	K4, K5

| 5 | Developing the ability to analyze and solve spatial problems using modelling approaches | **K3, K6** |

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

Text Book(s)	
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 Book(s)	
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	PSO 1	PS O2	PSO 3	PS O4	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)**					

Course code:	**AEC1**	**SEMINAR (COMMUNICATION AND PRESENTATION SKILLS)**	**L**	**T**	**P**	**C**
SEC/AEC	**Ability Enhancement Compulsory Course- soft skill-1**					
Pre-requisite	prior knowledge in Seminar (Communication and Presentation Skills)					

Course Objectives:

1. To encourage the all-round development of students by focusing on soft skills.
2. To make the students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
3. To develop and nurture the soft skills of the students through individual and group activities.
4. To expose students to right attitudinal and behavioural aspects and to build the same through activities

Unit - 1	**ROLE OF SOFTSKILL**

A course will give students the skills necessary to prepare professional materials for presentation.

Unit - 2	**SCIENTIFIC METHOD OF SOFTSKILL**

Topics covered in this course include: searching the scientific literature; scientific writing style, preparing scientific presentations, poster and oral presentations presentation of data using ICT; and using word processing, spreadsheet, and presentation software.

Unit - 3	**WRITTEN SKILLS**

Learn the art of selecting a problem and review of literature.

Unit - 4	**PRESENTATION SKILL**

The student will present a simple article on the basis of review of selected literature on any of the first semester subjects.

Unit - 5	**ANALYSING AND REPORT WRITING**

(Review and appraisal - regional geography / geospatial technology related / global issues)

Unit - 6	**Contemporary Issues**

Contemporary Issues and challenges

Expected Course Outcomes:		
1	Understand the role of communication in personal & professional success.	**K2, K4**
2	Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts.	**K3, K4**

3	Students will be able to understand the research methods associated with the study of human communication, and apply at least one of those approaches to the analysis and evaluation of human communication.	**K2, K6**
4	Actively participate in group discussion / meetings / interviews and prepare & deliver presentations	**K3, K6**
5	Students will be able to communicate effectively orally and in writing.	**K5, K6**

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

Text Book(s)	
1	Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
2	English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010

Reference Book(s)	
1.	Rani, E., & Mangala, S. (2010). Need and importance of soft skills in students. Journal of Literature, culture and Media studies, 2(3).
2.	Haber, R. J., & Lingard, L. A. (2001). Learning oral presentation skills. Journal of general internal medicine, 16(5), 308-314.
3.	Csikosova, A., Senova, A., & Culkova, K. (2012). Improving of communication and presentation Skills of the universities' students through e-Learning. Procedia-Social and Behavioral Sciences, 46, 2847-2851.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.edx.org/learn/soft-skills
2	https://www.goskills.com/Soft-Skills
3	https://www.lifehack.org/785450/online-learning-sites

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO 1**	**PS O2**	**PSO 3**	**PS O4**	**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)**					

SEMESTER II

Course code:	C4	APPLIED CLIMATOLOGY	L	T	P	C
Core/Elective	Core					
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 Book(s)

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 Book(s)

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.

11	Oliver, John E. (1973): Climate and Man's Environment: An Introduction to Applied Climatology, John Wiley & Sons, New York, London.
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)**					

Course Code	C5	HYDROLOGY AND OCEANOGRAPHY	L	T	P	C
Core/Elective	Core		3	1	0	4
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 Book(s)	
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: multiscale variability and global and regional impacts. Cambridge University Press.
Reference Book(s)	
1	Manheim, F. T. (1966). Soviet Books and Publications on Geological and Chemical Oceanography, Hydrology, and Other Subjects Acquired During the Second International Oceanographic Congress, Moscow, June 1966: Titles and Some Translated Contents and Notes. Woods Hole Oceanographic Institution.
2	Addison, H. (1961). Land Water and Flood, Chapman and Hall, London.
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)**					

Course code:	C6	PRACTICAL– II: Geospatial Lab	L	T	P	C
Core/Elective	**Core**					
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

Map exploration - Georeferencing – map projection and transformation – spatial entity creation – digitization – symbolization - attribute data editing – labelling and annotation – map design and layout - editing and topology: building topology, topology error rectification – edge matching – rubber sheeting.

Unit - 2	Spatial Data Editing and Analysis

Attribute data management and thematic mapping: quantitative and qualitative mapping, dot map, located pie chart and bar chart – proximity analysis – overlay analysis.

Unit - 3	Spatial Analysis and Spatial Statistics

Network analysis – geocoding - location and allocation models; spatial statistics: measurement- mean center, median center, standard distance

Unit - 4	Terrain and Surface Analysis

Surface analysis and Interpolation techniques: creation of contours, slope, aspect, kriging, spline, inverse distance weighted (IDW) – 3D visualization: DEM, TIN and visibility analysis.

Unit - 5	Spatial applications and Modelling

Multi criteria analysis and Ground truth support: GPS with field data attributes - geotagged photographs - Suitability analysis and modelling: habitat suitability – house hunting – noise pollution modelling – hydrological modelling

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 Book	
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)**

Course code:	E3	TRANSPORTATION GEOGRAPHY	L	T	P	C
Core/Elective	Elective					
Pre-requisite	Basic knowledge in geography					

Course Objectives:

1. Understand the purpose and importance of Transportation Geography
2. Explain the spatial organization of transport systems
3. Examine the role of transportation system in energy, environment and economy
4. Discuss the modes of transportation and trade and urban transportation
5. Apply and evaluate the concepts in planning and policy for sustainable development

Unit - 1	INTRODUCTION

Scope and significance of Transportation Geography- basic concepts-Physical Environment and Transportation - The Emergence of Mechanized Transportation Systems- Setting of Global Transportation Systems

Unit- 2	TRANSPORTATION AND SPATIAL STRUCTURE

Geography of Transportation Networks-Transport and Spatial Organization-Transport and Location- Information Technologies and Mobility

Unit- 3	TRANSPORTATION, ENERGY, ENVIRONMENT, ECONOMY AND SOCIETY

Transportation and Economic Development- Transportation and Energy- Transportation and Environmental justice- Sustainability and Decarbonization -Transportation and Society-Transport Costs- Demand of Transportation Services

Unit - 4	TRANSPORTATION MODES AND TRADE

Road, Rail and Pipelines, Maritime and Air Transport-Intermodal Transportation and Containerization-Transport Terminals and Hinterlands- Port, Rail and Airport Terminals-Trans-border and Cross-border Transportation- Globalization and International Trade- Freight Transportation and Value Chains- Transport hubs

Unit - 5	URBAN LAND USE, TRANSPORTATION AND PLANNING

Urban Land Use and Transportation- Urban Mobility- Urban Transport Challenges-Transport Policy-Transport Planning and Governance- Transport Safety and Security- Transportation Disruptions and Resilience- Geospatial technology and spatial transport planning

Unit - 6	CONTEMPORARY ISSUES AND CHALLENGES IN TRANSPORTATION GEOGRAPHY

Technology and Transport Infrastructure- Governance and Management- Social and Environmental Responsibility- Future Intelligent and smart Transportation Systems

Expected Course Outcomes:

1	Understand the basics of spatial structure of transportation network	K2, K6

2	Analyse the transport systems and problem from a spatial perspective.	**K2, K3**
3	Assess the environment, energy and other socio-economic dimensions with reference to transportation development	**K2, K5**
4	Evaluate different modes of transportation and trade for sustainable developmental activities	**K4, K2**
5	Evaluate the role of transportation in affecting current patterns of economic development and spatial planning	**K1, K6**

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

Text Book(s)	
1	Black, W. (2003) Transportation: A Geographical Analysis. New York: Guilford.
2	Haggett, P. (2001) Geography: A Modern Synthesis, 4th Edition, New York: Prentice Hall.
3	Jean-Paul Rodrigue (20220) The Geography of Transport System, Routledge Taylor & Francis Group,Newyork
4	Keeling, D.J. (2007) "Transportation Geography: New Directions on Well-Worn Trails", Progress in Human Geography, 31(2), 217-225.
5	Keeling, D.J. (2008) "Transportation Geography – New Regional Mobilities", Progress in Human Geography, Vol. 32, No. 2, pp. 275-283.
6	Knowles, R., J. Shaw and I. Docherty (eds) (2008) Transport Geographies: Mobilities, Flows and Spaces, Malden, MA: Blackwell.

Reference Book(s)	
1	Schiller, P.L., and J.R. Kenworthy (2018) An Introduction to Sustainable Transportation: Policy, Planning and Implementation, New York: Routledge
2	Tolley, R. and B. Turton (1995) Transport Systems, Policy and Planning: A Geographical Approach, Burnt Mill, Harlow, Essex: Longman.
3	Ullman, E.L. (1980) Geography as Spatial Interaction, Seattle: University of Washington Press

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://transportgeography.org/
2	https://cbpbu.ac.in/userfiles/file/2020/STUDY_MAT/GEO/null.pdf
3	https://unece.org/transport

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO 1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	1	1
CO2	1	3	3	2	1
CO3	2	2	1	2	2
CO4	1	2	1	2	1
CO5	3	1	1	1	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)**					

Course code: E4	GEOSPATIAL STATISTICS	L	T	P	C
Core/Elective Elective					
Pre-requisite Prior knowledge in statistics					

Course Objectives:

1. To introduce basic statistical procedures to the students
2. To indicate the assumptions, limitations and interpretation of these procedures and results
3. To train the students to handle these statistics towards analysing the geographical problems.
4. To understand the Statistical Techniques, Numerical data in Geography
5. To familiarize about Probabilistic Treatment, Parametric Statistics and Regression Analysis

Unit - 1	Statistics, Geography and Statistics

Significance of Statistics in geographical studies; Types of Data; levels of data measurement. Sampling: basic concepts, sample UNITs and design, sampling frame and procedures, standard error and sample size, testing the adequacy of samples

Unit - 2	Measures of Central Tendency and their significance

Centro graphic techniques: mean centre, median centre and standard distance. Measures of dispersion and concentration: Range, quartile deviation, mean deviation, standard deviation; coefficient of variation, Lorenz Curve and Gini's Coefficient; location Quotient.

Unit - 3	Bivariate Analysis

Forms of relation and measuring the strength of association and relation-construction and meanings of scatter diagram; Spearman's Rank Difference and Karl Pearson's Product Moment Correlation Coefficients

Unit - 4	Regression analysis

Regression equations, construction of regression lineinterpolation, prediction, explanation; residual-statistical tests of significance of the estimates; computation of residuals and mapping.

Unit - 5	Hypothesis Testing

Needs and types of hypotheses-goodness of fit and significance and confidence levels-parametric and non-parametric procedures: contingency tables, Chi-square test, t -test, Mann-Whitney U test, Analysis of Variance (ANOVA).

Unit - 6	CONTEMPORARY ISSUES

Multivariate statistical method applications to spatial problems. Linear and non-linear correlation; regression, factor analysis, cluster analysis; spatial statistics including: trend surfaces, sequences, point distributions.

Expected Course Outcomes:

1	Explain the role of quantitative information in geographic research and applications.	**K2, K1**
2	Demonstrate an understanding of basic descriptive statistics and regression methods as they apply to problem solving in Geography.	**K2, K4**
3	Evaluate the roles of probability theory and sampling distributions in drawing inferences about populations based on samples	**K3, K5**
4	Perform basic data manipulation, statistical calculations and graphical presentation by hand, and using computer spreadsheets or statistical software (e.g., Excel, SPSS).	**K4, K6**
5	Acquired skills to assemble, collect and manage big data resources so that they facilitate both statistical as well as geographical studies.	**K3, K6**

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

Reference Book(s)

1	David M. Smith (1975), Patterns in Human Geography, Penguin, Harmons worth.
2	David U (1981), Introductory Spatial Analysis, Methuen, London.
3	Ebdon, D. (1983), Statistics in Geography: A Practical Approach, Blackwell, London.
4	Gupta, S.P. (2010), Statistical Methods, Sultan Chand and Sons, Latest Edition.
5	Hammond, R. and McCullagh, P.S. (1974), Quantitative Techniques in Geography: An Introduction, Clarendan Press, Oxford.
6	Peter a. Rogerson (2015), statistical methods for geography: a student's guide, sage publications ltd, London, United Kingdom.
7	Mathews, J.A. (1987), Quantitative and Statistical Approaches to Geography
8	Haggett, P., Andrew D. C., & Allan F. (1977), Location Methods, Vols. I and II, Edward Arnold, London
9	Ashis sarkar, (2013), quantitative geography: tech. & presentations orient blackswan private

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://swayam.gov.in/course/266-quantitative-methods
2	http://www.sethspielman.org/courses/geog5023/
3	https://www.colorado.edu/geography/class_homepages/geog_4023_s08/
4	http://www.oxfordbibliographies.com/view/document/obo 9780199874002/obo-9780199874002-0053.xml
5	https://searchworks.stanford.edu/view/923805

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)**					

Course code:	SEC1	REMOTE SENSING, AND GNSS	L	T	P	C
SEC/AEC	Skill enhancement course-1					
Pre-requisite	Basic knowledge in Remote sensing					

Course Objectives:

1. Understand the purpose and importance of RS, GIS & 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 ratioing, 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

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 & 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

Pre-processing: Rectification and Enhancements – Manipulation - Classification methods: Supervised and Unsupervised - Ground truth verification – Accuracy assessment -Vegetation Indices: VI and NDVI, Software: ERDA and ENVIS. 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.

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)**					

Course code:	AEC2	TECHNICAL WRITING	L	T	P	C
SEC/AEC	**Ability enhancement compulsory course- soft skill- II**		1	0	1	2
Pre-requisite	No prior knowledge in Technical Writing (Research Article/ Report/ Thesis)					

Course Objectives:

1. This course is designed to develop skills that will enable to produce clear and effective scientific and technical documents
2. Understand professional writing by studying management communication contexts and genres, researching contemporary business topics, analyzing quantifiable data.
3. Learn to identify and select many types of writing frequently required in a variety of careers.

Unit - 1	**UNDERSTANDING RESEARCH WRITING**

The aim of this course is to provide students with the opportunity to improve their skills in writing a research article, report and to prepare other professional materials for presentation or publication

Unit - 2	**SCIENTIFIC WRITING SKILLS**

This course will cover review of scientific literature, scientific writing style; writing research papers, proposals

Unit - 3	**SCIENTIFIC PRESENTATIONS**

Preparing scientific presentations with data. Students will use scientific methodology or quantitative techniques

Unit - 4	**GEOSPATIAL RESEARCH**

Geospatial technology for preparing a short research paper

Unit - 5	**APPLICATION GEOSPATIAL TECHNOLOGY**

The application of geospatial technology and spatial analytical techniques will be used for writing and presenting a long research paper

Unit - 6	**CONTEMPORARY ISSUES**

 Contemporary Issues and challenges

Expected Course Outcomes:

1	Students will understand and know how to follow the stages of the writing process (prewriting/writing/rewriting) and apply them to technical and workplace writing tasks.	**K2, K3**
2	Students will be able to produce a set of documents related to technology and writing in the workplace and will have improved their ability to write clearly and accurately.	**K3, K4**

3	Students will understand the basic components of definitions, descriptions, process explanations, and other common forms of technical writing.	**K2, K4**
4	Students will be familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation.	**K4, K5**
5	Students will be able to read, understand, and interpret material on technology. They will have an appreciation for some of the ideas, issues, and problems involved in writing about technology and in workplace writing.	**K4, K6**

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

Text Book(s)

1	Young, M. (2002). The technical writer's handbook: writing with style and clarity. University Science Books.
2	Tebeaux, E. (2018). The emergence of a tradition: Technical writing in the English Renaissance, 1475-1640. Routledge.
3	Longo, B. (2000). Spurious coin: A history of science, management, and technical writing. SUNY Press.

Reference Book(s)

1	Alamin, A., & Ahmed, S. (2012). Syntactical and Punctuation Errors: An Analysis of Technical Writing of University Students Science College, Taif University, KSA. English Language Teaching, 5(5), 2-8.
2	Yu, H. (2008). Contextualize technical writing assessment to better prepare students for workplace writing: Student-centered assessment instruments. Journal of Technical Writing and Communication, 38(3), 265-284.
3	Mills, G. H., & Walter, J. A. (2018). Technical writing. Holt Rinehart and Winston.
4	Blake, G., & Bly, R. W. (1993). The elements of technical writing (p. 173). New York, NY: Macmillan.
5	Tebeaux, E. (2017). Whatever happened to technical writing.

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

1	https://www.apress.com/gp/open-source https://courses.lumenlearning.com/atdclinton-technicalwriting/chapter/course-objectives/
2	http://homepages.rpi.edu/~zappenj/TecWriting/twco10s.html
3	https://researcheracademy.elsevier.com/writing-research/writing-skills
4	https://www.unl.edu/gradstudies/connections/twenty-steps-writing-research-article
5	https://buyresearchpapers.net/blog/research-paper-writing-skills

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)**					

Course code:	I	INTERNSHIP	L	T	P	C
Internship/ industrial activity	Internship		0	0	2	2
Pre-requisite	Knowledge on Basic Science and Computing Skills					

Course Objectives:

1. Integrate theory and practice.
2. Discover new knowledge and understanding through exploration and investigation during an internship.
3. Develop communication, interpersonal and other critical skills in the job interview process.
4. Use of Geospatial technology and latest techniques in the relevant discipline of study.
5. An opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organisational setting.

INTERNSHIP PROCEDURE

Each candidate has to spend at least 8-10 weeks in an institution / industry /educational Institution/ business house where mapping or GIS or remote sensing, GPS or a combination of these above is the main activity, which may also include marketing of such products. At the end of the internship, the candidate has to produce an experience certificate and a report.

Expected Course Outcomes:

1	Develop skills to work effectively and further develop observation, recording and interpretation skills	**K2, K1**
2	Helps in skill building – Improvise skills in specific field of interest	**K2, K4**
3	Communicate and collaborate effectively and appropriately with different professionals in the work environment through written and oral means	**K3, K5**
4	Use geospatial tools and techniques for hazard mitigation and resource planning.	**K3, K6**
5	Pursue research and develop capabilities to handle multi-disciplinary field projects and work in teams and demonstrate leadership skills with professional ethics.	**K5, K6**

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

Text Book(s)

1	H. Frederick Sweitzer and Mary A. King (2019). Successful Internship - 5th edition. Brooks/Cole Publishing Co.
2	Lynne S. Gross (1993). Internship Experience - 2nd edition. Waveland Press, Inc.

Reference Book(s)

1	Marianne Ehrlich Green (1997). Internship Success - 97 edition. National Textbook Co.Gast, David L. Single subject research methodology in behavioral sciences: Applications in special education and behavioral sciences. Routledge, 2009.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://careers.uiowa.edu/students/benefits-internship
	https://scholarworks.bgsu.edu/cgi/viewcontent.cgi?article=1000&context=oer
2	https://www.grinnell.edu/sites/default/files/documents/Student%20Internship%20Handbook%20-%202014.pdf
3	https://careers.uiowa.edu/students/benefits-internship

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)**					

SEMESTER 3

Course code:	GEOGRAPHICAL THOUGHT	L	T	P	C
Core/Elective	Core Course 7				
Pre-requisite	Basic knowledge in Geography				

Course Objectives:

1. Understand ancient scholars' contribution to geography
2. Known exploration and discoveries, History of World Civilization and contribution of modern geographer to geography
3. Should be able to known dualism concept in geography, Region, regionalization and scientific explanation of deductive and inductive logic.
4. Should be able to learn quantitative revolution in geography, Paradigm shift and various new ideas and concept in geography
5. Explain how location play main role for modern politics

Unit-1	ANCIENT SCHOLAR TO CONTRIBUTION IN THE FIELD OF GEOGRAPHY

Nature of geography - Greek contribution to Physical geography, Human geography, Cartography, Mathematical geography - Contribution of Romans: Sytrabo, Ptolomy, Pompnius Mela, Lifirmanus - Arab contribution to geography - Ancient Indian Geographical Thought - Sources of information - Contribution of Indians – Geography of India, Dwipas, seasons – earth and sun

Unit-2	EXPLORATION AND DISCOVERIES

Major exploration and discoveries: Contribution of Megallan, Vascodagama, James cook, Cahristopher Columbus – Contribution of modern geographyers : varenias, Immanual Kant, Alexander Von Humbolt, Carl Ritter - Determinism and Possibilism, New Determinism – Contributions of Radzel, Ellensemple, La blaches, Ellsworth, Huntington, Griffith Taylor

Unit-3	DUALISM IN GEOGRAPHY

Dualism in Geography: Systematic and regional geography: Physical and human geography - The myth and realism about dualisms – Regional Geography: Concepts of a region, regionalization and regional methods - Scientific explanations: Deductive, inductive logic; types of explanations – cogitative description – cause and effect – temporal, functional and ecological systems

Unit-4	MODELS AND QUANTITATIVE REVOLUTION IN GEOGRAPHY

Theories and models in geography – quantitative revolution and paradigms - Themes in Geography – Positivism – Pragmatism – Behaviourism – functionalism – idealism – realism and Marxism

Unit-5	STATUS OF MODERN GEOGRAPHY

Modern political ideas – Heartland concept of Halford Mackindei – Rimland Theory of Spikeman – Social Darwinism of F.Ratzel - conceptual and methodological developments and changing paradigms; status of Indian Geography, Future of geography;

Unit-6	CONTEMPORARY GEOGRAPHY

Geography in the Face of Modern World Challenges

Expected Course Outcomes:

1	Recall ancient scholars' contribution to geography	K1, K2

2	Evaluate contribution of modern geographer to geography and ability to analysis determinism and possibilism in geography	**K2, K5**
3	Assessment of dualism concept in geography	**K4, K5**
4	Apply quantitative revolution in geography	**K3, K5**
5	Discuss various theories, themes, models in geography and evaluate modern political ideas based on location	**K3, K6**

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

Text Book(s)

1	Rana, Lalita. Geographical thought. Concept Publishing Company, 2008.
2	Martin, G. J. (2005). All possible worlds: A history of geographical ideas. OUP Catalogue.
3	Nayak, A., & Jeffrey, A. (2013). Geographical thought: An introduction to ideas in human geography. Routledge.
4	Cloke, P., & Johnston, R. (Eds.). (2004). Spaces of Geographical Thought: Deconstructing Human Geography′s Binaries. Sage.

Reference Book(s)

1.	Johnston, R. (2018). A Student's Introduction to Geographical Thought: Theories, Philosophies, Methodologies.
2.	May, J. A. (2019). Kant's concept of geography and its relation to recent Geographical thought. University of Toronto Press.
3.	Amedee, D., Golledge, R.G., 1975. An Introduction to the Scientific Reasoning in Geography, Random House, New York
4.	Anoop Nayak, Alex Jeffrey, 2013. Geographical Thought: An Introduction to Ideas in Human Geography, Routledge publication, ISBN:1317904125, 9781317904120
5	Beazley C.R., 1949. The Dawn of Modern Geography Vol.III, New York.
6	Fuchs R.J., and Demke G.J., 1977. Theoretical Problems of Geography, Ohio State Press, Ohio.
7	Haggett, P., 1966. Locational Analysis in Human Geography, New York.
8	Hartshorne R.1959. Perspective and Nature of Geography", Rand Mc Nally and Co., New Delhi.
9	Lalita Rana, 2008. Geographical thought - Concept Publishing Company, ISBN 8180695360, 9788180695360
10	Mackiner H.J., 1904. The Geographical Pivot of History, Geographical Journal, Vol.23
11	Majid Husain, 2015. Evolution of Geographical Thought, 6th edition - Rawat Publications, New Delhi.

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

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

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)**					

Course code:		THEORETICAL ECONOMIC GEOGRAPHY	L	T	P	C
Core/Elective	**Core Course 8**					
Pre-requisite	Basic knowledge in Geography					

Course Objectives:

1. Provide students with the contextual information of the spatial distribution and spatial interaction of economic activities
2. Understanding concept of space and economic principles with reference to geography.
3. Obtain an understanding of spatial and non-spatial data models
4. Understand and analyze the industrial locational models and their relevance to present scenario and critically analyse the economies of scale and agglomeration in heterogeneous landscape
5. Apply Geospatial technology in economic geography and regional planning for solving the spatial problems.

Unit - 1	**Economic Activities in Space**

Economic activity in space: basics - principles of location, distance and resource utilisation economic principles of demand, supply price and transactions and markets.

Unit - 2	**Basic concepts in spatial Analysis and spatial Organization**

Basic concepts: spatial analysis and spatial organisation; economic activity, interaction and economic landscape – primary activities and land rent- theory of isolated state

Unit - 3	**Principles of Demand-Supply and Scales of economics**

Principles of demand, supply, market, economies of scale; scale agglomeration, cost and price; the principles of heterogeneous landscape and resource variation – utility curve

Unit - 4	**Economic Activities**

Economic activities: primary - location and interaction mechanism - Von-Thunen location theory - application in time-space environment; manufacturing activity- Smith, Weber and Isard; tertiary activity- Christaller, Losch and Perrou

Unit - 5	**Economic Geography and its Applications**

Applications of geospatial technology in economic geography; regional planning - concepts of growth centres, area and sectoral plans - recent trends and scope of economic geography - new approaches to spatial policy issues - public policy

Unit - 6	**Contemporary Issues**

Contemporary issues and challenges

Expected Course Outcomes:

1	Develop an understanding of concepts and issues related to the spatial interactions of the economy	**K1, K2**
2	Understanding the theoretical developments and ability for problem solving	**K2, K3**

3	Develop the ability to analyze – critically – current issues related to economic geography with special reference to planning and development	**K3, K4**
4	Developing the ability to analyze spatial public policy and solve the spatial problems using geospatial technology	**K4, K6**
5	Develop an understanding of concepts and issues related to the spatial interactions of the economy	**K4, K5**

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

Text Book(s)

1	Boyce, R.R. (1974). "The Basis of Economic Geography", Holf Rinehart and Winston Inc. New York
2	Lloyd, P.E., and P.Dicken (1992). "Location in Space: A Theoretical Approach to Economic Geography", Harper International Edition

Reference Book(s)

1.	Abler, Adam and P.Gould (1972). Spatial Organisation: A Geographer's View of the World. Englewood Cliff. New Jersey.
2.	Baldwin, R., R. Forslid, P. Martin, G. Ottaviano and F. Robert-Nicoud, (2003). Economic Geography and Public Policy, Princeton.
3.	Fujita, M., P.R. Krugman and A.J. Venables, (1999). The Spatial Economy, MIT Press.
4.	Smith, D.E. (1971) Industrial Location: An Economic Geographical Analysis, John Wiley and Sons., New York.

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

1	https://www.tandfonline.com/toc/recg20/current
2	https://library.oapen.org/bitstream/id/ecf6e3e2-91ba-4cf4-952d-c04d4bbe4704/1005865.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

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)**					

Course code:		PRACTICAL-III: REMOTE SENSING AND MODERN SURVEY	L	T	P	C
Core/Elective	Core Course 9		1	0	3	4
Pre-requisite	Basic knowledge in remote sensing and soft skill of basic computing					

Course Objectives:

1. To train students on remote sensing data type and formats, imagery products and their availability.
2. To give insights on processing methods and techniques for handling radiometric and geometric properties of remotely sensed
3. To give principles and methods of multi-resolutions and multi-spectral data fusion, multi-temporal processing and accuracy assessment.
4. To develop data processing automation through batch processing
5. To create necessary skills to generate and analyze high level remote sensing products

Unit - 1	INTRODUCTION TO DIGITAL IMAGE PROCESSING

Introduction – familiarising Image processing display systems; Initial statistical extraction - univariate and multivariate statistics, histogram and its significance in remote sensing data; Pre-processing - Introduction, missing scan lies, desk tripping methods, geometric correction and registration, atmospheric corrections, illumination and view angle effects

Unit - 2	INTRODUCTION TO SURVEYING

Surveying – Principles and Types – traditional and modern survey (Technologies and equipment's) – merits and demerits of traditional surveys - automated survey systems – GNSS and GPS basics and real time application - Aerial Photogrammetry – Map Projections and Datum - Stereoscopes (Scales and Overlaps) – methods of stereoscope viewing – Parallax measurements– determination of height from aerial photos - interpretation of stereo pair

Unit - 3	IMAGE ENHANCEMENT TECHNIQUES & DIGITAL IMAGE CLASSIFICATION

Linear and Non- Linear Contrast Enhancement, Band Rationing, Edge Enhancement, High and Low Pass Filtering, Density Slicing

Classification - Geometrical basis of classification, unsupervised classification, supervised classification techniques - training sample selection, parallelepiped classifier, centroid classifier, maximum likelihood method, Hybrid methods and decision - tree classifiers. Use of external data, contextual information, feature - sub-feature study.

Unit - 4	ACCURACY ANALYSIS

Accuracy Analysis: Producer Accuracy, User Accuracy, Overall and Mapping Accuracy, Kappa Coefficient

Unit - 5	GEOSPATIAL ANALYSIS

Spatio-temporal analysis: Change detection - the nature of change detection, change detection algorithms, image differencing, and image rationing and classification comparisons; Surface Analysis: DEM – Watershed Analysis – Flow direction and accumulation model - Map modelling and applications.

Unit - 6	CONTEMPORARY ISSUES

Local Field visits – Signature set collection - group discussions related to current issues in Remote Sensing applications

Expected Course Outcomes:	
1	Understand quantitative remote sensing principles and integrate different tools for remote sensing data analysis.	**K2, K1**

2	Perform image corrections and enhancements and generate high level remote sensing products	**K2, K4**
3	Manipulate and process remote sensing data using manual and automated techniques	**K3, K5**
4	Critically compare different type of remote sensing data products and analysis technique and select the more appropriate to solve a real-world problem.	**K3, K6**
5	Create and analyze digital images using remote sensing technologies	**K5, K6**

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

Text Book(s)

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.

Reference Book(s)

1	Robert, G. Reeves (1983),"Manual of Remote Sensing Vol. I and II", American Society of Photogrammetry, Falls, Church, USA.
2	Richards (1993),"Remote sensing digital Image Analysis – An Introduction", Springer –Verlag.
3	Rafael C. Gonzalez,Richard Eugene Woods (2008),"Digital Image Processing," Pearson/ Prentice Hall.
4	Annadurai (2007),"Fundamentals of Digital Image Processing",Pearson Education.

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

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	2	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)**					

Course code:		POLITICAL GEOGRAPHY	L	T	P	C
Core/Elective	**Elective Course 5**		2	1	0	3
Pre-requisite	NIL					

Course Objectives:
1. Understanding key concepts in political geography, geopolitics approaches and recent developments
2. Apply geographic concepts to analyze how human agency interacts with the physical environment to shape and reshape political geographic outcomes
3. Analyzing the geopolitical significance of Indian ocean and its importance
4. Critically analyse political geography of contemporary India with various issues and conflicts

Unit - 1	**POLITICAL GEOGRAPHY: NATURE, SCOPE, APPROACHES AND SCHOOLS OF THOUGHT**

Nature, scope and subject matter of political geography; political geography and geopolitics - approaches to the study of political geography, recent development in political geography; major schools of thought.

Unit - 2	**GEOGRAPHIC ELEMENTS AND THE STATE**

Geographic elements and the state: physical elements; human elements; economic elements; political geography and environment interface

Unit - 3	**POLITICAL GEOGRAPHY: THEMES**

Themes in political geography: state, nation, nation-state and nation-building, frontiers and boundaries, colonialism, decolonization, neocolonialism, federalism and other forms of governance - The changing patterns of world powers perspectives on core-periphery concept, conflicts and cooperation.

Unit - 4	**GEOPOLITICAL SIGNIFICANCE IN INDIAN OCEAN**

Geopolitical significance of Indian ocean: political geography of any one of the following regions: SAARC Region, South-East Asia, West Asia, East Asia

Unit - 5	**POLITICAL GEOGRAPHY – CONTEMPORARY INDIA**

Political geography of contemporary India with special reference to: The changing political map of India, unity - diversity: centripetal & centrifugal forces; stability & instability; Interstate issues (like water disputes & riparian claims) and conflict resolutions insurgency in border states; emergence of new states; federal India: unity in diversity.

Unit - 6	**CONTEMPORARY ISSUES**

Contemporary issues

Expected Course Outcomes:		
1	Developing an understanding of political geography and its influence in politics	**K1, K2**
2	Able to apply spatial analysis methods to assess physical and human environment to shape and reshape political geographic outcomes	**K3, K4**

3	Understand the themes of political geography in relation to nation, state, nation-building, frontiers and boundaries.	**K2, K3**
4	Ability to analyse critically the conflicts in India and geopolitical significance of Indian ocean and its importance	**K4, K5**
5	Ability to describe the contemporary issues, conflicts and challenges surrounding the Indian regions – SAARC, South-east Asia, West and East Asia.	**K4, K6**

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

Text Book(s)

1	Dikshit, R.D., 1999. Political geography: A Century of progress, Sage, New Delhi.
2	John R., 1982. Short: An introduction to Political Geography Routledge, London,
3	Panikkar K. M., 1959. Geographical Factors in Indian History: 2 vols. Asia Publishing House, Bombay.
4	Pounds N.J.G., 1972. Political Geography. McGraw Hill, New York.
5	Joe Painter and Alex Jeffery.2009 Political Geography, 2nd Ed. Sage in 2009 with a reprint in 2012 (ISBN 978-1-4129-0138-3).

Reference Book(s)

1	Alexander, L.M., 1963. World Political Patterns Ran McNally, Chicago,
2	De Blij, H. J., Glassner, 1968. Martin Systematic Political Geography, John Wiley, New York.
3	Deshpande C.D., 1992. India-A Regional Interpretation Northern Book Centre, New Delhi.
4	Dikshit, R.D., 1996. Political Geography: A Contemporary Perspective. Tata McGraw Hill, New Delhi
5	Fisher Charles A., 1968. Essays in Political Geography, Methuen, London
6	Sukhwal, B.L., 1968. Modern Political Geography of India Sterling Publishers, New Delhi.

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

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

MPO	PSO 1	PSO2	PSO3	PSO4	PSO 5
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

Mapping with Programme Outcomes (MPO)*

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)**

Course code:	GEODATABASE PROGRAMMING		L	T	P	C
SEC 2	Skill Enhancement Course 2					
Pre-requisite	Prior knowledge in Soft skill					

Course Objectives:

1. Understand Spatial Data
2. Familiarizing with statistical techniques and processes
3. Gaining practical knowledge with regard to Big Data, Data Security and Cloud Computing.

Unit - 1	Data science

Classification, Regression, Similarity matching. - Algorithms Used in Data Science: Supervised learning: Linear/Logistic regression, Decision trees, Naïve Bayes. Unsupervised learning: K-means clustering, Association rules, Apriori, EM (expectation-maximization), Support vector machine(SVM), Naïve Bayesian - Collaborative Filtering.

Unit - 2	GIS and Remote Sensing data, Formats & exchange

Image storage formats, Data retrieval & Data compression techniques. Data Structures: Geographical data; spatial & non spatial, geographical data in computers, Spatial data Model – (i) Cartographic Map model – Raster structure, Quad tree Tessellation (ii) Geo-relational Model – Vector Data structure, Advantages & Disadvantages of Both.

Unit - 3	Understanding Spatial Data Science

Understanding of Spatial Data Science, Machine learning, spatial data mining, spatial indexing, Spatial data mining, Spatial data visualization, Spatial effects, Spatial data structures, spatial computing, Spatial data and spatial analysis, Spatial DBMS, Relational DBMS for spatial data, Spatial Hadoop and GIS Tools for Hadoop..

Unit - 4	Big Data security

Symmetric Techniques, Asymmetric Techniques, Authentication and Security Analytics. Big Data Technology: Operational vs. Analytical and cloud computing. Open source and commercial big database management system.

Unit - 5	Application & Challenges

Use cases for Spatial Big Data, Features of Spatial Big Data, Challenges of Spatial Big Data, Bigdata for social sciences,

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand Spatial data	K1, K2
2	Developing data analysis skills	K3, K4

3	Identify and Apply analytical techniques	**K3, K5**
4	Be able to identify challenges and deal with solutions for the same	**K4, K5**
5	Incorporate these concepts and techniques into the learning, business as well as related environment	**K4, K6**

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

Reference Book(s)	
1.	Anderson, C. (2008). The end of theory: The data deluge makes the scientific method obsolete. Wired Magazine. Updated 6/23/2008), Available at: http://www. wired. com/science/discoveries/magazine/16-07/pb_theory.
2.	James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
3.	Cathy O'Neil and Rachel Schutt (2013). Doing Data Science, Straight Talk from the Frontline. O'Reilly.
4	Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
5	Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.

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)**					

Course code:		GEOSPATIAL PROJECT PLANNING MANAGEMENT	L	T	P	C
Core/Elective						
Pre-requisite		Basic Knowledge in Research Methodology and Project Management				

Course Objectives:

1. Known to identify research problem and planning for research design
2. learn project planning and management and also design, implementation, monitoring and testing of project
3. Learn data collection methods, class intervals and various statistical analysis software and techniques for research
4. Develop skill for Hypothesis Testing in research Methodology and able to use various statistical software for hypothesis testing
5. Understand steps for writing and publishing a research report and manuscript editing.

Unit - 1	**Research / Project management**

Research Meaning, Research Objectives, Types of Research, and Motivations in Research

Research methods vs. methodology, relevance of research, importance of research

methodology, research process, Project Management: Definition – Nature, Scope and Functions – Evolution of project Management – Management thought in modern trend – Patterns of the project management analysis

Unit - 2	**Research Design/ Project Planning**

Research / Project planning – Identification of problem – problem statement – Research design and breakdown of the steps, Associated software and tools – (Primavera, MS project, Open Project)

Unit - 3	**Project planning and management**

 Project planning and management – initiation – design and development – implementation – monitor and testing – project closing - tools and techniques in PM – Global PM scenarios (BMI – PMBOK – Prince2 – M2M – IPMA etc.,)

Unit - 4	**Testing**

 EDA and Design: Data collection and collection of data – univariate methods and graphs – bivariate and trivariate graphs –multivariate methods and graphs – EMA (Exploratory Map Inferences from analysis - hypothesis testing parametric and non-parametric tests – Z,t, F tests, X2 and KS Tests and applications.

Unit - 5	**Report Writing and Publishing**

Report Writing and Publishing: Reports, seminar papers (short and long) and dissertations – open source tools in research and reporting (example: Mind Map, PAST, Gretl, GeoDa, Zotora, Nevernote and Lyx/script) - basics of manuscript editing for the press – language and ethics in reporting.

Unit - 6	**Contemporary Issues**

 Contemporary updates project management

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Recall identification of research problem and develop research design	**K1, K2**
2	Apply bibliographic tools in research and use various writing style manual	**K2, K3**
3	Plan for data collection and construct class intervals method to classify the data	**K3, K4**
4	Develop skill for use various statistical software for hypothesis testing	**K4, K5**
5	Prepared for writing and publishing a research report and manuscript editing, Apply new techniques and use different research tools	**K4, K6**
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create		
Text Book(s)		
1	Smith, P. G., & Merritt, G. M. (2020). Proactive risk management: Controlling uncertainty in product development. productivity press.	
2	Kothari, Chakravanti Rajagopalachari. Research methodology: Methods and techniques. New Age International, 2004.	
3	Kumar Ranjit (2011). 'Research Methodology a step-by-step guide for beginners', New Delhi: SAGE Publication India Limited.	
4	Meredith, J. R., Shafer, S. M., & Mantel Jr, S. J. (2017). Project management: a strategic managerial approach. John Wiley & Sons.	
5	Marchewka, J. T. (2016). Information technology project management: Providing measurable organizational value. John Wiley & Sons.	
Reference Book(s)		
1.	Verma, S. P. Practical approach to research methodology. Akansha Publishing House, 2005.	
2.	Goddard, Wayne, and Stuart Melville. Research methodology: An introduction. Juta and Company Ltd, 2004.	
3.	Singh, Yogesh Kumar. Fundamental of research methodology and statistics. New Age International, 2006.	
4.	Gast, David L. Single subject research methodology in behavioral sciences: Applications in special education and behavioral sciences. Routledge, 2009.	
5.	Layton, M. C., Ostermiller, S. J., & Kynaston, D. J. (2020). Agile project management for dummies. John Wiley & Sons.	

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://methods.sagepub.com/reference/sage-encyc-qualitative-research-methods/n343.xml
2	https://www.adelaide.edu.au/course-outlines/109846/1/sem-1/
3	https://www.researchgate.net/publication/319229966_Methodologies_used_in_Project_Management
4	https://study.com/academy/lesson/what-are-project-management-methodologies-types-examples.html
5	https://www.pmi.org/pmbok-guide-standards/foundational/PMBOK

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)**					

Course code:		EMOTIONAL INTELLIGENCE AND ACADEMIC PERFORMANCE	L	T	P	C
AEC 3		Ability Enhancement Course				
Pre-requisite		No prior knowledge in Soft skill				

Course Objectives:
4. Learned about emotional intelligence, what it is, and how you can use it.   5. Acquired awareness of one's emotions and learned how to manage them.   6. Examined ways to improve personal emotional intelligence and for better academic performance.   7. An awareness of others' emotions, inspiring high performance by responding to those emotions   8. Considered consequences of behaviour before acting and weighed decisions carefully

Unit - 1	Emotional Intelligence Basic
Emotional Intelligence: Concept of Emotional Intelligence, Understanding the history and origin of Emotional Intelligence.	

Unit - 2	Science of Emotional Intelligence
Contributors to Emotional Intelligence, Science of Emotional Intelligence, EQ and IQ, Scope of Emotional Intelligence	

Unit - 3	Components of Emotional Intelligence
Components of Emotional Intelligence: Self-awareness, Self-regulation, Motivation, Empathy, Social skills. Emotional Intelligence Competencies.	

Unit - 4	Models of Emotional Intelligence
Elements of Emotional Intelligence, Models of Emotional Intelligence: The Ability-based Model, The Trait Model of Emotional Intelligence, Mixed Models of Emotional Intelligence. Emotional Intelligence at Work place: Importance of Emotional Intelligence at Work place? Cost–savings of Emotional Intelligence,	

Unit - 5	Importance of Emotional Intelligence
Emotionally Intelligent Leaders, and Case Studies Measuring Emotional Intelligence: Emotionally Intelligence Tests, Research on Emotional Intelligence, Developing Emotional Intelligence.	

Unit - 6	Contemporary Issues
Contemporary issues Emotional intelligence in Academic performance.	

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Identify the benefits of having a higher level of emotional intelligence	K1, K2
2	Developing emotional intelligence involves learning four core skills	K3, K4

3	Identify and practice the principles of self-management, self-awareness, self-regulation, motivation, and empathy	**K3, K5**
4	Be able to demonstrate empathy in a wide variety of situations	**K4, K5**
5	Incorporate these concepts and techniques into the learning environment	**K4, K6**

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

Text Book(s)	
1	Babaei, Bahare, and Ali Abdi. "Textbooks Content Analysis of Social Studies and Natural Sciences of Secondary School Based on Emotional Intelligence Components." Universal Journal of Educational Research 2.4 (2014): 309-325
2	Nelson, Darwin B., and Gary R. Low. Emotional intelligence. Boston: Prentice Hall, 2011.
3	Wolfe, Kara. "Enhancing the Emotional Intelligence of Students: Helping the Critical Few." Journal of the Scholarship of Teaching and Learning 19.3 (2019): 16-33.

Reference Book(s)	
1.	Nguyen, Tiffany, et al. "Emotional intelligence and managerial communication." American Journal of Management 19.2 (2019): 54-63.
2.	Koc, E. (Ed.). (2019). Emotional intelligence in tourism and hospitality. CABI.
3.	Goleman, D. (2012). Emotional intelligence: Why it can matter more than IQ. Bantam.
4.	Ubago-Jiménez, J. L., González-Valero, G., Puertas-Molero, P., & García-Martínez, I. (2019). Development of emotional intelligence through physical activity and sport practice. a systematic review. Behavioral Sciences, 9(4), 44.
5.	Bradberry, T., & Greaves, J. (2009). Emotional Intelligence 2.0. TalentSmart.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://positivepsychology.com/teaching-emotional-intelligence/
2	https://www.helpguide.org/articles/mental-health/emotional-intelligence-eq.htm
3	https://future-students.uq.edu.au/stories/why-emotional-intelligence-important-students
4	https://gradepowerlearning.com/emotional-intelligence-for-kids/
5	https://www.verywellfamily.com/strategies-for-increasing-emotional-intelligence-460606

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)**					

Semester-IV

Course code:	C10	GEOGRAPHY OF INDIA AND PLANNING	L	T	P	C
Core/Elective		Core	2	1	0	3
Pre-requisite		Basic Knowledge in Geography				

Course Objectives:

1. To learn the physical setting of Indian topography and climatic condition
2. To understand soil characteristics and agriculture distribution
3. To knows population characteristics and distribution
4. To get knowledge of trades and transport systems of India
5. To study disaster zones of India

Unit - 1	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 - 2	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, Environmental,

Unit - 3	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 - 4	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 - 5	**NATURA DISASTER**

Natural Disasters in India (Earthquake, Drought, Flood, Cyclone, Tsunami,

Himalayan Highland Hazards and Disasters.

Unit - 6	**CONTEMPORARY ISSUES**

Space relationship of India with neighbouring countries; Regional disparities in economic development; Concept of sustainable growth and development; Environmental awareness; Linkage of rivers; Globalisation and Indian economy.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the physical, cultural, economic, and demographic aspects with reference to India and pursue it for further research.	**K1, K2**
2	To analysis soil types and variation of vegetation	**K2, K3**
3	Acquaint with the distinctiveness of geographic regions as the field of learning in Geographical studies	**K3, K6**
4	To evaluate various transport network system of India	**K4, K5**
5	To apply sustainable concept to natural resource	**K4, K6**

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

Text Book(s)

1	Deshpande, C.D. (1992). India – A Regional Interpretation. , New Delhi, ICSSR and Northern Book Centre
2	Nag, P., & 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: A Future with a Difference. Allied Publishers, 1998.
7	Marg, Bahadur Shah Zafar. "INDIAN GEOGRAPHY."

Reference Book(s)

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

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

1	https://www.india.gov.in/india-glance/profile
2	https://www.jstor.org/stable/1773463
3	https://www.nature.com/articles/001413a0
4	https://asiasociety.org/education/india-geographic-sketch

5	https://www.insightsonindia.com/indian-geography//

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)**

Course code:	C11	REGIONAL PLANNING				
Core/Elective		**Core Courses**				
Pre-requisite	Basic Knowledge in Geography					

Course Objectives:

1. To understand the concepts and theories in regional planning
2. Describe the characteristics of an ideal planning region and regionalization of India for planning purpose
3. Focus on the exploration of changing concept of development and emphasizing the promotion of equitable and economical use of natural and human resources to improve the quality of life.
4. Discuss the global pattern of development and Learn variation in inter regional development
5. Application of geospatial technology in regional planning.

Unit - 1	**REGIONAL PLANNING**

Definition of region, evolution and types of regional planning: formal, functional, and planning regions and regional planning; need for regional planning; types of regional planning.

Unit - 2	**PLANNING REGION**

Choice of a region for planning: characteristics of an ideal planning region; delineation of planning region; regionalization of India for planning (Agro Ecological Zones)

Unit - 3	**THEORIES AND MODELS FOR REGIONAL PLANNING**

Theories and models for regional planning: growth pole model of Perroux; growth centre model in Indian context; Myrdal, Hirschman, Rostow and Friedmann; village cluster

Unit - 4	**CONCEPT OF DEVELOPMENT**

Changing concept of development, concept of underdevelopment; efficiency-equity debate - measuring development: indicators (economic, social and environmental)

Unit - 5	**GLOBAL PATTERN OF DEVELOPMENT**

Global pattern of development: inter-regional variations; human development: international, interstate comparison of India – geospatial technology and regional planning

Unit - 6	**CONTEMPORARY ISSUES**

Contemporary Issues

Expected Course Outcomes:

1	Acquire a general understanding of the major concepts and theories in the fields of regional development and Planning.	**K1, K2**
2	Identify, appreciate and use models and principles for policy formulation	**K4, K5**
3	Evaluate regional development planning polices	**K4, K5**

4	Acquire ability to prescribe appropriate strategies for regional development at appropriate level of governance	**K3, K6**
5	Comprehensive understanding on contemporary issues and challenges in relation to regional development.	**K1, K6**

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

Text Book(s)

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	Glikson (1955). Arthur: Regional Planning and Development, Netherlands Universities foundation for International Co-operation, London.
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.

Reference Book(s)

1	Misra, R.P. (1969). Regional Planning: Concepts, Techniques and Policies, University of Mysore, Mysore.
2	Misra, R.P. (1974). Regional Development Planning in India-A Strategy, Institute of Development Studies, Mysore.
3	Mitra, A., (1965). Levels of Regional Development, Census of India, Vol.I, Part IA(I) and (ii), New Delhi.
4	Myrdal, G., (1957). Economic Theory and Under-Development Regions, Gerald Duckworth, London.
5	Janki Jiwan (2021).Regional Development And Planning. Rawat Publication.
6	Vishwambhar Nath (2009).Regional Development and Planning in India. Concept Publishing Company.
7	Allen G. Noble, Frank J. Costa, Robert B. Kent (1998). Regional Development and Planning for the 21st Century, Routledge.

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

1	https://www.ancpatna.ac.in/departments/geography/lectures/PG%20Sem-II/M%20A%20II%20delinsn%20of%20region-%20Bhawana%20Nigam.pdf.
2	https://www.researchgate.net/publication/245381193_Regional_Development_Theory_Conceptual_Foundations_Classic_Works_and_Recent_Developments/link/546f4bdb0cf2d67fc03109fe/download
3	http://www.dspmuranchi.ac.in/pdf/Blog/Regional-Planning-All_Part-Conc.pdf
4	http://www.dspmuranchi.ac.in/pdf/Blog/Regional_Planning_Techniques.pdf.

Mapping with Programme Outcomes (MPO)*

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

Course code:	C12	SPATIAL ANALYSIS AND MODELLING				
Core/Elective	**Core**					
Pre-requisite		**Basic Knowledge in Cartography**				

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.
3. Understand the theoretical and practical concepts pertaining to map making.
4. Assess the importance of the spatial models, applications and tools for spatial analysis currently prevailing in the field of GIS.
5. Apply the GIS concepts to create, analyze and interpret the spatial maps in the field of geospatial technology.
6. Suggest tools and techniques for execution of spatial operations.

Unit - 1	**FUNDAMENTALS OF MAPPING AND EXPLORATION**

Map exploration - Georeferencing – map projection and transformation – spatial entity creation – digitization – symbolization - attribute data editing – labelling and annotation – map design and layout - Editing and topology: building topology, topology error rectification – edge matching – rubber sheeting

Unit - 2	**SPATIAL DATA EDITING AND ANALYSIS**

Attribute data management and thematic mapping: quantitative and qualitative mapping, dot map, located pie chart and bar chart – Proximity analysis – overlay analysis – heat maps – flow maps - Geotagged photographs.

Unit - 3	**SPATIAL ANALYSIS AND SPATIAL STATISTICS**

Network analysis – Geocoding - location and allocation models; spatial statistics: Measurement- Mean Center, Median Center, Standard Distance; Least cost path Analysis; Real time data visualization

Unit - 4	**TERRAIN AND SURFACE ANALYSIS**

Surface analysis and Interpolation techniques: Creation of Contours, Slope, Aspect, Kriging, Spline, Inverse Distance Weighted (IDW) – 3D visualization: DEM, TIN.

Unit - 5	**SPATIAL APPLICATIONS AND MODELLING**

Ground truth support: GPS with field data attributes - Suitability analysis and modelling: habitat suitability – house hunting – noise pollution modelling – hydrological modelling

Unit - 6	**WEB GIS**

Geospatial Web Services: Publishing map using QGIS – Interactive Mapping and Visualization: Google Earth Engine – Web Map Publishing – Geoserver – Data Storage: PostgreSQL and PostGIS

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 Book(s)

1.	Aronoff, S. (1991). Geographic Information Systems: A Management Perspective, WDL Publications, 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., & 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
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.*

Reference Book(s)

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
4	https://www.researchgate.net/publication/301561923_Introduction_to_GIS_A_practical _based_Lab_work_for_beginners
5	http://edshare.soton.ac.uk/19460/
6	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.466.1262&rep=rep1&type=p df

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)**					

Course code:	E 06	NATURAL HAZARDS & DISASTER MANAGEMENT				
Core/Elective	**Elective**					
Pre-requisite	Basic Knowledge in Geography					

Course Objectives:

7. To orient students about various natural and manmade disasters
8. To teach the concept of Disaster management and measures to be taken at different stages of disaster management
9. To provide insight about global, national and regional level scenario of disaster management
10. To train students in doing Risk assessment and Vulnerability analysis
11. To teach students vulnerability reduction strategies

Unit - 1	Introduction

Hazard, Risk, Vulnerability, Disaster; Disaster Management, Meaning, Nature Importance, Dimensions & Scope of Disaster Management, Disaster Management Cycle. National disaster management framework; financial arrangements for Disaster Management, International Strategy for Disaster reduction.

Unit - 2	Natural Disasters

Natural Disasters- Meaning and nature of natural disasters, their types and effects, Hydrological Disasters - Flood, Flash flood, Drought, cloudburst. Geological Disasters- Earthquakes, Landslides, Avalanches, Volcanic eruptions, Mudflow. Wind-related- Cyclone, Storm, Storm surge, tidal waves. Heat and cold Waves, Climatic Change, Global warming, Sea Level rise, Ozone Depletion

Unit - 3	Man-made Disaster

CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters. Fire – building fire, coal fire, forest fire, Oil fire. Accidents- road accidents, rail accidents, air accidents, sea accidents. Pollution and deforestation- air pollution, water pollution, deforestation, Industrial

wastewater pollution, deforestation.

Unit - 4	Disaster Determinants

Factors affecting damage – types, scale population, social status, habitation pattern, physiology and climate. Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate,

Unit - 5	Disaster Management Information Sources Forecasting & warning:

Indian meteorological department, tsunami warning centre, pacific

disaster centre, central water commission; Resources: UNISDR, USAID, Red Cross ,Indian

disaster resource network; Other: National disaster management authority, National Institute of disaster management, National Geophysical Research Institute, Bhuwan, National disaster response force, State and district disaster management centre

Unit - 6	Strategic development for Vulnerability reduction

Physical & Social infrastructure for Vulnerability reduction, Interactive areas for Vulnerability

reduction & Policymaking, Hazard resistant designs and construction, System management Strategic planning for vulnerability reduction

Expected Course Outcomes:

1	Students will learn different disasters and measures to reduce the risk due to these disasters.	**K1, K2**
2	Students will learn institutional frame work for disaster management at national as well as global level	**K2, K3**
3	The student will get familiarised with the ecosystem and issues related to the environmental system..	**K3, K6**
4	students can act as First Respondent and can handle Onsite situations	**K4, K5**
5	will help students in building a safer environment through sustainable development. At the end of this course, students are expected to carry out pre and post-disaster damage assessments, understand disaster recovery and the role of different agencies in the rehabilitation	**K4, K6**

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

Text Book(s)

1.	Disaster Administration and Management, Text & Case studies- SL Goel-Deep and Deep Publications
2.	Disaster Management- G.K Ghosh-A.P.H. Publishing Corporation
3.	Disaster management – S.K.Singh, S.C. Kundu, Shobha Singh A – 119, William Publications, New Delhi.
4.	Disaster Management – Vinod K Sharma- IIPA, New Delhi,1995
5.	Encyclopedia of Disaster Management- Goel S.L. - Deep and Deep Publications, New Delhi, 2006.

Reference Book(s)

1.	Disaster Administration and Management, Text & Case studies- SL Goel-Deep and Deep Publications
2.	Disaster Management- G.K Ghosh-A.P.H. Publishing Corporation
3.	Disaster management – S.K.Singh, S.C. Kundu, Shobha Singh A – 119, William Publications, New Delhi.
4.	Disaster Mitigation and Management Post – Tsunami Perspectives P, Jagadish Gandhi

5.	Disaster Mitigation – Experiences and reflections – By Pradeep sahni - Prentice – Hall of India
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
4	https://www.researchgate.net/publication/301561923_Introduction_to_GIS_A_practical_based_Lab_work_for_beginners
5	http://edshare.soton.ac.uk/19460/
6	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.466.1262&rep=rep1&type=pdf

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)**					

Course code:	PCC	PROJECT WORK			
Core/Elective	**Professional Competency Course**				
Pre-requisite	Students shall meet with their supervisors throughout semester for guidance and assistance in researching the background to their project area				

Course Objectives:

1. Think beyond the classroom, practical work and help them to comprehend the skills, knowledge and confidence in the specific subject area
2. Exercise students' understanding and skills acquired in MSc programme by applying them to a practical problem
3. Understanding of current work in the field and ability to plan a research project
4. Understanding and ability to carry out an investigative science project
5. Developing skills in scientific writing for publication in referred journals

PROJECT WORK

The Project Work is an extended piece of work carried out (largely) independently. A faculty member will be assigned as advisor for each student based on expert knowledge in the subject area. In addition to Guide, Departmental Committee also interact with students through presentations and other means of discussion for creating professional experience in the specific field. Guidelines and other details for the Project Work/ Dissertation will be provided by the department.

Students are encouraged to carry out projects in collaboration with industry, or in support of research projects in the Department of Geography / Government departments / National Research Institutes/UN agencies / NGO's. etc.

The project can be taken highlighting any issue relating to geographic knowledge and analysis. The project is for addressing problems relating to spatial data gathering, mining, warehousing and or raster / vector analysis and modelling. Programming or script writing can also be theme for the project, if it involves spatial data handling or analysis or modelling or in combinations of all. All data analysis and survey related projects shall necessarily present in a series of thematic maps. At the end of the project work, students have to present a seminar.

Expected Course Outcomes:

1	Gaining ability to capture, analyze and present geospatial data for visualisation	**K2, K4**
2	Demonstration of depth of technical understanding and application skills	**K3, K5**
3	Demonstration of ability to critically analyse other work and come up with original ideas with creative contribution	**K1, K4**
4	Ability to analyze the results and draw conclusions from the research work	**K4, K5**
5	Ability to write academic/ scientific report for a specific topic to solve the spatial problems	**K5, K6**

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

Text Book(s)

1	Douglas Amedeo, Reginald G.Golledge (1975). An Introduction to Scientific Reasoning in Geography; John Wiley & sons Inc. New York.

2	H.N.Misra, and Vijai P.Singh (1998). Research Methodology Social, Spatial and Policy Dimensions; Rawat Publications, New Delhi.
3	William Strunk(2005) The Elements of Style: A Style Guide for Writers, ISBN 0-97522-980-X, http://academic.csuohio.edu/simond/courses/elos3.pdf
Reference Book(s)	
1.	Council of Science Editors. Scientific Style and Format: The CSE Manual for Authors, Editors, and Publishers. 7th ed. Reston, VA: Council of Science
2.	Humbert M. Blacock, J.R,Ann B. Blalock (1971). Methodology in Social Research; Mc GRAW HILL – London.
3.	Kothari C.R (2004). 'Research Methodology Methods and Techniques', New Delhi: New Age International Publication.
4.	Kumar Ranjit (2011). 'Research Methodology a step by step guide for beginners', New Delhi: SAGE Publication India Limited.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	APA Citation Guide - University Libraries - The Ohio State University http://www.lib.ohio-state.edu/sites/guides/apagd.html Examples of citations using the Publication Manual of the American Psychological Association (APA).
2	APA Style.org Frequently Asked Questions: http://www.apastyle.org/faqs.html Chicago Manual of Style Examples of Chicago-Style Documentation http://www.chicagomanualofstyle.org/tools.html
3	Examples of citations using the Chicago Manual of Style. Chicago Manual of Style Citation Guide - University Libraries - The Ohio State University: http://library.osu.edu/sites/guides/chicagogd.php

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO 1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	3	2	1	2
CO2	1	1	1	1	1
CO3	2	2	1	2	
CO4	1	1	2	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)**					

Course code:	AEC4	Decision Making and Logical Thinking Skills			
Core/Elective/Soft Skill		**Soft skill-IV**			
Pre-requisite		No prior knowledge in Soft skill			

Course Objectives:

1. Analyze the difference between decision and outcome types.
2. A logical decision-making process that establishes the best decision every time.
3. Organize their decision-making process
4. Identify criteria for evaluating options and avoid decision traps.
5. Evaluation of successful decisions to improve future decision-making.

Unit - 1	CONCEPT OF DECISION MAKING

To understand the concept of decision making and nature of decision making. To gain a better understanding of decision-making characteristics. Decisions of different types. To comprehend the different aspects that influence decision-making.

Unit - 2	DECISION-MAKING THEORIES

A better understanding of decision-making theories. Assessing the decision-making process and background, the factors that influence decision making.

Unit - 3	DECISION-MAKING STRATEGIES

Making decisions based on biases, make good decisions by understanding their importance. Identifying good decision-making strategies. Making good decisions more likely.

Unit - 4	SIGNIFICANCE OF DECISION MAKING

Create good academic decisions by understanding their significance. Considerate the process works is essential to making good decisions.

Unit - 5	TECHNIQUES/TOOLS

Good decision-making strategies, Decision Making Techniques/Tools, The Importance of making good decisions. An appropriate approach to solving quantitative problems, Analyze logical relationships to solve problems, solving real-world problems with logical and analytical thinking.

Unit - 6	CONTEMPORARY ISSUES

Contemporary Issues Decision Making and Logical Thinking Skills

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Recent research in cognitive psychology has implications for human decision-making Decision-making by individuals and groups.	**K1, K2**
2	Determine how decision-making systems can be improved by analyzing the academic's systems	**K2, K3**
3	Solve a range of decision situations using tools, techniques, and frameworks	**K3, K4**

4	Maximize effectiveness of decisions by understanding personal decision styles Decision-making by individuals	**K4, K5**
5	Determine the best method to logical thinking and Establish a process for reviewing a decision effectively.	**K4, K6**

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

Text Book(s)

1	Peterson, M. (2017). An introduction to decision theory (2nd ed.). Cambridge University Press. ISBN 13: 978-1316606209
2	George, M. L., Rowlands, D., Price, M., & Maxey, J. (2005). The Lean Six Sigma pocket toolbook. ISBN 13: 978-0071441193
3	Weiten, W. (2021). Psychology: Themes and variations. Cengage Learning

Reference Book(s)

1.	Yin, R. K. (2017). Case study research and applications: Design and methods (6th ed.). Sage Publications. ISBN-13: 978-1506336169.
2.	American Psychological Association. (2019). Publication manual of the American Psychological Association (7th ed.). Washington, DC: Author.
3.	Averweg, U. R. F. (2012). Decision-making support systems: Theory & practice-eBooks and textbooks from bookboon. com. bookboon. com.
4.	Stapleton, P. (2019). Avoiding cognitive biases: promoting good decision making in research methods courses. Teaching in Higher Education, 24(4), 578-586.
5.	Cottone, R. R., Tarvydas, V., & Hartley, M. T. (2021). Ethics and decision making in counseling and psychotherapy. Springer Publishing Company.

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

1	https://www.coursera.org/courses?query=decision%20making
2	https://www.edx.org/learn/decision-making
3	https://www.udemy.com/course/decision-making-problem-solving-crash-course/
4	https://www.mooc-list.com/tags/decision-making
5	https://www.futurelearn.com/courses/decision-making-and-risk

Mapping with Programme Outcomes (MPO)*					
MPO	**PSO 1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	1	1	1	1	2
CO2	1	1	3	1	1
CO3	1	2	1	2	2
CO4	2	1	2	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)**					

Elective	SEC3	Geospatial Intelligence	L	T	P	C
Core/Elective	Geospatial Intelligence		**0**	**1**	**2**	**3**
Pre-requisite	Basic Knowledge in Geography					

Course Objectives:

- Describe the core geospatial intelligence needs related primarily to disaster response, and humanitarian relief efforts, military operations, surveillance, and navigation.
- Design and implement strategies for collecting or sourcing geospatial data and any accompanying metadata.
- Critically evaluate the potential impacts of data quality on spatial analysis and decision-making.
- Apply critical thinking, collaboration, and communication skills.
- Prepare and present intelligence reports tailored to a variety of the human security applications.

Unit - 1	INTRODUCTION GEOSPATIAL INTELLIGENCE

Physical and human geography used to situate geospatial intelligence work, fundamental geographic information science principles and the accompanying geospatial technologies (GIS, GPS, photogrammetry, remote sensing, and sensor networks) for disaster management, humanitarian assistance, and intelligence problem-solving.

Unit - 2	METHODS AND APPROACHES

Methods and approaches for linking legacy geospatial datasets with other kinds of information to yield useful spatial intelligence. Methods and approaches for linking textual information to geographic locations.

Unit - 3	GEOINTELLIGENCE PROBLEM-SOLVING

capabilities and characteristics of various satellite and sensor systems, full motion video, and unmanned aerial vehicles for feature extraction and disaster management, humanitarian assistance, and intelligence problem-solving tasks.

Unit - 4	GEOINTELLIGENCE APPLICATIONS

Role and character of disaster management, humanitarian assistance, and intelligence briefs, imagery and area reports in human security applications. rapidly evolving number and variety of interactive and dynamic products threat and hazard evaluation, Preparation and presentation of predictive analytic conclusions, and the role of situational awareness and the common operating picture in human security applications.

Unit - 5	EMERGING GEOSPATIAL INTELLIGENCE

Exploration new mobile devices and applications, virtual and augmented reality opportunities, and cartographic representations and visualization techniques, Virtual and augmented reality opportunities, and cartographic representations and visualization techniques.

Expected Course Outcomes:

1	Understanding of Geospatial Intelligence	K1, K2
2	Details understanding on Methods And Approaches	K2, K5
3	Analyse and modelling the Geographic data to create geo-intelligence for decision making	K3, K4

4	Complete understanding of Geo-intelligence various applications	**K5, K6**
5	Understanding Emerging trends of Geo-intelligence	**K4, K6**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create
Text Book(s)

1	Anderson, E. 2000. The Geography of Hazard Analysis: Disaster Management and the Military. The Scope of Military Geography. 219-232.
2	Corson, M.W. and Palka, E.J. 2004. Geotechnology, the US military, and war. In Bruun, S.D., Cutter, S.L., and Harrington, J.W. (eds.) Geography and Technology. Dordrecht, The Netherlands, Kluwer: 401-427
3	Rees W.G (2015,"Physical Principles of Remote Sensing", 3rd Edition, Cambridge University Press, New York.
4	Palka, E. 2000. A Decade of Instability and Uncertainty: Mission Diversity in the MOOTW Environment. The Scope of Military Geography. 167-196.
5	Palka, E.J., Galgano, F.A., and Corson, M.W. 2006. Operation Iraqi Freedom: A military geographic perspective. Geographical Review 95: 373-399.

Reference Book(s)

1	USGIF. State and Future of GEOINT: 2015-2019. Reston, VA: United States Geospatial Intelligence Foundation
2	Treverton, G. and Gabbard, B. 2008. Assessing the Tradecraft of Intelligence Analysis, RAND (National Security Research Division).

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