PG DEPARTMENT OF GEOGRAPHY

Choice Based Credit System and Outcome Based Education
Course Structure and Course Work Manual

M.Sc.,Geography

Curriculum Framed From Model Syllabus of

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005

Candidates Admitted Academic Year 2023-2024 Onwards

Kunthavai Naacchiyaar Government Arts College for Women (Autonomous)
Re-Accredited by NAAC with 'B' Grade
Thanjavur, Tamil Nadu, India - 613 007

Affiliated to Bharathidasan University, Tiruchirappalli

PG DEPARTMENT OF GEOGRAPHY

VISION

To Impart Quality Education in Geography to Rural and Economically Weaker Students with Professional Competence and Confidence.

MISSION

- To provide excellent teaching-learning environment with its focus on progressing education using latest technology.
- To enhance students to acquire the core knowledge of the syllabus.
- To encourage students to develop analytical and logical thinking.
- To graduate qualified students with skills and employability.
- To inculcate ethical and moral values.

PROGRAMME OUTCOME (PO) - M.Sc., GEOGRAPHY

After completing the M.Sc., Programme the students will be able to

PO.1 Demonstrate the knowledge of concepts, theories and laws to understand the physical world and human society.

PO.2 Evaluate, the past events influenced physical and human environment at local and global level.

PO.3 Understand human-environment and nature-society interactions as well as various global environmental challenges.

PO.4 Appreciate and interpret topographic sheet, aerial photographs and remote sensing images.

PO.5 Apply the analytical skills obtained in practical geography to address real world problems.

PO.6 Acquire the ability in handling geospatial tools and techniques.

PO.7 Conduct independent research in their field of interest with ethics.

PO.8 Present the research outcome in both written and oral form.

PO.9 Understand how to achieve Sustainable Development Goals (SDGs)

PO.10 Work as Cartographer, Researcher, Teacher/Professor, GIS specialist, Climatologist, Town / Regional planner and Surveyor.

KunthavaiNaacchiyaarGovt.ArtsCollegeforWomen(Autonomous),Thanjavur-7.

M.Sc.GeographyCourseStructureUnder TANSCHE - CBCS

(Forthe Candidates Admittedfromthe Academic Year 2023-2024 Onwards)

Sem.	Course	CODE	TitleofthePaper	Inst. Hrs.	Cre.	Ex. Hrs.	Marks		Total
							Int.	Ext.	
I	CC1	23KP1G01	Principles of Cartography	7	5	3	25	75	100
	CC2	23KP1G02	Applied Geomorphology	7	5	3	25	75	100
	CC3(P)	23KP1G03P	Lab I Techniques of Mapping and Map Analysis	6	4	3	40	60	100
	EC1	23KP1GECG1:1	Population and Settlement Geography	5	3	3	25	75	100
		23KP1GECG1:2	Environmental Geography						
	EC2	23KP1GECG2:1	Principles of GIS	5	3	3	25	75	100
		23KP1GECG2:2	Geoinformatics						
			Total	**30**	**20**				**500**
II	CC4	23KP2G04	Applied Climatology	6	5	3	25	75	100
	CC5	23KP2G05	Hydrology and Oceanography	6	5	3	25	75	100
	CC6(P)	23KP2G06P	Lab II Geospatial Techniques	6	4	3	40	60	100
	EC3	23KP2GECG3:1	Geospatial statistics	4	3	3	25	75	100
		23KP2GECG3:2	Geography of Social Wellbeing						
	EC4	23KP2GECG4:1	Remote Sensing and GNSS	4	3	3	25	75	100
		23KP2GECG4:2	Emotional Intelligence and Academic Performance						
	SEC 1	23KP2GSEC1	Natural hazards and Disaster Management	4	2	3	25	75	100
	ECC 1 Val. Added	23KP2GECC1:1	Field Work and Mapping	-	3	-	50	50	100
		23KP2GECC1:2	MOOC	-		-	-	-	-
	ECC 2	23KP2ECCG2	Addon Course	-	4	-	-	-	-
			Total	**30**	**22**				**600**
III	CC7	23KP3G07	Geographical Thought	6	5	3	25	75	100
	CC8	23KP3G08	Theoretical Economic geography	6	5	3	25	75	100
	CC 9 (P)	23KP3G09P	Lab III Remote Sensing and Modern Surveying	6	5	3	40	60	100
	CC 10	23KP3G10	Geography of India and Resource Development	6	4	-	24	75	100
	EC5	23KP3GECG5:1	Political Geography	3	3	-	25	75	100
		23KP3GECG5:2	Agricultural Geography						
	SEC 2	23KP3GSEC2	Geospatial Project Planning Management	3	2		25	75	100
	Int/Ind.Act	23KP3I	Internship/Industrial Activity#	-	2		50	50	100
	ECC 3 Val. Added	23KP3GECC3:1	Water and Soil Resource Management	-	3	3		100	100
		23KP3GECC3:2	MOOC			-	-	-	-
			Total	**30**	**26**				**600**
IV	CC11	23KP4G11	Regional Planning	6	5	3	25	75	100
	CC12 (P)	23KP4G12P	Lab IV Spatial Analysis and Modeling	6	5	3	40	60	100
	Project	23KP4GPW	Project Work with Viva voce	10	7			100	100
	EC6	23KP4GELG6:1	Geo Database Programming**	4	3	3	25	75	100
		23KP4GELG6:2	Advanced Surveying**						
	SEC/PCS3	23KP4GSEC3	Geospatial Intelligence	4	2		25	75	100
		23KP4EA	Extension Activity/Field Work	-	1				
			Total	**30**	**23**				**500**
			Grand Total	**120**	**91+(10)**				**2200**

 # For the 4 weeks started during I year summer vacation (Apr-May) & Completed before the commencement of III Semester

***(Industry/ Entrep.) 20 % Theory 80 % Practical*

SEMESTER – I	
CC 1 PRINCIPLES OF CARTOGRAPHY	
Course Code:23KP1G01	
HOURS :7	**Credits: 5**
COURSE OBJECTIVES	
1. Exploring and defining principles of cartography, emerging trends in cartography and information age 2. Understanding the basics of geodesy and map projections 3. Gaining skills in map symbols, cartographic design, representation and production of maps, and map composition 4. Critically assessing online resources, software and its uses for interactive mapping 5. Discussing the importance of web mapping and geospatial data policy	
Unit - 1	**FUNDAMENTALS OF CARTOGRAPHY**
History and future of cartography - Information age and mapping, Cartography as language and communication -visual thinking and visual communication-spatial information system.	
Unit - 2	**MAP PROJECTIONS AND COORDINATE SYSTEMS**
Geodesy, coordinate systems, and map projections- geographical data – spatial objects and attributes – map scale and accuracy	
Unit - 3	**MAP DESIGN AND LAYOUT**
Map compilation - levels of data measurement, generalization, cartographic design principles - map symbolization- Qualitative and Quantitative symbols - graphic communication – map elements and layout	
Unit - 4	**TERRAIN AND SURFACE ANALYSIS**
Production and Map output - Typography & 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 - NOT FOR SEMESTER EXAMINATION**
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
2.	Explain the fundamental importance of map scale and benefits and limitations of map projections
3.	Demonstrate cartographic techniques, generalisation regarding map design and layout, graphical and visual variables
4.	Obtain the skills in creating reference and thematic maps using hard copies and web maps
5.	Able to generate digital maps from open source data, analyse and interpret the interactive maps
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)PrinciplesofMapDesign.NewYork,NY:GuilfordPress.
3.	Misra,R.P.andA.Ramesh(1989).FundamentalsofCartography,ConceptsPublishingCompany, New Delhi.
4.	Monkhouse,F.J.andWilkinson,H.R.,(1971).Mapsanddiagrams:theircompilation and construction. Methuen.
5.	Brewer,C.A.(2005).DesigningBetterMaps.Redlands,CA:ESRIPress.(ISBN1- 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

SEMESTER – I

CC 2 APPLIED GEOMORPHOLOGY

Course Code: 23KP1G02

HOURS : 7 **Credits: 5**

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 andspace
3. To understand the processes that shapes the landforms aroundus.
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**

Geomorpological Mapping for Land Evaluation, Hazard, Agriculture, Urban and Mineral Exploration – Application of Geo-Informatics in landform Mapping.

Expected Course Outcomes:	
1	A clear understanding of the key concepts of geomorphology and dynamic aspects of landform development
2	Understand the relationship between geomorphologic processes, natural resources and environmental impacts
3	Ability to analyze the geomorphologic hazards and risks associated to geomorphic processes
4	Learn the various tools and techniques relevant to the applied aspects of Geomorphology in various fields.
5	Knowledge on landscape development and skill on the use of geomorphicprocess,featuresandeventinresourcesandenvironmental planning andmanagement
Text Book(s)	
1	Paul R.Bierman, David R.Montgomery (2020), "Key concepts in Geomorphology", Macmillan Pulblications, New York.
2	Richard John Huggett (2011), "Fundamentals of Geomorphology", Routledge, Tailor & Francis, London.
3	Robert, S.A and Suzanne, P.A (2010),"Geomorphology – The mechanics and chemistry of landscapes, Cambridge University Press.
4	Ramkumar, M (2009),"Geological hazards: Causes, Consequences and methods of Containment", New India Publishers, New Delhi.
5	Savindra Singh (2019),. "Geomorphology" Pravalika Publications, Allahabad, India
Reference Book(s)	
1.	Abbas Farshad (2006), "Introduction to applied Geomorphology for soilscientists" Earth Systems Analysis (ESA) Surface Processes Group (Geohazards), ITC, Enschede, The Netherlands.
2.	Andrew Goudie (2003)," Encyclopedia of Geomorphology", Routledge, Tailor & Francis, New York.
3.	Arthur L. Bloom (2002),"Geomorphology – A Systematic Analysis to Late Cenozoic landforms; Prentice – Hall of India Pvt., Ltd., New Delhi.
4.	Bridge, J.S., (2003),"Rivers and Floodplains: Forms, Processes, and Sedimentary Record", Blackwell Publishing, Oxford.
5.	Grotzinger, J., Jordan, T., Press, F. and Siever, R., (2007), "Understanding Earth (5th ed.)", W.H. Freeman and Co., New York, ISBN 0-7167-6682-5
6.	Ruhe, R.V. (1982), "Geomorphology", Boston: Honghton Mifflin Company
7.	William D. Thornbury (1954),"Principles of Geomorphology",John Willy & sons, Inc., London.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://earthsurface.readthedocs.io/en/latest/
2	https://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-163-surface-processes-and-landscape-evolution-fall-2004/lecture-notes/

SEMESTER – I	
CC 3(P) LAB I TECHNIQUES OF MAPPING AND MAP ANALYSIS	
Course Code:23KP1G03P	
HOURS :6	**Credits: 4**
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 mapmaking. 5. To understand the concepts and importance of various analysis used in mapping.	
Unit I	Slope Analysis: Wentworth method Relative Relief Analysis: Smith method Hypsometric Analysis
Unit II	Stream ordering Drainage density Water Balance graph
Unit III	Climograph Climatograph Rainfall Dispersion diagram
Unit IV	Crop concentration Crop combinations (Any one: Weaver / Doi / Rafiuallah) Index of diversification - Gibbs Method
Unit V	Appreciation and Interpretation of SOI toposheets Appreciation and Interpretation of Atlas maps Appreciation and Interpretation of NATMO maps

Expected Course Outcomes:	
1	Understanding the importance of various mapping techniques in geographical study
2	Understand the procedures and steps involved in the interpretation of thematic, topographic and atlas maps etc.
3	Learnthequantitativeapplicationsinvolvedinmappingandinterpolation.
4	Ability to analyze and perform analysis like network analysis, stream analysis, point and line pattern analysis.
5	Capable of creating maps based on appropriate cartographic knowledge.

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 Aalysis, Ebenzer Baylis and Sons, USA.
4.	Ramamurthy, K. (1982): Map Interpretation, Rex Printers, Madras
5.	Understanding Map Projection (2003-2004): GIS by ESRI, Redlands
6.	Chrisman, N. (1997): Exploring Geographic Information systems, John Wiley & Sons., New York
7.	*The ESRI Guide to GIS Analysis,* by Andy Mitchell, ESRI Press, 1999, 188 pp.
Reference Book(s)	
1.	Monkhouse,F.J.,andWilkinson,H.R.(1976):MapsandDiagrams,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

SEMESTER – I

EC 1: 1 POPULATION AND SETTLEMENT GEOGRAPHY

Course Code: 23KP1GECG1:1

HOURS : 5 **Credits: 3**

COURSE OBJECTIVES

1. Toexplaintheargumentsandassumptionsofdominanttheoriesofpopulationchangein 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 – Overpopulation, 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, 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 Indiancities;functional Classification of Indian Cities; Conurbations and Metropolitan Regions; Urban Sprawl; Slums and Associated Problems; Town Planning; Problems of Urbanization and Remedies.

Unit - 5	**THEORIES OF ORIGIN OF TOWNS**

Theories of Origin of Towns: 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.

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.
2	Assessment of vital statistics of population data
3	Acquire and interweave theoretical foundation for addressing research issues related to population dynamics in the real world
4	Acquiring, handling and analysing population data both at the grassroots level and secondary sources
5	Recollect types and patterns of urban and rural settlement
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. &NangiaSudesh, (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

SEMESTER – I	
EC 1:2 ENVIRONMENTAL GEOGRAPHY	
Course Code: 23KP1GECG1:2	
HOURS :5	**Credits: 3**
COURSE OBJECTIVES	
To Study the Biosphere, Biomes and Green House Impacts.	
To Understand the Causes, Effects of Pollution and Various disasters.	
Unit1	Environmental Geography: Meaning and Scope–ElementsofEnvironment-Atmosphere-Hydrosphere-Lithosphere–Biosphere.
Unit 2	Biomes: Concept – Major Biomes –Tropical Biome- Temperate Biome – Temperate Grass land Biome–Tundra Biome
Unit3	Pollution and Pollutants - Cause and Effect of Air, Water, Land and Noise Pollution
Unit4	Green House Effect - Ozone Depletion - Global Warming - Sea level changes – Acid Rainfall – Cloud Burst.
Unit 5	Disaster Definition -Types: Natural Disaster- Manmade Disaster – Biological Disasters- Cause and Effect – National Disaster Management Authority.

Expected Course Outcomes:	
1.	On the successful completion of the course, student will be able to:
2	Appreciate the structure and functions of ecosystems
3	Understand the different biomes and its significance
4	Acquire the insight about various pollution, pollutants and impacts
5	Define the cause and consequences of green house effect and associated features.
References:	
1	AlexanderJohnW.,(1991)"EconomicGeography",PrenticeHallofIndiaLtd.,NewDelhi.
2	Allen J L.,(1994),"Student Atlas of Environmental Issues", Dushkin Publications,New Delhi.
3	DikshitR.D.,(2006),"Frontier in Environment Geography", Prayag Publication, Allahabad.
4	Kumrasamy K.,(2004),Remote Sensing for Environmental Studies, Department of Geography, Bharathidasan University, Tiruchirappalli.
5	Savindra Singh,(2002),"Environmental Geography", Prayag Pustak Bhavan, Allahabad

SEMESTER – I

EC 2:1 PRINCIPLES OF GIS

Course Code:23KP1GECG2:1

HOURS :5 **Credits: 3**

COURSE OBJECTIVES

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

Unit - 1	**Basic concepts of spatial science and GIS**

Basic Concepts of Spatial Science and GIS: Geographic Spaces, Spatial Data and information, Reference Systems and Datum, Approaches and Components of GIS - 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 Modeling and its Applications**

GIS Modeling - Multi-criteria Analysis - Network Applications - LBS - Geocoding - Suitability Modeling - Location Allocation Modeling - Applications and Case Studies

Expected Course Outcomes:	
1	Developing an understanding of spatial concepts and spatial and non- spatial data models
2	Learning skills in creating spatial data models using GIS software
3	Gaining ability to access data in the GIS, compile, analyse, and present geospatial data
4	Performing GIS functions and demonstrate the skills in modelling
5	Developing the ability to analyze and solve spatial problems using modelling approaches

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

SEM I	EC 2:2	GEOINFORMATICS	CODE 23KP1GECG2:2	Ins. Hrs 5	Credit 3

Course Objectives: To introduce Geoinformatics techniques comprising integration of advanced spatial information tools to assess and model the Geographical problems.

Outcomes: On completing this course students will be able to

CO	STATEMENT
1	Define the science and technologies involved in Geoinformatics.
2	Explain the digital mapping technology
3	Describe the state of art of GIS and its various applications for spatial solutions
4	Explore the scope of GNSS technology by emphasizing mapping solutions.
5	Evaluate the suitable geospatial tools and data to apply various spatial modeling.

Unit 1: Nature, branches and development of Geoinformatics – Principles of satellite remote sensing - types of imaging and non imaging sensors: Optical, thermal and microwave – Spectral characteristics: Visible, IR, Thermal and Microwave - Image characteristics, resolutions and interpretation of optical, thermal and RADAR images.

Unit 2: Photogrammetry techniques, aerial triangulation, measurements of scale, relief displacement and stereoscopic parallax and orthophoto – LiDAR data characteristics, limitations and advantages – Principal applications of aerial photos - Overview of drone survey.

Unit 3: Development and Components of GIS - Spatial entity, attributes and geometry - data models and editing: Raster, Vector and TIN - GIS Database: Concept of arc, node, objects and topology – Data Analysis: Measurements, query, buffer, overlay, interpolation and network – overview of GIS spatial Modeling and SDSS.

Unit 4: Components of GNSS – Global Navigational Systems - Indian Regional Navigation Satellite System, GAGAN and Navik: Technology and Applications - Positioning methods, data processing and Accuracy – Surveying, Mapping, tracking, navigation and GIS Applications of GNSS.

Unit 5: Applications of Geoinformatics - Landuse/land cover, soil, agriculture, water resources, urban planning, disaster management, utility mapping and e-governance: Methodology and techniques adopted - National and international setups, standardization and dissemination policy of geospatial data.

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Current contour (Not for Examination): *Hyper spectral remote sensing, GPR survey, Data mining and AI, Location Intelligence and cloud GIS,*

References:

1. Ian Heywood, Cornelius, S., S. Carver. (2000). *An Introduction to Geographical Information Systems*, New York: Addison Wesley Longman Limited.
2. Jensen, J. R. (2006). *Introductory Digital Image Processing: A Remote Sensing Perspective*, Prentice-Hall Inc.
3. Kang-tsung Chang (2002). *Introduction to Geographical Information Systems*, New Delhi: Tata McGraw-Hill Publishing Company Limited.
4. Reddy, A. M., (2008). *Textbook of Remote Sensing and Geographic Information System*, B.S. Publication.

https://novatel.com/an-introduction-to-gnss
https://www.freebookcentre.net/Civil/Surveying-Books.html
https://www.esri.com/en-us/news-publications/ebooks
https://www.indiascienceandtechnology.gov.in/geospatial-technology

Expected Course Outcomes:	
1	To recall weather elements and its importance
2	Discuss various wind around the world
3	To compare climatic classification for global and regional level
4	Apply various weather forecasting methods
5	Analysing the Characteristics of Urban Heat Island

SEMESTER – II	
CC 4 APPLIED CLIMATOLOGY	
Course Code:23KP2G04	
HOURS : 6	**Credits: 5**
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: Tri cellular 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	

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, McGraw 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

SEMESTER – II

CC 5 HYDROLOGY AND OCEANOGRAPHY

Course Code: 23KP2G05

HOURS : 6 **Credits: 5**

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.

Expected Course Outcomes:

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

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

SEMESTER – II	
CC 6 LAB II: GEOSPATIAL TECHNIQUES	
Course Code:23KP2G06P	
HOURS : 6	**Credits: 4**
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 I	Georeferencing and transformation Creation of feature class Editing and Topology
Unit II	Attribute data editing Dot map – Qualitative & Quantitative Located Bar chart and Pie chart
Unit III	Proximity analysis Interpolation Overlay analysis
Unit IV	Surface Analysis – Contour Construction 3D Visualization – DEM, TIN Creation of Slope and Aspect
Unit V	GNSS Traversing(Open and Closed) GNSS Positioning and Tracking Geo tagged photographs

Expected Course Outcomes:	
1	A clear understanding in key concepts of cartography, GIS and the aspects in reading, designing, and evaluating digital cartographic maps
2	Understand the relationship between map projections, coordinate systems and geospatial layers including map algebra and spatial statistics.
3	Learn the skills in data collection, storage, analysis and interpretation of spatial data in GIS interface.
4	Ability to analyse and evaluate the maps and perform spatial operations like overlay analysis, landscape analysis, terrain analysis, suitability analysis and spatial modelling.
5	Create tools and models for developing and solving complex geospatial problems in GIS
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

SEMESTER – II	
EC 3 GEOSPATIAL STATISTICS	
Course Code: 23KP2GECG 3:1	
HOURS : 4	**Credits: 3**
COURSE OBJECTIVES	
To introduce basic statistical procedures to the students To indicate the assumptions, limitations and interpretation of these procedures and results To train the students to handle these statistics towards analysing the geographical problems. To understand the Statistical Techniques, Numerical data in Geography To familiarize about Probabilistic Treatment, Parametric Statistics and Regression Analysis	
Unit - 1	**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**
Centrographic techniques: mean, median 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 line interpolation, 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).	

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

SEMESTER – II	
EC 3 GEOGRAPHY OF SOCIAL WELLBEING	
Course Code: 23KP2GECG 3:2	
HOURS : 4	**Credits: 3**
COURSE OBJECTIVES	
To understand the nature, scope and relationships of geography and human wellbeing To acquire knowledge on spatial dimensions of social diversity components	
Unit 1	Geography of Social Wellbeing: Concept, Origin, Nature and Scope.
Unit 2	Social Diversity: Caste, Class, Religion, Race and Gender and their Spatial distribution
Unit 3	Social Wellbeing and Inclusive Development: Concept and Components – Healthcare, Housing and Education.
Unit 4	**Unit IV:** Social Geographies of Inclusion and Exclusion, Slums, Gated Communities, Communal Conflicts and Crime.
Unit 5	**Unit V:** Social welfare program and policies.
References	
1	Ahmed,A.,(1999):SocialGeography,RawatPublications.
2	Casino,V.J.D.,Jr.,(2009):SocialGeography:ACriticalIntroduction,WileyBlackwell.
3	Cater,J.andJones,T.,(2000):SocialGeography:AnIntroductionto
4	ContemporaryIssues,HodderArnold.
5	Holt,L.,(2011):GeographiesofChildren,YouthandFamilies:AnInternational Perspective,Taylor&Francis.
6	Panelli,R.,(2004):SocialGeographies:FromDifferencetoAction,Sage.
7	Rachel,P.,Burke,M.,Fuller,D.,Gough,J.,Macfarlane,R.andMowl, G.,(2001):IntroducingSocialGeographies,OxfordUniversityPres s.
8	Ramotra,K.C.,(2008):DevelopmentProcessesandtheScheduledCastes,RawatPublication. Smith,D.M.,(1977):Humangeography:AWelfareApproach,EdwardArnold,London

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SEMESTER – II	
EC IV REMOTE SENSING AND GNSS	
Course Code: 23KP2GECG4:1	
HOURS: 4	**Credits: 3**
COURSE OBJECTIVES	
1.Understand the purpose and importance of Remote sensing and GNSS 2.To provide background knowledge and understanding of principles of RS and GNSS Systems 3. To enhance student's capacity to interpret images and extract information on the earth surface from multi-resolution imagery at multi-scale level.	
Unit - 1	**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.	
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.	
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.	
Unit - 4	**Basics of GNSS**
Introducing Global Navigation Satellite System: GNSS Segments, Satellite Orbit, Satellite Position on Orbital Plane, Signals, Reference System and Observation Techniques - Antispoofing and Selective Availability.	
Unit - 5	**Remote Sensing Applications in Geography**
Applications of Remote Sensing in Geography: Geomorphology, Water Resources, Disaster studies, Forestry, Agriculture, Land use and Land cover and Urban planning - Applications of Microwave and Thermal Remote Sensing.	

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

SEMESTER – II	
EC 4:2 EMOTIONAL INTELLIGENCE AND ACADEMIC PERFORMANCE	
Course Code:23KP2GECG 4:2	
HOURS : 4	**Credits: 3**
COURSE OBJECTIVES	
Learned about emotional intelligence, what it is, and how you can use it. Acquired awareness of one's emotions and learned how to manage them. Examined ways to improve personal emotional intelligence and for better academic performance. An awareness of others' emotions, inspiring high performance by responding to those emotions Considered consequences of behavior 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 Workplace: Importance of Emotional Intelligence at Workplace? 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.	

On the successful completion of the course, student will be able to:	
1	Identify the benefits of having a higher level of emotional intelligence
2	Developing emotional intelligence involves learning four core skills
3	Identify and practice the principles of self-management, self- awareness, self-regulation, motivation, and empathy
4	Be able to demonstrate empathy in a wide variety of situations
5	Incorporate these concepts and techniques into the learning environment

TextBook(s)	
1	Babaei, Bahare, and Ali Abdi. "Textbooks Content Analysis of Social Studies and Natural Sciences of Secondary School Based on Emotional Intelligence Components."UniversalJournalofEducationalResearch2.4(2014):309-325
2	Nelson,DarwinB.,andGaryR.Low.Emotionalintelligence.Boston:Prentice Hall, 2011.
3	Wolfe, Kara. "Enhancing the Emotional Intelligence of Students: Helping the CriticalFew."JournaloftheScholarshipofTeachingandLearning19.3(2019): 16-33.
ReferenceBook(s)	
1.	Nguyen, Tiffany, et al. "Emotional intelligence and managerial communication."AmericanJournalofManagement19.2(2019):54-63.
2.	Koc,E.(Ed.).(2019).Emotionalintelligenceintourismandhospitality.CABI.
3.	Goleman, D.(2012).Emotionalintelligence:Whyit canmattermorethanIQ. Bantam.
4.	Ubago-Jiménez, J. L., González-Valero, G., Puertas-Molero, P., &García- Martínez, I. (2019). Development of emotional intelligence through physical activityandsportpractice.asystematicreview.BehavioralSciences,9(4),44.
5.	Bradberry,T.,&Greaves,J.(2009).EmotionalIntelligence2.0.TalentSmart.
RelatedOnlineContents[MOOC,SWAYAM,NPTEL,Websitesetc.]	
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

SEMESTER - II	
SEC I NATURAL HAZARDS AND DISASTER MANAGEMENT	
Course Code: 23KP2GSEC1	
HOURS : 4	**Credits: 2**
COURSE OBJECTIVES	
1. To orient students about various natural and manmade disasters 2. To teach the concept of Disaster management and measures to be taken at different stages of disaster management 3. To provide insight about global, national and regional level scenario of disaster management 4. To train students in doing Risk assessment and Vulnerability analysis 5. 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	

	Expected Course Outcomes
1	Students will learn different disasters and measures to reduce the risk due to these disasters.
2	Students will learn institutional frame work for disaster management at national as well as global level
3	The student will get familiarized with the ecosystem and issues related to the environmental system..
4	Students can act as First Respondent and can handle Onsite situations
5	It 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
	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

SEMESTER – II	
ECC 1:1 Fieldwork and mapping	
Course Code: 23KP2GECC1:1	
1. To impart knowledge about basic principles of field surveying procedures andpractices. 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 fieldwork. 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 25 pages, excluding figures, tables, photographs, maps, references and appendices.	
Unit - 4	**FIELD WORK**
The students will go for a field work in the Second semester ,the basis of that, each student has to submit a field work report as part of the second semester coursework	
Unit - 5	**SUBMISSION**
Each report must be accompanied by field note book, a fair copy of map, related cross sections and other relevant documents.	

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

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

SEM II				
ECC1:2	**MOOC** (Value Added)	**CODE 22KP2ECCG1:2**		**Credits 3**

According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Our college is recognized as a local chapter.

Coordinator with department course in-charge will guide the students well in advance regarding the suitable value added courses which is not available in the college and registration process, time to time. **The course should be selected so as to complete during the month of May.**

SEM II				
ECC2	**ADD-ON COURSE**	**CODE 23KP2ECCG2**		**Credits 4**

Each department will offer a Certificate Course with 10-20 contact hrs (after regular class hrs).It can be availed by the interested students of any discipline. The course will be decided time to time and organized by the Head / course coordinator. Course modules will be announced well in advance ***(registration done before the commencement of semester II- i.e December)*** and course modules are handled by internal or external faculty / experts or jointly.

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SEMESTER – III	
CC 7 Geographical Thought	
Course Code: 23KP3G07	
HOURS : 6	**Credits: 5**
Course Objectives:	
1. Understand ancient scholars' contribution to geography 2. Know exploration and discoveries, History of World Civilization and contribution of modern geographer to geography 3. Should be able to know 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	**Unit-1**
Nature of geography - Greek contribution to Physical geography, Human geography, Cartography, Mathematical geography - Contribution of Romans: Strabo, Ptolemy, Pomponius Mela - Arab contribution to geography - Ancient Indian Geographical Thought - Sources of information - Contribution of Indians – Geography of India, Dwipas, seasons – Earth and Sun.	
Unit-2	**Unit-2**
Major explorations and discoveries: Contribution of Magellan, Vasco da Gama, James Cook, Christopher Columbus – Contribution of modern geographers: Varenius, Immanuel Kant, Alexander von Humboldt, Carl Ritter - Determinism and Possibilism, New Determinism – Contributions of Ratzel, Ellen Semple, La Blache, Ellsworth, Huntington, Griffith Taylor.	
Unit-3	**Unit-3**
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 – cognitive description – cause and effect – temporal, functional, and ecological systems.	
Unit-4	**Unit-4**
Theories and models in geography – Quantitative revolution and Paradigms - Themes in Geography – Positivism – Pragmatism – Behaviorism – Functionalism – Idealism – Realism – and Marxism.	
Unit-5	**Unit-5**
Modern political ideas – Heartland concept of Halford Mackinder – Rimland Theory of Spykman – Social Darwinism of F. Ratzel - conceptual and methodological developments and changing paradigms; status of Indian Geography, Future of geography.	

Expected Course Outcomes:

1	Recall ancient scholars' contribution to geography
2	Evaluate contribution of modern geographer to geography and ability to analysis determinism and possibilism in geography
3	Assessment of dualism concept in geography
4	Apply quantitative revolution in geography
5	Discuss various theories, themes, models in geography and evaluate modern political ideas based on location

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.
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

SEMESTER – III

CC 8 THEORETICAL ECONOMIC GEOGRAPHY

Course Code: 23KP3G08

HOURS : 6 **Credits: 5**

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 analyze 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 Perroux.

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.

Expected Course Outcomes:	
1	Develop an understanding of concepts and issues related to the spatial interactions of the economy
2	Understanding the theoretical developments and ability for problem solving
3	Develop the ability to analyze critically current issues related to economic geography with special reference to planning and development
4	Developing the ability to analyze spatial public policy and solve the spatial problems using geospatial technology
5	Develop an understanding of concepts and issues related to the spatial interactions of the economy
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/

SEMESTER – III	
CC 9(P) Lab III: Remote Sensing and Modern Surveying	
Course Code: 23KP3G09P	
HOURS :6	**Credits: 5**
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**
1.1 Image Registration 1.2 Image Cropping and Resizing 1.3 Image Thresholding 1.4 Color Space Conversion	
Unit - 2	**IMAGE ENHANCEMENT TECHNIQUES & DIGITAL IMAGE CLASSIFICATION**
2.1 Image Enhancement 2.2 Image Filtering 2.3 Image Segmentation 2.4 Image Classification	
Unit - 3	**GPS SURVEYING**
3.1 GPS Point Positioning 3.2 GPS Tracking 3.3 Geocaching 3.4 GPS Mapping	
Unit - 4	**ACCURACY ANALYSIS**
4.1 Producer Accuracy Assessment 4.2 User Accuracy Assessment 4.3 Overall Accuracy Assessment 4.4 Kappa Coefficient Calculation	
Unit - 5	**GEOSPATIAL ANALYSIS**
5.1 Image Differencing 5.2 Image Ratioing 5.3 DEM and Watershed Analysis 5.4 Map Modeling and Applications	

Expected Course Outcomes:	
1	Understand quantitative remote sensing principles and integrate different tools for remote sensing data analysis.
2	Perform image corrections and enhancements and generate high level remote sensing products
3	Manipulate and process remote sensing data using manual and automated techniques
4	Critically compare different type of remote sensing data products and analysis technique and select the more appropriate to solve a real-world problem.
5	Create and analyze digital images using remote sensing technologies

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

SEMESTER – III	
CC 10 GEOGRAPHY OF INDIA AND RESOURCE DEVELOPMENT	
Course Code: 23KP3G10	
HOURS : 6	**Credits: 4**
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 understand the major Industries of India 5. To get knowledge of trades and transport systems 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)	
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	**MAJOR INDUSTRIES OF INDIA**
Major Industries Distribution and Production of India: Cotton Industries, Sugarcare Industries, Iron and Steel Industries, Cement Industries, Chemical Industries and Automobile Industries. Major Industrial region in India.	
Unit - 5	**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.	

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.
2	To analysis soil types and variation of vegetation
3	Acquaint with the distinctiveness of geographic regions as the field of learning in Geographical studies
4	To analysis various Industrial system of India
5	To evaluate various transport network system of India
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//

SEMESTER – III

EC 5:1 POLITICAL GEOGRAPHY

Course Code: 23KP3GECG5:1

HOURS : 3 **Credits: 3**

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.

Expected Course Outcomes:	
1	Developing an understanding of political geography and its influence in politics
2	Able to apply spatial analysis methods to assess physical and human environment to shape and reshape political geographic outcomes
3	Understand the themes of political geography in relation to nation, state, nation-building, frontiers and boundaries.
4	Ability to analyse critically the conflicts in India and geopolitical significance of Indian ocean and its importance
5	Ability to describe the contemporary issues, conflicts and challenges surrounding the Indian regions – SAARC, South-east Asia, West and East Asia.
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

SEM III	EC 5:2	AGRICULTURAL GEOGRAPHY	CODE 23KP3GECG5:2	Ins. Hrs 3	Credit 3

Course Objectives:
To know various determinants of agriculture and agricultural systems of the world
To understand the importance agricultural regionalization and the significance of sustainable development goals.

Course Outcomes: *Upon completion of the course, students will be able to*

COs	Statements
CO1	Recognize different approaches to agricultural geography
CO2	Understand the factors determining agriculture, systems of agriculture and agroclimatic regions
CO3	Appreciate the significance of regionalisation
CO4	Apply various models of agricultural geography in the real world situation
CO5	Realize how to achieve Sustainable Development Goals

Unit I: Agricultural Geography: Definition, Objectives, Historical Perspective – Approaches to Agricultural Geography – Sources of Agricultural Data – Land Use and Land Cover Classification by National Remote Sensing Centre.

Unit II: Agricultural System: Physical and Socio-economic Determinants of Agriculture - Whittlesey's Classification – Agro-climatic zones of India by Indian Council of Agricultural Research - Agro-ecological Zones of India by National Bureau of Soil Survey and Land Use Planning.

Unit III: Agricultural Regionalization: Cropping Pattern, Crop Combination Regions (Weaver, Doi and Rafiullah), Crop Diversification and Agricultural Productivity – Role of Geoinformatics in Crop Area and Yield Estimation.

Unit IV: Models in Agricultural Geography: Significance and Limitations – Classification of Models: Input-Output, Decision Making, Diffusion, von Thunen's and Jonasson's Models.

Unit V: Food, Nutrition and Health: Distributional Pattern of Food and Nutrition – Causes and Spatial Pattern of Hunger – Eradication of Hunger: Role of Green Revolution – Nutrition and Health.

Current contour (Not for Examination): *Agriculture, the gamble of monsoon – Inter-State water dispute – Inter-linking of rivers - Kuruvai cultivation at peril in Tamil Nadu – Minimum Support Price for various crops*.

References:

1. Gautam, A. (2014). *Agricultural Geography.* Allahabad: Sharda Pustak Bhawan
2. Hussain, M. (2014). *Systematic Agricultural Geography.* Jaipur: Rawat Publications.
3. Shafi, M. (2006). *Agricultural Geography.* New Delhi: Doring kindersley India Pvt. Ltd.
4. Singh, J., & Dhillon, S. (1984). *Agricultural Geography.* New Delhi: Tata McGraw Hill.
5.Venugopal, S. (2006). *Agricultural Geography.* New Delhi: Arise Publication and Distribution.

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SEMESTER – III

SEC II GEOSPATIAL PROJECT PLANNING MANAGEMENT

Course Code: 23KP3GSEC2

HOURS: 3 **Credits: 2**

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	**Geospatial Research**

Geospatial Research - Motivations in Research - importance of geospatial research - Geospatial Data Collection Methods - Spatial Sampling Techniques - Geospatial Analysis Tools - Geospatial Research Ethics – Case studies

Unit - 2	**Project Planning**

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 management**

Evolution of project Management – Management thought in modern trend – Patterns of the project management analysis – Implementation – Monitor and Testing – Project Closing - Tools and Techniques in PM – Global PM scenarios (BMI – PMBOK – Prince2 – M2M – IPMA etc.,)

Unit - 4	**Hypothesis Testing**

Exploratory Map Inferences from analysis (EMA) - 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 (Mind Map, PAST, Gretl, GeoDa, Zotora, Nevernote and Lyx/script) - Basics of manuscript editing for the press – language and ethics in reporting.

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
2	Apply bibliographic tools in research and use various writing style manual
3	Plan for data collection and construct class intervals method to classify the data
4	Develop skill for use various statistical software for hypothesis testing
5	Prepared for writing and publishing a research report and manuscript editing, Apply new techniques and use different research tools
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.

SEM III	Internship / Industrial Activity	CODE 23KP3I	Ins. Hrs -	Credit 3

1. Internship (External) can be executed under the supervision of internship coordinator / guide..
2. It can be undertaken during the summer vacation of the **II Semester *(April /May).*** It is of three week duration for three credits.
3. The students can pursue their internship in any Institution / industry /Education Institution/ Business House / Consultancies / other Government / Private / Non Governmental Organizations where Surveying, Mapping, GIS, Remote Sensing and all other geography and related fields is the main activity.
4. The internship fetches 100 marks to the students. 50 marks will be awarded to the report submitted by the students not exceeding 10 pages. Another 50 marks will be allotted for viva-voce examination by the internal guide.

SEM III	ECC3	WATER AND SOIL RESOURCE MANAGEMENT	CODE 23KP3GECC3:1	Ins.Hrs. -	Credits 3

This is an Value added courses which is an optional paper instead of MOOC offered in **SELF STUDY MODE** to gain extra credits. Students have to prepare this course work by their own effort and attend the examinations to secure credit.

Course Objectives:
To Understand the basic components of hydrological cycle and comprehend practices of integrated watershed management.
To Study the soil as a basic resource, focusing its distribution, problems and management

Unit I: Hydrological Cycle: Systems approach in hydrology, human impact on the hydrological cycle; Precipitation, interception, evaporation, evapotranspiration, infiltration, ground-water, runoff and overland flow;

Unit II: Water Balance: input and output; water balance; floods and droughts; Integrated water resource management.

Unit III: River Basin: Characteristics and problems of river basins, basin surface run-off, and measurement of river discharge. Watershed management

Unit IV: River Water Dispute; River linkages; Case studies

Unit V: Soil Resource: Definition, Types and Distribution, Utilisation, Problems and Management of Soil Resource.

References:

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

SEM III	**ECC3**	**MOOC**	**CODE 23KP3GECC3:2**	**Ins.Hrs. -**	**Credits 3**

According to the guidelines of UGC, the students are encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Our college is recognized as a local chapter.

Coordinator with department course in-charge will guide the students well in advance regarding the suitable value added courses which is not available in the college and registration process, time to time. **The course should be selected so as to complete before the month of November.**

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SEMESTER – IV	
CC 11 REGIONAL PLANNING	
Course Code:23KP4G11	
HOURS : 6	**Credits: 5**
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	
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	

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	JankiJiwan(2021).Regional Development and Planning. Rawat Publication.
6	VishwambharNath(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.

Expected Course Outcomes:	
1	Acquire a general understanding of the major concepts and theories in the fields of regional development and Planning.
2	Identify, appreciate and use models and principles for policy formulation
3	Evaluate regional development planning polices
4	Acquire ability to prescribe appropriate strategies for regional development at appropriate level of governance
5	Comprehensive understanding on contemporary issues and challenges in relation to regional development.

SEMESTER – IV	
CC12 LAB IV SPATIAL ANALYSIS AND MODELING	
Course Code: 23KP4G12P	
HOURS: 6	**Credits:5**
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.	
Unit I	1.1 Spatial statistics Measurement- Mean Centre 1.2 Median Centre, 1.3 Standard Distance
Unit II	2.1 Network analysis – Geocoding 2.2 Location and allocation models 2.3 Least cost path Analysis
Unit III	3.1 Watershed Analysis – Fill Sinks and Generate Stream network 3.2 Flow direction 3.3 Accumulation model
Unit IV	4.1 GNSS - Habitat suitability 4.2 House hunting 4.3 Noise pollution modelling
Unit V	5.1 Heat maps 5.2 Flow maps 5.3 Google Earth Engine

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=pdf

Expected Course Outcomes:	
1	A clear understanding in key concepts of cartography, GIS and the aspects in reading, designing, and evaluating digital cartographic maps
2	Understand the relationship between map projections, coordinate systems and geospatial layers including map algebra and spatial statistics.
3	Learn the skills in data collection, storage, analysis and interpretation of spatial data in GIS interface.
4	Ability to analyse and evaluate the maps and perform spatial operations like overlay analysis, landscape analysis, terrain analysis, suitability analysis and spatial modelling.
5	Create tools and models for developing and solving complex geospatial problems in GIS.

SEM IV	Project	PROJECT WORK	CODE 23KP4GPW	Ins.Hrs 10	Credit 7

1. The students should select a specific topic in Geography and related fields. It should have innovative components and societal relevance. Appropriate statistical analysis, evaluating geographical models, interdisciplinary approach and application of geospatial techniques are given more weightage.

2. Integration of primary and secondary data may be used, wherever possible.

3. Suitable maps, diagrams and graphs and scientific interpretation should be incorporated in the report**. A Complex map / figures / graphs can be shown in a single page other wise a page can be used with at least TWO maps / figures / graphs** to maintain the consistency of the dissertation. There are three multiples copies of dissertation with back & back printout in soft binding form is to be prepared for submission.

4. The Project Report should be between 20 and 25 pages (excluding figures and tables) and with the following structure:

I. Problem and Procedure
II. Review of Literature
III. Aims and Objectives
IV. Data and Techniques used
V. Result and discussion
VI. Summary and Conclusion
References

5. Evaluation and Viva

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

Sl.No	Area of work	Max. Marks
1	Plan of the Project	10
2	Execution of the Plan / Collection of Data / Organization of Materials / Application of Tools / Experiment / Study / Hypothesis Testing etc., and Presentation of Report	40
3	Individual Initiative	25
4	Viva – Voce Performance	25
	Total Marks	**100**

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SEMESTER – IV	
EC 6:1 GEO DATABASE PROGRAMMING	
Course Code: 23KP4GELG6:1	
HOURS : 4	**Credits: 3**
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**
Introduction and Scope of Data Science - Data Warehouse - Spatial Data in Data Science - Machine Learning Algorithms of Spatial Data Science: Supervised and unsupervised Techniques	
Unit-2	**GIS and Remote Sensing data, Formats & AMP**
Image storage formats, Data retrieval, Data compression techniques - Spatial data Model – (i) Cartographic Map model – Raster structure, Quad tree Tessellation (ii) Geo-relational Model – Vector Data structure - Advantages and Disadvantages - Accelerated Mobile Pages (AMP)	
Unit-3	**Understanding Spatial Data Science**
Machine learning, spatial data mining, spatial indexing, Spatial data visualization, Spatial effects, Spatial data structures, spatial computing, 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, Big data for Geography and other Sciences.	

ReferenceBook(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, AnandRajaraman 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.

Expected Course Outcomes:	
1	Understand Spatial data
2	Developing data analysis skills
3	Identify and Apply analytical techniques
4	Be able to identify challenges and deal with solutions for the same
5	Incorporate these concepts and techniques into the learning, business as well as related environment

SEM IV	EC6:2	ADVANCED SURVEYING	CODE 23KP4GELG6:2	Ins.Hrs. 4	Credits 3

Course Objectives:
To appreciate the preparation of various thematic maps with the application of various techniques.
To read weather map for forecasting and decision making.

Course Outcomes: *Upon completion of the course, students will be able to*

COs	Statements
CO1	Comprehend the reference and coordinate systems for the Earth
CO2	Understand the concept of Astronomical Surveying
CO3	Recognize various photogrammetric surveying methods
CO4	Appreciate the role of Total Station in modern surveying
CO5	Survey using hand-held GNSS receiver

Unit I: Introduction to Surveying: Concepts and Methods – Understanding Reference System, Reference frame and Coordinate System for the Earth – Coordinate and Datum Transformations – Projected Coordinate System.

Unit II: Astronomical Surveying: Astronomical Terms and Definition – Motion of Sun and Stars – Celestial Coordinate System – Time System – Nautical Alamanac – Apparent Attitude and Corrections – Field Observations and Determinations of Time, Longitude, Latitude and Azimuth by Attitude and Hour Angle Method.

Unit III: Aerial Surveying: Introduction – Vertical, Stereo and Analytical Photogrammetry - Photogrammetric Products – Image Matching – Fundamentals of LiDAR and RADAR – Hydrographic Surveying.

Unit IV: Total Station Surveying: Classification – Basic Measuring and Working Principles of an Electro-Optical and Microwave Total Station - Sources of Errors – Trilateration – Applications.

Unit V: GNSS Surveying: Basic Concepts – Space, Control and User Segments – Satellite Configuration – Signal Structure – Orbit Determination and Representation – Antispoofing and Selective Availability – Hand Held and Geodetic Receivers – Field Work Procedure – Data Processing Applications.

Current Contour (Not for semester examination): Reconnaissance – Rout surveys for highways, railways and waterways - Tunnel alignment and setting out – Settlement and Deformation studies – Drone Surveying.

References:

1.Arora, K. (2010). Surveying (Vol. 2). New Delhi: Standard Book House.
2.Chandra, A. (2015). Higher Surveying. New Delhi: New Age International Publishers.
3.Duggal, S. (2013). Surveying (Vol. 2). New Delhi: Mc GrawHill Education.
4.Lu, Z., Qu, Y., & Qiao, S. (2014). Geodesy: Introduction to Geodetic Datum and geodetic Systems. Berlin: Springer-Verlag.
5.Punmia, B., Jain, A. K., & Jain, A. K. (1990). Surveying (Vol. 3). New Delhi: Lakshmi Publications.
6.Torge, W. (2001). Geodesy (3rd Edition ed.). New York: Walter de Gruyter Berlin.

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SEMESTER – IV	
SEC/PCS3	**GEOSPATIAL INTELLIGENCE**
	Course Code: 23KP4GSEC3
HOURS : 4	**Credits: 2**

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 TO GEOSPATIAL INTELLIGENCE**

Physical and Human Geography as a Base for Geospatial Intelligence Work – Geospatial Technologies: GIS, GPS, Photogrammetry, Remote Sensing, and Sensor Networks – Geospatial Intelligence for Disaster Management, Humanitarian Assistance, and Problem-Solving.

Unit - 2	**METHODS AND APPROACHES**

Geospatial Data Collection - Data Analysis – Data Integration - Data Mining - Predictive Analysis - Open Source Intelligence (OSINT) - Spatial Data Quality Assurance.

Unit - 3	**GEOINTELLIGENCE PROBLEM-SOLVING**

Geospatial Analysis: Security - Disaster Response - Urban Planning and Land Use - Environmental Monitoring - Wildlife Conservation - Humanitarian Assistance.

Unit - 4	**GEOINTELLIGENCE APPLICATIONS**

Agriculture and Precision Farming - Healthcare and Epidemiology - Infrastructure Development - Energy Management - Law Enforcement - Business and Marketing - Maritime and Aviation.

Unit - 5	**EMERGING TRENDS IN GEOSPATIAL INTELLIGENCE**

Artificial Intelligence (AI) - Big Data Analytics - Real-time Geospatial Monitoring - Unmanned Aerial Vehicles (UAVs) and Drones - 3D and LiDAR Technology - Geospatial Cloud Services.

Text Book(s)	
Anderson, E. 2000. The Geography of Hazard Analysis: Disaster Management and the Military. The Scope of Military Geography. 219-232.	
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	
Rees W.G (2015,"Physical Principles of Remote Sensing", 3rd Edition, CambridgeUniversity Press, New York.	
Palka, E. 2000. A Decade of Instability and Uncertainty: Mission Diversity in the MOOTW Environment. The Scope of Military Geography. 167-196.	
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).

Expected Course Outcomes:	
1	Understanding of Geospatial Intelligence
2	Details understanding on Methods And Approaches
3	Analyse and modelling the Geographic data to create geo-intelligence for decision making
4	Complete understanding of Geo-intelligence various applications
5	Understanding Emerging trends of Geo-intelligence

SEM IV	**EA**	**Extension Activity/Field Work**	**CODE 23KP4EA**	**Ins.Hrs. -**	**Credits 1**