KANNUR UNIVERSITY
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(Abstract)

FYUG B.Sc. Geoinformatics and Remote Sensing Programme in Affiliated Colleges under Kannur University – Modified Scheme and Syllabi for the First and Second Semesters with effect from 2026 Admission and for the Third to Eighth Semesters with effect from 2025 Admission – Approved and Implemented – Orders Issued.

ACADEMIC C SECTION

ACAD C/ACAD C1/14772/2024 Dated: 18.08.2026

Read:-1. U O No Acad/A3/10916/25 dated 21.06.2025

2. U.O. No. ACAD C/ACAD C1/14772/2024 DATED 05.01.2026

3. E-mail from Associate Professor and Head, Department of Geoinformatics and Remote Sensing, Government Model Degree College (RUSA), Mananthavady, Wayanad , dated 01.08.2026

4 Minutes of the meeting of the Board of Studies in Geography (cd) held on 05.08.2026

5. E mail from the Dean, Faculty of Science , dated 07.08.2026

6. Orders of the Vice Chancellor in the file of even no., dtd 13.08.2026

ORDER

1. Provisional affiliation was granted to five UG Programmes at Government Model Degree College-RUSA, Thrissilery, Mananthavady, Wayanad, during the Academic Year 2025–26, including three new programmes, namely, **B.Sc. Geoinformatics and Remote Sensing, B.Sc. Psychology and Neurosciences, and B.Com. Finance with Forensic Accounting**, as per the paper read as (1) above.
2. The **Scheme and Syllabi for the First and Second Semesters of the FYUG B.Sc. Geoinformatics and Remote Sensing Programme** in affiliated colleges under Kannur University were approved and implemented with effect from the **2025 admission**, as per the paper read as (2) above.
3. Subsequently, the Associate Professor and Head, Department of Geoinformatics and Remote Sensing, Government Model Degree College (RUSA), Mananthavady, Wayanad, submitted the **Modified Scheme and Syllabi** for **the First and Second Semesters with effect from the 2026 admission and for the Third to Eighth Semesters with effect from the 2025 admission**, for approval.
4. As per the paper read as (4) above, the **Board of Studies in Geography (CD)** held an online meeting on 05.08.2026 and considered the Modified Scheme and Syllabi for the First and Second Semesters with effect from the 2026 admission and for the Third to Eighth Semesters with effect from the 2025 admission, and **recommended the same for approval.**
5. The minutes of the Board of Studies in Geography (CD), along with the Modified Scheme and Syllabi, were thereafter forwarded to the **Dean, Faculty of Science**, for remarks. The Dean, vide email dated 07.08.2026, conveyed his **support for the decision and recommendations of the Board of Studies in Geography (CD)**.
6. The Vice Chancellor, after considering the recommendations of the Dean, Faculty of Science, and in exercise of the powers of the Academic Council conferred under **Section 11(1), Chapter III of the Kannur University Act, 1996**, and all other enabling provisions

read together therewith, has **approved the Modified Scheme and Syllabi for the First and Second Semesters with effect from the 2026 admission and for the Third to Eighth Semesters with effect from the 2025 admission**, subject to reporting the same to the Academic Council.

7. The **Modified Scheme and Syllabi for the First and Second Semesters with effect from the 2026 admission and for the Third to Eighth Semesters with effect from the 2025 admission of the FYUG B.Sc. Geoinformatics and Remote Sensing Programme in affiliated colleges under Kannur University** are appended to this U.O. and uploaded on the University website.
8. **Orders are issued accordingly.**

Sd/-
Bindu K P G
Joint Registrar (Acad)
For REGISTRAR

To: 1.The Principals of all Affiliated Colleges
2.

Copy To: 1. The Controller of Examinations (Through PA to CE)
2. JR (Exam)/ AR VII (Exam)/SO (EXC1)
3. The Chairperson, BoS in Geograpgy (cd)
4. PS to VC/PA to R
5. DR/JR (Academic)
6.IT Cell (For uploading in the website)
7. SF/DF/FC

Forwarded / By Order
SECTION OFFICER

KANNUR UNIVERSITY

Geoinformatics and Remote Sensing

SYLLABUS

Four Year Under Graduate Programme FYUGP 2025

Graduate Attributes/Programme Outcomes (PO)

Graduate attribute	*Academic Level*	*Personal Level*	*Professional Level*
General	Critical thinking Scientific thinking Intellectual rigour Research-related skills Creativity and innovation	Cultural competency Gender sensitivity	Life-long learning Ethical awareness Team work
Work ready	Problem-Solving Knowledgeable information Digital Literacy	Multicultural Competence Social Intelligence Communication skills	Leadership qualities Geo spatial modelling Cooperativeness Team readiness
Successful	Autonomous Innovative Insightful Reflective thinking	Analytical reasoning Self-directed learning	Synergetic action

Programme Specific Outcomes (PSO)

At the end of the B.Sc. Geoinformatics and Remote Sensing Program at Kannur University, a student would:

PSO1	Gain comprehensive knowledge of geospatial sciences by understanding the principles, processes, and mechanisms of the earth's bio-physical systems and human-environment interactions.
PSO2	Demonstrate critical thinking skills through the application of spatial concepts such as scale, space, place, and environment in analyzing real-world problems with the help of advances in geo-information technology.
PSO3	Acquire proficiency in geospatial technologies, including Remote Sensing, GIS, GPS, and spatial data science, to address challenges of the Anthropocene at global, regional, and local scales.
PSO4	Apply practical geoinformatics tools for spatial decision-making in areas such as disaster management, natural resource management, urban and regional planning, sustainability, and social justice.
PSO5	Develop competence in data acquisition, processing, interpretation, modeling, and visualization to represent complex geographic realities effectively.
PSO6	Develop proficiency in effective communication of conceptual and practical geographical knowledge in geoinformatics to both scientific and public audiences.

PSO7	Engage in interdisciplinary and multicultural contexts by integrating geoinformatics knowledge with natural and social sciences, forging partnerships with academia, industry, and local communities to generate innovative, enduring solutions for human and ecological well-being.

Kannur University Four Year Under Graduate Programme (FYUGP) in Geoinformatics and Remote Sensing - 2026

SYLLABUS

Type	Course	Code	Credit	Level
SEMESTER - I				
DSC	Basics of earth system and Geoinformatics (A-1)	KU1DSCGRS101	4	100
	B/C-1		4	
	B/C-2		4	
AEC	Language (AEC-1)		3	
	Language (AEC-2)		3	
MDC	MDC -1	KU1MDCGRS101	3	
Minimum Credit Requirement for SEMESTER I			**21**	
SEMESTER - II				
DSC	Fundamentals of Cartography (A-2)	KU2DSCGRS107	4	100
	B/C-3		4	
	B/C-4		4	
AEC	Language (AEC-3)		3	
	Language (AEC-4)		3	
MDC	MDC-2	KU2MDCGRS102	3	
Minimum Credit Requirement for SEMESTER II			**21**	
SEMESTER - III				
DSC	Introduction to Remote Sensing (A-4)	KU3DSCGRS201	4	200
	Understanding Space and Society (A-5)	KU3DSCGRS202	4	
	B/C-5		4	
	B/C-6		4	
MDC	Kerala Studies (MDC-3)		3	
VAC	VAC-1 - Environment and Sustainability	KU3VACGRS201	3	
Minimum Credit Requirement for SEMESTER III			22	

SEMESTER - IV				
DSC	Climate and Ocean Science (A-6)	KU4DSCGRS208	4	200
	Fundamentals of Geoinformatics (A-7)	KU4DSCGRS209	4	
	Field Techniques in Geographical Studies (A-8)	KU4DSCGRS210	4	
SEC	(SEC-1) Introduction to Survey Techniques	KU4SECGRS201	3	
VAC	VAC-2 - Ecosystem Services	KU4VACGRS202	3	
	VAC 3 – Water Resource Management	KU4VACGRS203	3	
Minimum Credit Requirement for SEMESTER IV			21	
SEMESTER - V				
DSC	Digital Image Processing (A-10)	KU5DSCGRS301	4	300
	Quantitative Techniques in Geography (A-11)	KU5DSCGRS302	4	
	Introduction to Programming (A-12)	KU5DSCGRS303	4	
DSE	Biogeography	KU5DSEGRS301	4	
	Water Resource Management	KU5DSEGRS302		
DSE	Regional Planning and Development	KU5DSEGRS303	4	
	Soil Geography	KU5DSEGRS304		
SEC	(SEC-2) Introduction to Geo-Spatial Technology	KU5SECGRS301	3	
Internship	Internship (Vacation)	KU5INTERN301	2	
Minimum Credit Requirement for SEMESTER V			25	

SEMESTER - VI					
DSC		Geography of India (A-13)	KU6DSCGRS304	4	300
		Fundamentals of Global Positioning System (GPS) (A-14)	KU6DSCGRS305	4	
		Research Methodology (A-15)	KU6DSCGRS306	4	
DSE		Geoinformatics for Urban Planning	KU6DSEGRS305	4	
		Geographical Thought	KU6DSEGRS306		
DSE		Geography of Tourism	KU6DSEGRS307	4	
		Population Dynamics and Application of GIS	KU6DSEGRS308		
SEC		(SEC-3) Advanced Geospatial Techniques	KU6SECGRS302	3	
Minimum Credit Requirement for SEMESTER VI				23	
Students exiting after 3rd Year: awarded UG Degree with Major in Geography					
Total Credit Requirement for UG Degree				**133**	
SEMESTER - VII					
DSC		Spatial Planning and Development (A-16)	KU7DSCGRS401	4	400
		Disaster Management (A-17)	KU7DSCGRS402	4	
		Database Management System (A-18)	KU7DSCGRS403	4	
		Programming with Python in GIS and Remote Sensing (A-19)	KU7DSCGRS404	4	
		Geo-Statistics (A-20)	KU7DSCGRS405	4	
Minimum Credit Requirement for SEMESTER VII				20	
SEMESTER - VIII					
1	DSC	Application of AI in Geoinformatics (A-21)	KU8DSCGRS405	4	400
2	DSC	Principles of Photogrammetry (A-22)	KU8DSCGRS406	4	
3	DSC	Web Technology for Geoinformatics (A23)	KU8DSCGRS407	4	
4	Project	Project (In Honours Programme)	KU8PGRS401	12	
		Project (In Honours with Research Programme)	KU8RPGRS401		

OR				
1	MOOC/Online Course			4
2	MOOC/Online Course			4
3	MOOC/Online Course			4
4	Project	Project (In Honours Programme)	KU8PGRS401	12
		Project (In Honours with Research Programme)	KU8RPGRS401	
OR				
1	DSC	Application of AI in Geoinformatics (A-21)	KU8DSCGRS405	4
2	DSC	Principles of Photogrammetry (A-22)	KU8DSCGRS406	4
3	DSC	Web Technology for Geoinformatics (A23)	KU8DSCGRS407	4
4	MOOC/Online Course			4
5	MOOC/Online Course			4
6	MOOC/Online Course			4
Minimum Credit Requirement for SEMESTER VIII				24
Student Exit After Four Year: Hons/Hons with Research Degree with Major in Geography				
Total Credit Requirement for Hons/Hons with Research				**177**

Group No.	Sl. No.	Course Code	Title	Semester	Total Hrs	Hrs/ Week	Credits	Marks		
								Internal	External	Total

1		**CLIMATE SCIENCE**								
	1	KU1DSCGRS102	Weather and Climate Change	1	75	5	4	35	65	100
	2	KU2DSCGRS108	Climate Change and Sustainable Development	2	75	5	4	35	65	100
	3	KU3DSCGRS203	Mitigation and Adaptation to Climate Change	3	75	5	4	35	65	100
2		**DISASTER MANAGEMENT**								
	1	KU1DSCGRS103	Introduction to Disaster Management	1	75	5	4	35	65	100
	2	KU2DSCGRS109	Disaster Management Processes	2	75	5	4	35	65	100
	3	KU3DSCGRS204	Disaster Mitigation and Management	3	75	5	4	35	65	100
3		**GEOINFORMATICS**								
	1	KU1DSCGRS104	Introduction to Remote Sensing	1	75	5	4	35	65	100
	2	KU2DSCGRS110	Fundamentals of GIS	2	75	5	4	35	65	100
	3	KU3DSCGRS205	Spatial Analysis	3	75	5	4	35	65	100
4		**DIGITAL SURVEYING**								
	1	KU1DSCGRS105	Fundamentals of Surveying	1	75	5	4	35	65	100

	2	KU2DSCGRS111	Conventional Surveying	2	75	5	4	35	65	100
	3	KU3DSCGRS206	Digital Surveying	3	75	5	4	35	65	100
5		**REGIONAL GEOGRAPHY**								
	1	KU1DSCGRS106	World Regional Geography	1	75	5	4	35	65	100
	2	KU2DSCGRS112	Physical Geography of India	2	75	5	4	35	65	100
	3	KU3DSCGRS207	Geography of Kerala	3	75	5	4	35	65	100

GROUPING OF MDC COURSES IN GEOGRAPHY

1	KU1MDCGRS101	Western Ghats– Culture and Ecology	1	45	3	3	25	50	75
2	KU2MDCGRS102	Introduction to Climate Change	2	45	3	3	25	50	75
3		Kerala Studies							
4									

GROUPING OF SEC COURSES IN GEOGRAPHY

1	KU4SECGRS201	Introduction to Survey Techniques	4	45	3	3	25	50	75
2	KU5SECGRS301	Introduction to Geo-Spatial Technology	5	45	3	3	25	50	75
3	KU6SECGRS302	Advanced Geospatial Techniques	6	45	3	3	25	50	75

GROUPING OF VAC COURSES IN GEOGRAPHY

1	KU3VACGRS201	Environment and Sustainability	3	45	3	3	25	50	75
2	KU4VACGRS202	Ecosystem Services	4	45	3	3	25	50	75
3	KU4VACGRS203	Water Resource Management	4	45	3	3	25	50	75

Basics of Earth System and Geoinformatics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC	100-199	KU1DSCGRS101	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This course provides a crucial foundational understanding of the dynamic and interconnected nature of the Earth's systems. It examines the complex interactions among the atmosphere, lithosphere, hydrosphere, and biosphere, enabling a holistic view of natural processes. Complementing this, Geoinformatics provides the technological framework for collecting, analysing, and interpreting spatial data related to these processes. This course enables the student to build scientific understanding, apply modern tools, solve environmental problems, and make informed decisions for a sustainable future. As environmental challenges and climate-related issues become increasingly frequent, understanding the basics of Earth systems combined with geospatial technologies is critical for informed decision-making and scientific advancement.

Course Pre requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamental components and processes of the Earth system, and their interrelationships.	U
2	Develop knowledge on the significance of Earth system science in addressing environmental and climatic issues.	A
3	Apply the basic principles of geoinformatics to collect, visualize, and interpret geospatial data.	A

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Earth and its Lithosphere**	10
	1	Earth as a system and its components; Origin and evolution of earth as a planet	
	2	Earth's interior and Isostasy	
	3	Origin of Continents and Oceans: Continental Drift and Plate Tectonics	
	4	Landforms- plains, plateaus and mountains- types	
2		**Atmosphere**	10
	1	Composition and Structure; Weather and Climate- Elements and Controls	
	2	Energy: Insolation and Temperature	
	3	Pressure Systems and wind circulation	
	4	Precipitation	

	Hydrosphere		
3	1	Hydrological cycle	15
	2	Ocean Salinity and Temperature	
	3	Ocean Water Movements: Waves, Tides and Currents	
	4	Oceanic deposits	
4	**Earth Observation System**		10
	1	History of Earth Observation; Various Platforms- land based, air-based and space born platforms	
	2	Types of Satellites; Landsat Satellite and India's Satellite Programme	
	3	Satellite sensors: Orbits and Platforms for Earth observation, sensors and scanners, active and passive sensors. Electromagnetic spectrum	
	4	EMR, Spectral signatures, Concept of resolution and its types	
5	**Teacher Specific Module**		
	Directions		
	Practicals 1. Scale - Representation of Scale Construction of Plain scale 2. Types of Maps 3. Climate data sources; Weather instruments: data acquisition and dissemination, Local weather data collection and analysis		30

Essential Readings:

1. The Earth System, Kump, L.R., Kasting, J.F., & Crane, R.G., Pearson.
2. The Blue Planet: An Introduction to Earth System Science, Skinner, B.J., Murck, B.W. Wiley.
3. Earth as an Evolving Planetary System, Condie, K. C., Academic Press.
4. Environmental Geology. Montgomery, C. W., McGraw Hill.
5. Geodynamics. Turcotte, D. & Schubert, G., Cambridge University Press.
6. Aerial Photography and Image Interpretation, Paine, D.P. & Kiser, J.D., John Wiley & Sons
7. Remote Sensing and Image Interpretation, Lillesand, T.M., Kiefer, R.W., & Chipman, J.W., John Wiley & Sons.
8. Global Geomorphology. Summerfield, M. A., Longman Scientific & Technical.
9. Fundamentals of Geomorphology, Huggett, R. J., Routledge

10. Thornbury, W. D. Principles of Geomorphology, Wiley Eastern.
11. Geomorphology, Savindra Singh, Pravalika Publications
12. Atmosphere, Weather and Climate, Barry, R. G., & Chorley, R. J., Routledge.
13. General Climatology, Critchfield, H. J., Prentice-Hall.
14. Climatology: An Atmospheric Science, Oliver, J. E., & Hidore, J. J., Pearson Education.
15. Physical Geography: Science and Systems of the Human Environment, Strahler, A. H., & Strahler, A. N, Wiley.
16. Climatology. Savindra Singh, Prayag Pustak Bhawan, Allahabad.
17. Fundamentals of Geomorphology, Huggett, R. J. Routledge.
18. Introduction to Geomorphology. Kale, V. S., & Gupta, A, Orient Longman.
19. Regional Oceanography: An Introduction, Tomczak, M., & Godfrey, J. S., Daya Publishing House
20. Climate Change 2021: The Physical Science Basis. IPCC (Intergovernmental Panel on Climate Change) Cambridge University Press.

Suggested Readings:

1. Introduction to Modern Climate Change, Dessler, A. E. Cambridge University Press.
2. The Earth System, Kump, L. R., Kasting, J. F., & Crane, R. G, Pearson Education.
3. Climate Change and India: Vulnerability Assessment and Adaptation, Shukla, P. R., & Ramana, P. V, Universities Press.
4. Principles of Geographical Information Systems, Burrough, P. A., & McDonnell, R. A, Oxford University Press.
5. Geographic Information Science and Systems, Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W, Wiley.
6. Remote Sensing of the Environment: An Earth Resource Perspective, Jensen, J. R., Pearson Prentice Hall.
7. Global Positioning System: Principles and Applications, Gopi, S, Tata McGraw-Hill.
8. Geoinformatics: Fundamentals and Applications, Nag, P, Concept Publishing, New Delhi.
9. Fundamentals of geographic information systems, Michael N. DeMers, Teri Publication
10. Introduction to Geographic Information Systems, Kang – Tsung Chang, Mc Graw hill Education.

Assessment Rubrics:

Evaluation Type		Marks	Evaluation Type		Marks	Total
Lecture		**75**	**Practical**		**25**	**100**
a)	**ESE**	**50**	**a)**	**ESE**	**15**	

b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Fundamentals of Cartography

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
II	DSC	100-199	KU2DSCGRS107		4	75
Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	

3	2	0	35	65	100	1.5

Course Description:

This course is designed to provide the knowledge and skills for understanding the process of map making. This course covers the design, purpose, use, and proper development of maps. provides a general introduction to Cartography, broadly defined as the art, science, and ethics of mapmaking and map use.

Course Pre-requisite: Nil

Course Outcomes:

Expected Outcome		Learning Domains
1	Understand the types of maps and importance of maps	U
2	Learn about the history of map making	R
3	Understand the different methods to represent earth-map relations	A
4	Understand the methods of representation of geographical data	A

Remember(R), Understand (U), Apply(A), Analyse(An), Evaluate(E), Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2		✓					
CO 3			✓				
CO 4						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Nature and Scope of cartography**		10
	1	Definition and Approaches in cartography	
	2	History of Cartography: Ancient Period	
	3	History of Cartography: Medieval Period	
	4	Modern Cartography- Recent Trends and Techniques	
2	**Maps**		12
	1	Definition of a Map	
	2	Essentials of a Good Map	
	3	Classification of maps	
	4	Importance of Maps	
	Earth-Map relations		
3	1	Geographical Co-ordinates and Direction	12
	2	Scale	
	3	Map Projections	
	4	Surveying and Remote Sensing Techniques	
4	**Representation of features on a map**		11
	1	Methods of mapping and representation of terrain on a map	
	2	Mapping the weather and climatic data	
	3	Thematic and complex mapping	
	4	Map reproduction	
5	**Practical**		
	Directions		
	Drawing exercises • Map Projection- Polar Zenithal Stereographic, Conical with One Standard Parallel, Simple Cylindrical Projection • Graphs and Diagrams-Columnar, Linear, and Circular graphs • Preparation of climatic maps- Isopleths, Isotherms, Isobars, Isohytes, • Windrose diagrams, Climograph		30

Essential Readings:

1. Ashish Sarkar : Practical Geography-A systematic approach, Orient Blackswan Pvt. Ltd
2. Bangulia A.M : Practical Geography, Anmol Publishers Pvt. Ltd
3. Gopal Singh : Map work and Practical Geography, Vikas Publishing Pvt. Ltd
4. Monkhouse and Wilkinson : Maps and Diagrams, Metheun and Company
5. Saha P and Basu P : A Practical Geography, Books and Allied Ltd. Kolkata
6. Singh R L and Rana P B Singh, Elements of Practical Geography, Kalyani Publishers
7. Siya Ram Sharma : Practical Geography, Murali Lal & Sons Pvt. Ltd.
8. Zulfequar Ahmad Khan M D Text book of Practical Geography, Concept Publishing Company

Suggested Readings:

1. Gupta K K and Tyagi V C : Working with Map, Survey of India, DST, New Delhi
2. Mishra R P and Ramesh A, : Fundamentals of Cartography, Concept Pub. New Delhi
3. Robinson A H, Elements of Cartography, John Wiley and Sons, New York
4. Sarkar A : Practical Geography: A systematic Approach, Orient Black Swan Pvt. Ltd, New Delhi

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Introduction to Remote Sensing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS201	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

The course is designed to introduce students to the fundamental concepts and applications of remote sensing technology. This course emphasizes hands-on experience, providing students with the skills needed to acquire, analyze, and interpret remote sensing data. Through practical exercises and projects, students will learn how to apply remote sensing techniques in various fields such as environmental monitoring, agriculture, urban planning, and disaster management.

Course Prerequisite:NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To create a basic knowledge on different types of remote sensing, basic principles of remote sensing	U
2	To make the students aware about the significance of the applications of remote sensing as a tool for monitoring objects & phenomena and suggesting their strategic management.	A
3	Examine the recent trends in RS technology and its application in various fields of research.	An
4	To apply the potentials of remote sensing technology in multidisciplinary research and to make suggestions for various problems	E

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✔						
CO 2		✔		✔			
CO 3			✔	✔			✔
CO 4						✔	✔

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Principles of Remote Sensing**	10
	1	Evolution of Remote Sensing, Process of remote Sensing,	
	2	Advances in Indian remote sensing	
	3	Electromagnetic Radiation, EMS, Energy Interactions with Atmosphere and Ground.	
	4	Development of Aerial remote Sensing, Basic Principles of Photogrammetry - Flight Planning Mission, Types of Aerial Photographs, Film-Filters-Aerial cameras	
2		**Principles of Satellite remote sensing.**	12
	1	LANDSAT, SPOT, IRS, ERS, INSAT programmes and their characteristics.	
	2	Types of satellites and sensors, Platforms / Sensor properties	
	3	Multispectral and Hyperspectral Remote Sensing, Thermal and micro wave Remote Sensing.	
	4	Data products- Geometric Characteristics.	

	Principles of Image Interpretation		
	1	Basic Principles of Visual Interpretation of an Image	

3	2	Digital Image Processing, Procedures in Digital Image Processing, Data Pre-processing, Ground Truth verification.	12
	3	Image Classification- Supervised and Unsupervised Classification, Accuracy Assessment	
	4	Indices; NDVI, SAVI, NDWI, EVI, NDBI	
4	**Application of Remote Sensing**		11
	1	Application of RS in Agriculture-Forestry, Land use Land Cover mapping	
	2	Application of RS Environmental studies, Hydrology, Marine and Coastal studies	
	3	S for Urban studies Regional Planning and disaster management	
	4	Recent Trends in Remote Sensing, LIDAR, Drone Mapping, Hyperspectral Remote Sensing.	
5	**Teacher Specific Module- Practical**		30
	Directions		
	Prepare Practical Record File containing at least 5 exercises from the following: 1. Practical 1: Calculation of Scale of Aerial Photograph (Using following methods: Focal Length and Flying Height of the Aircraft, Using Photo Distance and Ground Distance, Using Photo Distance and Map Distance). 2. Practical 2: Orientation of Aerial Photo using available Stereoscope (Mirror or Pocket Stereoscope). 3. Practical 3: Identification, Image Interpretation Key and interpretation of Feature Types in Aerial Photographs using a stereoscope. 4. Practical 4: Downloading various remote sensing data (Bhuvan and Landsat data). Preparation of spectral signatures curves for different Various Feature Types (LU/LC) types (only four: Water body, Vegetation, Open/fallow land and built up). 5. Practical 5: Clip, merge, band stacking / virtual raster.		
	6. Practical 6: Satellite Image Classification Using Supervised Methods and Preparation of Land Use/Land Cover Map Using Bhuvan or Landsat Data. 7. Practical 7: Satellite Image Classification using unsupervised/supervised classification methods. 8. Practical 8: Urban Sprawl mapping using NDBI or LULC or Vegetation Monitoring using NDVI or LULC		

Essential Readings:

1. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
2. Basudeb Bhatta (2008) Remote Sensing and GIS, OUP India Publication.
3. Christian Matzler (2006) Thermal microwave radiation: Applications for remote sensing, The Institution of Engineering and Technology, London.
4. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
5. Christian Matzler (2006) Thermal microwave radiation: Applications for remote sensing, The Institution of Engineering and Technology, London.

Suggested Readings:

1. Remote Sensing and Environment, Elsevier Publication
2. Journal of Geodesy, Springer Publication.
3. IEEE Transactions on Geoscience and Remote Sensing, Institute of Electrical and Electronics Engineers Inc.
4. Remote Sensing in Ecology and Conservation, Zoological society of London, Online ISSN:2056-3485
5. Sailesh Samanta, A Text Book of Remotesensing , GIS and GNSS, Nation press Publication.

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Understanding Space and Society

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS202	4	60

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

Space and society form a symbiotic relationship that has captivated the attention of geographers. The profound interconnectedness between these entities lies at the heart of geographical inquiry, offering a nuanced lens through which human activities and social structures are examined in the context of the spaces they inhabit. The paper attempts to introduce students to understand the co-production of social structure and space in the contemporary world.

Course Pre requisite : NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the relationship between space and society.	U
2	To analyse population growth and its spatial pattern	An
3	In-depth understanding of social space and its construction	E
4	Understanding the geographical manifestations of culture	A

Remember(R), Understand(U), Apply(A), Analyse (An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO	✓						

1							
CO 2					✓		
CO 3		✓					
CO 4						✓	

COURSE CONTENTS

Contents for Classroom Transaction :

MODULE	UNIT	DESCRIPTION	HOURS
1		**Spatial Dimensions of Human Society**	12
	1	Nature and Contemporary relevance of Human Geography	
	2	Major Themes: Space (Absolute, Relative, Relational), Place, Scale, Movement, Region	
	3	Approaches in Human Geography (Positivism, Humanism, Structuralism)	
	4	Concept of Social Space and Topophilia	
2		**Population**	12
	1	World Population Distribution and Growth	
	2	Population Dynamics (Fertility, Mortality and Migration)	
	3	Demographic Transition and its Regional Pattern	
	4	Population Composition (Residence, Age, Sex)	
3		**Social Geography**	12
	1	Language	
	2	Religion	
	3	Tribes and Caste	
	4	Race and Ethnicity	
4		**Cultural Geography**	12
	1	Culture : Meaning and formation	
	2	Types of Culture, Components/Structure of Culture	
	3	Culture and Geography: Cultural Landscape	
	4	Cultural Realms of the World	
		Teacher Specific Module (Any one from the following)	

5	1. Field visit to distinguish urban and rural space	12
	2. Compiling demographic profile using census data	

Essential Readings:

1. Ahmad, Aijazuddin.(1999).Social Geography. Jaipur: Rawat Publications
2. Aitken,S.and Valentine,G(2006).Approaches to HumanGeography. Sage Publications.
3. Fouberg,E.H.,Murphy,A.B.,& De Blij,H.J.(2015).Human Geography: People, Place and Culture. John Wiley & Sons.
4. Knox,P.L.,Marston,S.A.,& Imort,M.(2016).Human Geography: Places and regions in global context. New York: Pearson.
5. Rubenstein,JamesM.(2017).TheCultural Landscape:An Introduction to Human Geography. Pearson. .

Suggested Readings:

1. Chandna,R.C.(2017).Population Geography. NewDelhi, U.S.A.: Kalyani Publishers.
2. Hassan,M.I. (2005).Population Geography.Jaipur,India : Rawat Publications.
3. Jordan-Bychkov., et al. (2006). The Human Mosaic: A ThematicIntroductiontoCulturalGeography.NewYork, U.S.A.: W. H. Freeman and Company.
4

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	10
	Total	**100**

Climate and Ocean Science

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC	200-299	KU4DSCGRS208	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

The course on Climate and Ocean system offers a comprehensive exploration of Earth's atmospheric and oceanic systems, focusing on their dynamic interactions and influence on the global climate. The syllabus encompasses a broad range of topics, including atmospheric circulation patterns, climate zones, ocean currents, climate change, and the impact of human activities on the environment. Through a combination of theoretical lectures, practical lab sessions and fieldwork, students gain a deep understanding of climate processes, ocean dynamics, and their intricate relationship with the Earth's ecosystems. Moreover, the course equips students with essential analytical and research skills, enabling them to assess climate data, develop climate models, and propose effective strategies for climate adaptation and mitigation.

Course Prerequisite: NIL

Course Outcomes:

CO No	Expected Outcome	Learning Domains
1	Understand the mechanism of climatic phenomena.	U

2	Understand the extreme weather phenomena, their occurrence, and its impact.	An
3	Classification of climate & analysis of climatic data, their interpretation and weather forecasts.	A
4	Understanding ocean relief features along with ocean circulations and physiochemical characteristic	R
5	To develop a solid idea about ocean resources and laws concerning oceans	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2		✓					
CO 3					✓		
CO 4	✓						
CO 5						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction to Climatology**	12
	1	Nature and Scope of Climatology; Climatology and Meteorology	
	2	Weather and Climate, Elements and controls of climate	
	3	Insolation and Controlling factors, Heat Budget	
	4	Atmospheric temperature- Horizontal distribution and factors affecting; Vertical distribution- Normal lapse rate and Inversion of temperature	
2		**Atmospheric System**	14
	1	Atmospheric Pressure- Horizontal Distribution– Coriolis force; Major pressure belts; Vertical Distribution	
	2	Atmospheric disturbances- cyclones, anti-cyclones, air masses	

	3	Water in the atmosphere: Atmospheric humidity and its types; Evaporation – Condensation – Forms of condensation – Fog – Clouds – Classification – Precipitation – Types – Distribution	
	4	Climatic Regions and Classification	
3	**Ocean System**		12
	1	Relief of the ocean floor	
	2	Temperature and Salinity of the oceans– Distribution	
	33	Ocean circulations- Waves and Tides	
	4	Currents of the Indian, Pacific & Atlantic Ocean & Counter Currents	

4	**World Oceans**		12
	1	Oceanic Deposits	
	2	Coral reefs – Types - Barrier reef, Atoll, Fringing Reef & coral islands	
	3	Theories of Coral formation	
	4	Ocean resources and international cooperation	

5	**Teacher Specific Module**	10
	Directions	
	Field Work- Visit nearest local weather station,	
	Observing the coastal landscape	

Essential Readings:

1. Critchfield, HowardJ(2008):General Climatology, Prentice Hall, London
2. Barry,R.G.,andChorley,R.J.(2010):Atmosphere,Weather andC limate,Routledge,London
3. Oliver,JohnE & Hidore, JohnJ (2001):Climatology-Anatmospheri cscience,Pearson Education
4. Singh,Savindra(2020):Climatology, Pravallika publications, Allahabad
5. Sidhartha,K(2016):Atmosphere,Weather and Climate, Kisalaya Publications Private Limited, Delhi
6. Lal D S (2003):Climatology, Sharda Pustak Bhavan, Allahabad.
7. Sidhartha,K (2014): Oceanography-A brief introduction ,Kisalaya

Publications, Private Limited, Delhi
8. Thurman,Harold V(2011): Essentials of Oceanography, Prentice Hall India, New Delhi
9. Ashish Sarkar(2009) Practical Geography–A systematic approach,Orient Black Swan, Kolkata.
10. Saha,Pijushkanti(2017) Advanced Practica lCartography,Books and Allied,Kolkata
11. Singh L R (2009) Fundamentals of Practical Geography, Sharda Pustak Bhavan
12. Singh RL and Rana B Singh(2004) Elements of Practical Geography, Kalyani Publishers, New Delhi
13. Robinson,P.J.and Sellers,H. (1986),Contemporary Climatology, Longman, London.

Suggested Readings:

1. Negi,B.S (2000):Climatology and Oceanography, Kedar Nathram Nath publishers, Meerut
2. Trewartha, G.T. (Latest edition) Introduction to Climate, McGraw Hill, New York.
3. Mayes and Hughes (2004):Understanding weather-a visual approach, Arnold publishers
4. Lutgens, Frederick K et.al (2018):The Atmosphere-An Introduction to Meteorology, Prentice Hall India, New Delhi
5. Strahler,A.H.and Strahler,AN.,(2001) Modern Physical Geography(4/E), JohnWiley and Sons, Inc., New York
6. https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-currents
7. https://worldoceanreview.com/en/wor-1/climate-system/great-ocean-currents/
8. Bulletin of the American Meteorological Society (https://journals.ametsoc.org/toc/bams/current)
9. Climate Dynamics (https://link.springer.com/journal/volumes And Issues/382)
10. International Journal of Climatology(https://rmets.onlinelibrary.wiley.com/journal/10970088) Journal of Climate (https://journals.ametsoc.org/toc/clim/current)
11. Nature Climate Change (https://www.nature.com/nclimate/)
12. Weather and Climat eExtremes (https://www.sciencedirect.com/journal/weather-and-climate-extremes)

Assessment Rubrics:

	Evaluation Type	**Marks**
	End Semester Evaluation	**70**
	Continuous Evaluation	**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Practical Record File	20
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Fundamentals of Geoinformatics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC	200-299	KU4DSCGRS209	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

The Geographic Information System (GIS) Practical course aims to equip students with hands-on experience in using GIS software for spatial data analysis, mapping, and visualization. Students will learn practical skills in data manipulation, geo processing, and spatial analysis through laboratory exercises, projects, and case studies. The course covers a range of GIS applications in various domains such as urban planning, environmental management, agriculture, and disaster response. By the end of the course, students will be proficient in utilizing GIS tools and techniques to solve real-world spatial problems.

Course Pre-requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the basic principles and concepts of Geographic Information System (GIS).	U
2	Acquire, preprocess, and manage spatial data from various sources.	A
3	Perform spatial analysis tasks such as proximity analysis, spatial querying, and surface analysis using GIS software.	An
4	Create thematic maps, perform spatial interpolation, and visualize spatial data effectively.	C
5	Integrate and manipulate spatial datasets for decision-making and planning purposes	E
6	Design and implement GIS-based projects to address real-world spatial problems	C
7	Communicate spatial analysis findings effectively through maps, reports, and presentations	A

**RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			
CO 4					✓		
CO 5			✓				
CO 6						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction to GIS**	10
	1	Introduction to GIS: Concepts and Applications	
	2	Components of GIS: Hardware, Software, Data, and People	
	3	Spatial Data Types and Formats	
	4	Coordinate Systems and Map Projections	
2		**Spatial Data Handling and Analysis**	12
	1	Spatial Data Acquisition Techniques: GPS, Remote Sensing	
	2	Data Preprocessing and Cleaning	
	3	Spatial Analysis Techniques: Buffering, Overlay, and Interpolation	
	4	Geo processing Tools and Functions in GIS	
		Advanced Spatial Analysis	
3	1	Advanced Spatial Analysis Techniques: Network Analysis, 3D Analysis	12
	2	Spatial Statistics and Modeling	
	3	Web GIS and Mobile GIS Applications	

	4	Case Studies and Practical Applications	
4	**Project-based Learning in GIS**		11
	1	Designing and Planning GIS Projects	
	2	Data Collection and Integration for Project Implementation	
	3	Analysis, Interpretation, and Presentation of Project Results	
	4	Real-world Applications and Case Studies	
5	**Teacher Specific Module**		
	Directions		
	Prepare a project file using the applications of GIS Software. The project may be designed on any of the following topic, if not limited to them: Land Use / Land Cover Change, Urban Studies, Environmental Hazards, resource mapping and management etc.		30

Essential Readings:

1. Fundamentals of Geographical Information Systems" by P. C. K. Mishra
2. "GIS Applications in Agriculture" by S. R. Pal and S. K. Ghosh
3. "Geographic Information Systems: An Introduction" by Mahesh Rao and Shashi Shekhar
4. "GIS and Remote Sensing: Principles and Applications" by Mohammed A. Kalkhan
5. "Geoinformatics: Principles, Applications, and Emerging Trends" by Prashant K. Srivastava and Lipi Das
6. "Introduction to GIS and Remote Sensing" by A. V. Senthil Kumar and C. V. Raja
7. "Practical Manual on GIS and Remote Sensing" by N. Thirunavukkarasu and V. R. Rajan
8. "Geospatial Technology for Digital Soil Mapping" by A. B. Panigrahy, S. K. Swain, and

P. K. Srivastava

9. "Practical Manual on Geoinformatics" by R. R. Yadav and S. K. Srivastava
10. "Geographical Information System and Global Positioning System" by P. C. K. Mishra
11. "Remote Sensing and GIS: Principles and Applications" by P. C. K. Mishra and O. P. Mathur
12. "GIS for Environmental Applications: A Practical Approach" by X. Wang and V. P. Singh
13. "Geoinformatics: Theory and Practice" by K. S. Rajan and K. C. Tiwari
14. "Advanced Techniques in Geographic Information Systems" by P. R. Ahuja and K. P. K. Nair
15. "GIS and Remote Sensing: Principles and Applications" by Mohammed A. Kalkhan
16. "Advanced Geospatial Analysis: Theory and Applications" by K. C. Tiwari and K. S. Rajan
17. "Practical Applications of Geospatial Technology" by S. K. Swain, A. B. Panigrahy, and

P. K. Srivastava

18. "Advanced Remote Sensing: Digital Image Processing and Applications" by P.

C. K. Mishra

19. "Spatial Analysis and Modeling in Geographical Transformation Process" by P. L. N. Raju
20. "Spatial Data Analysis in Urban and Regional Planning" by A. K. Singh and O. P. Mathur
21. "Advanced Geographical Information Systems and Web Technologies" by B. P. Prakash
22. "Spatial Data Mining and Geographic Knowledge Discovery" by M. Anji Reddy
23. "Advanced Spatial Statistics: Geostatistics, Spatial Regression, and Spatial Econometrics" by G. S. Srinivasan and K. R. Prasad.

Suggested Readings:

1. Fundamentals of Geographical Information Systems" by P. C. K. Mishra
2. "GIS Applications in Agriculture" by S. R. Pal and S. K. Ghosh
3. "Geographic Information Systems: An Introduction" by Mahesh Rao and Shashi Shekhar
4. "GIS and Remote Sensing: Principles and Applications" by Mohammed A. Kalkhan
5. "Geoinformatics: Principles, Applications, and Emerging Trends" by Prashant K. Srivastava and Lipi Das
6. "Introduction to GIS and Remote Sensing" by A. V. Senthil Kumar and C. V. Raja
7. "Practical Manual on GIS and Remote Sensing" by N. Thirunavukkarasu and V. R. Rajan
8. "Geospatial Technology for Digital Soil Mapping" by A. B. Panigrahy, S. K. Swain, and P.

K. Srivastava

9. "Practical Manual on Geoinformatics" by R. R. Yadav and S. K. Srivastava
10. "Geographical Information System and Global Positioning System" by P. C. K. Mishra
11. "Remote Sensing and GIS: Principles and Applications" by P. C. K. Mishra and O. P. Mathur
12. "GIS for Environmental Applications: A Practical Approach" by X. Wang and V. P. Singh
13. "Geoinformatics: Theory and Practice" by K. S. Rajan and K. C. Tiwari
14. "Advanced Techniques in Geographic Information Systems" by P. R. Ahuja and K. P. K. Nair
15. "GIS and Remote Sensing: Principles and Applications" by Mohammed A. Kalkhan
16. "Advanced Geospatial Analysis: Theory and Applications" by K. C. Tiwari and K. S. Rajan

. Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Field Techniques in Geographical Studies

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC	200-299	KU4DSCGRS210	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

"Introduction to Surveying Techniques" is a skill enhancement practical course designed to provide students with a comprehensive understanding of fundamental land surveying methods and tools. Through hands-on training and practical fieldwork, this course covers fundamental surveying principles, modern instruments, and techniques used in the industry. The course highlights various job opportunities and career paths available in the field of land surveying, helping students develop the practical skills and industry knowledge needed to excel and unlock a wide range of career opportunities.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To differentiate between different methods of field survey and inter-relationship between them	U
2	Observation of filed realities; Processing and Analysis of Field data	A
3	Mastering the advanced techniques of Filed survey and mapping	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓					✓	
CO 2			✓	✓			
CO 3			✓	✓			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction**	10
	1	Land surveying: definitions, history, and importance	
	2	Land Survey- Classification, instruments used; basic principles	
	3	Field book and Field Notes; Preparation of plans	
	4	Occupational safety and health while surveying	
2		**Chain & Compass**	12
	1	Introduction to Chain & Tape Survey- instruments and uses	
	2	Procedure for Chaining; Measurement of distance by a chain and chaining; Open Traverse and Closed Traverse Chain Survey; Obstacles in chain surveying	
	3	Prismatic Compass Survey: Identification and parts of instruments in compass survey	
	4	Prismatic Compass Survey – Open & Closed traverse (Procedures); Conduct survey using- Radiation and Intersection Method; Elimination of Errors	
3		**Plane Table and Clinometer**	12
	1	Plane Table Survey- principles and equipment used	
	2	Plane table survey: Procedures and Methods of Surveying	
	3	Conduct of Plane Table Survey using- Radiation and Intersection Methods	

	4	Indian Clinometer – Calculation of Height	

.	**Modern Land Surveying**		
4	1	Dumpy Level: Instruments Used for Levelling and Preparation of contours	11
	2	Theodolite: uses, types; Set up and perform centering of the instrument	
	3	Theodolite Survey: Finding heights of accessible and inaccessible points	
	4	Total Station- characteristics, development and advantages, Procedures of Surveying using Total Station and Robotic Total Station (Video Demonstration) DGPS- GPS versus DGPS; mechanisms and procedures (Video Demonstration)	
5	**Teacher Specific Module -Practicals** *Directions*		
	Following practical exercises may be conducted. A Record File containing plates of each activity to be prepared. 1. Chain and Tape: Calculate the areas of an irregular field - Apply geometrical formula for calculating the area. 2. Chain Survey- Open and Closed Traverse 3. Prismatic Compass: Radiation and Intersection Method 4. Plane Table Survey: Radiation and Intersection Method 5. Indian Clinometer: Calculation of Height 6. Dumpy Level: Levelling and Preparation of contours 7. Theodolite: Finding heights of accessible and inaccessible points 8. Total Station and Indian DGPS: identify instruments and procedures and steps		30

Essential Readings:

1. Zulfequar Ahmad Khan M.D (1998), Text book of Practical Geography, Concept Pubishing company
2. Siya Ram Sharma (2008), Practical Geography, Murali Lal & Sons Pvt.Ltd
3. Singh L.R (2009), Fundamentals of Practical Geography, Sharda Pustak Bhavan
4. Gopal Singh (1998) Map Work and Practical Geography (4th Edition), Vikas Publishing House, Ahmedabad.
5. Singh R.L & Rana P.B. Singh(2005, Elements of Practical geography, Kalyani Publishers
6. Bangulia A.M. (2006), Practical Geography, Anmol publishers Pvt Ltd 27
7. Ashish Sarkar (2009), Practical Geography - A systematic approach. Orient Blackswan Pvt Ltd
8. Monk House, F.J. & Wilkinson, H.R. (1973) Maps and Diagrams, Methuen & Co Ltd, London.
9. Saha, P. &Basu, P. (2014) Advanced Practical Geography, Books and Allied Ltd., Kolkatta.

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Digital Image Processing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCGRS301	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This course provides a comprehensive introduction to Digital Image Processing (DIP) in Remote Sensing, focusing on the processing and analysis of satellite imagery for geographic and environmental studies. It familiarizes students with techniques such as image acquisition, preprocessing, enhancement, classification, and interpretation for understanding earth surface features and environmental changes. The course combines theoretical knowledge with practical training in geospatial technologies, enabling learners to analyze spatial data, create meaningful visual outputs, and support decision-making in areas such as natural resource management, environmental monitoring, disaster management, and sustainable development.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the principles, concepts, and digital characteristics of remotely sensed data and digital image processing techniques for analyzing earth surface phenomena..	U
2	Apply image preprocessing, enhancement, transformation, and classification techniques using geospatial technologies for spatial analysis and interpretation.	A

3	Demonstrate practical skills in handling satellite imagery and geoinformatics software for resource mapping, environmental monitoring, and spatial decision-making	A
4	Develop analytical and communication skills by interpreting processed geospatial data and presenting outputs for scientific, planning, and societal applications.	

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Fundamentals of Digital Image Processing**		10
	1	Introduction to Digital Image Processing in Remote Sensing - Analog and digital image concepts	
	2	Elements of visual image interpretation	
	3	Digital image structure: pixels, resolution, DN values - Image acquisition and satellite data formats	
	4	Electromagnetic spectrum and spectral signatures	
	5	Image characteristics: spatial, spectral, radiometric, and temporal resolution	

	6	Remote sensing sensors and platforms	
	7	Image rectification and geometric correction basics - Introduction to image processing software and data sources	

2	**Image Enhancement Techniques**		10
	1	Image preprocessing concepts – Radiometric, Geometric and Noise removal	
	2	Image enhancement techniques -Contrast stretching and histogram equalization	
	3	Spatial Convolution – Spatial filters - Types	
	4	Image Composites – FCC, TCC	
		Principal Component Analysis (PCA) basics	
3	**Image Classification and Analysis**		15
	1	Concepts of image classification	
	2	Supervised and unsupervised classification - Training samples and signature generation - Classification algorithms and methods - Accuracy assessment and error matrix	
		Unsupervised Classification –K-Means, ISODATA	
	3	Change detection techniques	
	4	Vegetation indices (NDVI and related indices)	
		Digital elevation models and terrain analysis	
4	Applications of Digital Image Processing		10
	1	Applications in agriculture and soil studies	
	2	Water resource and watershed analysis	
	3	Forest and biodiversity assessment	
	4	Urban and regional planning applications	
		Disaster management applications	
5	**Teacher Specific Module**		30
	Practicals Hands-on training in image processing software Downloading and handling satellite datasets Image preprocessing and enhancement exercises Image classification and accuracy assessment Preparation of thematic maps NDVI , Change Detection Analysis Terrain and watershed analysis		

References:

11. Jensen, J. R. *Introductory Digital Image Processing: A Remote Sensing Perspective*. Pearson Education.
12. Lillesand, T. M., Kiefer, R. W., and Chipman, J. *Remote Sensing and Image Interpretation*. Wiley.
13. Campbell, J. B. and Wynne, R. H. *Introduction to Remote Sensing*. Guilford Press.
14. Sabins, F. F. and Ellis, J. M. *Remote Sensing: Principles, Interpretation and Applications*. Waveland Press.

Online Journals

1. Remote Sensing Journal (MDPI)
2. ISPRS Journal of Photogrammetry and Remote Sensing
3. International Journal of Remote Sensing
4. IEEE Transactions on Geoscience and Remote Sensing
5. Journal of Applied Remote Sensing

Online Libraries and Learning Resources

1. NASA Earthdata
2. USGS EarthExplorer
3. ESA Copernicus Open Access Hub
4. Google Earth Engine Documentation
5. FAO GeoNetwork Open Source Portal

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Quantitative Techniques in Geography

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSC	300-399	KU5DSCGRS302	4	60

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

The course would enable students to explore the principles and applications of statistical methods in spatial analysis and geographic research. It equips them with the essential skills to analyze, interpret, and visualize geographic data, providing a robust foundation for understanding spatial patterns and processes.

Throughout the course, students will learn how to collect, organize, and manipulate geographic data using statistical techniques. They will delve into descriptive and

inferential statistics, exploring techniques such as measures of dispersion, spatial sampling and regression analysis.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To know the nature of geographic data and its various sources.	R
2	To distinguish and apply descriptive and inferential statistical techniques.	U
3	Understand the advantages and disadvantages of central tendencies and dispersion.	U
4	Evaluate centrographic techniques and its application in geography.	A
5	Comprehend the science and techniques of sampling, probability and hypothesis testing.	U
6	Apply bivariate statistical analysis such as correlation and regression.	An

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2						✓	
CO 3					✓		
CO 4				✓			
CO 5					✓		
CO 6			✓				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
	Statistical Methods in Geography		12
	1	Quantitative Revolution in Geography, Significance of Statistical Methods and its limitation	
	2	Sources of Data in Geography	
1	3	Geographical Data Matrix, Frequency Distribution Tables and Cross Tabulation	
	4	Scales of Measurement (Nominal, Ordinal, Interval, Ratio)	
2	**Descriptive Statistics**		12
	1	Measures of Central Tendency (Mean, Median, Mode, Harmonic Mean and Geometric Mean)	
	2	Measures of Dispersion (Mean deviation, Quartile Deviation, Standard Deviation, Variance, Coefficient of Variation and Lorenz Curve)	
	3	Partition Values: Quartiles, Deciles and Percentiles	
	4	Centro-graphic Techniques: Mean Centre, Median Centre, Standard Distance	
3	**Sampling, Probability and Hypothesis Testing**		12
	1	Theory of Sampling and Types	
	2	Theory of probability	
	3	Probability distribution function- Normal Distribution and Fitting of Normal Curve, Concept of Skewness and Kurtosis	
	4	Testing of Hypothesis: T-test, F-test, Chi-square	
4	**Bivariate Analysis**		12
	1	Karl Pearson's Product Moment Correlation	
	2	Spearman's Rank Correlation	
	3	Simple Regression	
	4	Residuals from regression and its mapping	
	Teacher Specific Module		12

5	Teacher may circulate a data matrix of about (100 x 10) with each row representing an aerial unit (100 districts or villages) and about 10 columns of relevant attributes of the areal units like demographic variables etc. Construct frequency distribution table for at least 2 variables and calculate descriptive statistical measures for the frequency distribution table constructed.	
	From the data matrix a sample set (20 Percent) would be drawn using systematic or stratified methods of sampling and locate the samples on a map with a short note on methods used. Bivariate analysis should be carried out on these randomly selected districts.	
	Each student will submit a record containing five exercises from each modules.	

Essential Readings:

1. Berry B. J. L. and Marble D. F. (eds.): Spatial Analysis – A Reader in Geography.
2. Ebdon D., 1977: Statistics in Geography: A Practical Approach.
3. King L. S., 1969: Statistical Analysis in Geography, Prentice-Hall.
4. Mahmood A., 1977: Statistical Methods in Geographical Studies, Concept.
5. Pal S. K., 1998: Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
6. Sarkar, A. (2013) Quantitative geography: techniques and presentations. Orient Black Swan Private Ltd., New Delhi

Suggested Readings:

1. Silk J., 1979: Statistical Concepts in Geography, Allen and Unwin, London.
2. Spiegel M. R.: Statistics, Schaum's Outline Series.
3. Hammond P. and McCullagh P. S., 1978: Quantitative Techniques in Geography: An Introduction, Oxford University Press.

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Practical Record	20
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Introduction to Programming

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
V	DSC	300-399	KU5DSCGRS303		4	75
Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description	This course introduces the basic concepts of programming in Geographic Information Systems (GIS) and Remote Sensing. It focuses on simple and practical understanding of coding using Python, R, and Google Earth Engine (GEE) for spatial data handling, analysis, and visualization. The course is designed for beginners and aims to build foundational skills in geospatial programming for real-world applications.
Course Outcomes	1. Understand the basics of programming concepts in GIS and Remote Sensing. 2. Apply Python and R for simple geospatial data analysis. 3. Use Google Earth Engine for basic remote sensing data processing. 4. Perform basic spatial data visualization and mapping. 5. Develop simple scripts for automating GIS tasks.
Course Prerequisite	• Basic knowledge of Geography• Fundamentals of GIS and Remote Sensing• Basic computer skills

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1							
CO 2							
CO 3							

Contents for Classroom Transaction

Sl.No	Module	Sl.No	Unit	Hours

1	Introduction to Programming in GIS	1	Introduction to Programming – Concepts, variables, data types	10
		2	Role of Programming in GIS and Remote Sensing	
		3	Overview of Python, R, and Google Earth Engine	
		4	Introduction to spatial data formats (Raster and Vector)	
2	Python for GIS	1	Basics of Python (syntax, variables, loops)	12
		2	Introduction to libraries: NumPy, Pandas	
		3	Introduction to GeoPandas and Rasterio	
		4	Simple spatial data handling and visualization in Python	
3	R Programming for Spatial Analysis	1	Basics of R programming (data types, functions)	12
		2	Introduction to spatial packages (sp, sf, raster)	
		3	Data import, manipulation, and visualization in R	
		4	Basic spatial analysis using R	
4	Google Earth Engine	1	Introduction to Google Earth Engine platform	11
		2	Basics of JavaScript syntax in GEE	
		3	Loading and visualizing satellite data	
		4	Simple image processing and classification	
5	Lab Work	1	Basic Python scripting for GIS (reading and plotting data)	30
		2	Simple R-based spatial data visualization	
		3	Working with satellite data in Google Earth Engine	
		4	Mini project: Basic GIS/Remote Sensing analysis using any tool	

Essential References

1. Zandbergen, P. A. (2020). Python scripting for ArcGIS Pro. ESRI Press. https://www.esri.com/en-us/esri-press/browse/python-scripting-for-arcgis-pro
2. Lovelace, R., Nowosad, J., & Muenchow, J. (2019). Geocomputation with R. CRC Press. https://r.geocompx.org
3. Gorelick, N., Hancher, M., Dixon, M., Ilyushchenko, S., Thau, D., & Moore, R. (2017). Google Earth Engine: Planetary-scale geospatial analysis. Remote Sensing of Environment, 202, 18–27. https://doi.org/10.1016/j.rse.2017.06.031
4. Lillesand, T., Kiefer, R. W., & Chipman, J. (2015). Remote sensing and image interpretation (7th ed.). Wiley. https://www.wiley.com/en-us/Remote+Sensing+and+Image+Interpretation%2C+7th+Editionp-9781118343289
5. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic information systems and science (4th ed.). Wiley. https://www.wiley.com/en-us/Geographic+Information+Systems+and+Science%2C+4th+Edition-p-9781118676950
6. Westra, E. (2013). Python geospatial development (2nd ed.). Packt Publishing. https://www.packtpub.com/product/python-geospatial-development/9781782161523
7. Hijmans, R. J., & van Etten, J. (2012). Geographic data analysis and modeling with R. https://rspatial.org
8. Pebesma, E., & Bivand, R. (2023). Spatial data science: With applications in R. Chapman & Hall/CRC. https://r-spatial.org/book

Suggested References

1. Python Software Foundation. (2023). Python documentation. https://docs.python.org/3/
2. R Core Team. (2023). R: A language and environment for statistical computing. https://www.r-project.org/
3. Google Earth Engine. (2024). Earth Engine documentation. https://developers.google.com/earth-engine
4. ESRI. (2023). ArcGIS learning resources. https://learn.arcgis.com
5. McKinney, W. (2022). Python for data analysis (3rd ed.). O'Reilly Media. https://wesmckinney.com/book/
6. VanderPlas, J. (2016). Python data science handbook. O'Reilly Media. https://jakevdp.github.io/PythonDataScienceHandbook/
7. Wickham, H., & Grolemund, G. (2017). R for data science. O'Reilly Media. https://r4ds.had.co.nz
8. Bivand, R. S., Pebesma, E., & Gómez-Rubio, V. (2013). Applied spatial data analysis with R (2nd ed.). Springer. https://link.springer.com/book/10.1007/978-1-4614-7618-4
9. QGIS Development Team. (2024). QGIS documentation. https://docs.qgis.org
10. Ujaval Gandhi. (2023). Spatial thoughts tutorials (QGIS, GEE, Python). https://spatialthoughts.com

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Geography of India

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSC	400-499	KU6DSCGRS304	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This introductory course in Geography of India provides students with a comprehensive understanding of physical and cultural aspects of India. This course helps to develop an in-depth understanding of agricultural and irrigation facilities available in the nation. The student can acquire knowledge about the resource base and industrial activities of India in general. The student can analyse the demographic aspects and available facilities and power resources of the nation to cater its population

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the process of Urbanization, urban characteristics and urban problems of India	U
2	Understanding and analysis of Population characteristics of India	A
3	Acquires skills to measure and evaluate resources in India	An
4	Understanding transportation networks and industries of India	Ap

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✔						
CO 2		✔			✔		
CO 3		✔	✔				
CO 4			✔			✔	✔

Module	Unit	Content	Hrs
I		**Physical Settings of India**	12
	1	India-Location-States- Union Territories- Neighbouring Countries	
	2	Physical features – Major Physiographic Divisions Drainage Systems- Himalayan Rivers- Peninsular Rivers	
	3	Indian Climate- Monsoon- Local Winds-Recent Cyclones	
		Soil types – their characteristics and distribution	
	4	Forest-National Parks-Wild Life Sanctuaries-Community Reserve- Environmental Movements	
	Sections from References:		
II		**Agriculture and Irrigation**	10
	5	Geographical distribution of major crops – Rice, Wheat, Millets, Cotton, Sugarcane - Oil seeds- Spices	
	6	Beverage crops in India - Tea, and Coffee	
	7	Irrigation in India – types –Agricultural problems in India	
	8	Multipurpose River Valley Projects	
	Sections from References:		
III		**Resources**	11
	9	Minerals – Types	
	10	Distribution of iron ore- manganese- bauxite- mica and copper	
	11	Power resources –Hydel- Thermal- Atomic	
	12	Distribution of Coal- Petroleum and Natural Gas	
	13	Nonconventional Energy – Solar-Tidal-Wind- Geo-Thermal	

IV	**Demography, Industries and Transportation**		12
	14	Distribution of population – Density of population	
	15	Literacy, Sex-ratio, Life expectancy, Birth Rate-Death Rate	
	16	Urbanization in India-Major urban infrastructure development programmes in India	
	17	Major Urban problems	
	18	Industries- Iron and Steel	
	19	Cotton Textile-Jute Industry	
	20	Sugar and IT industries	
	21	Transport – Road, Railway, Inland Waterways and Airways	
	22	Major Ports	
		Sections from References:	
V	**Practical Work in Geography of India**		30
1	The practical component of this course will entail a study tour/filed visit program encompassing significant geographical locations across India. The duration of study tour/filed visit activities is not less than 7 days, excluding travel time. students tasked to conduct field work/field survey in any topic aligned with the module 1-4 and compile a comprehensive report consolidating their findings for final evaluation		

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE/ Tour Report and Viva -Voce**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

FUNDAMENTALS OF GLOBAL POSITIONING SYSTEM (GPS)

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSC	300-399	KU6DSCGRS305	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This course explores how Global Navigation Satellite Systems (GNSS) map and track our world, taking you from the core science of satellite constellations to real-world field applications. You will learn how satellite tech evolved, decode signal structures, master precise positioning techniques, and learn how to fix common data errors. Beyond the theory, you will get hands-on experience stepping outside to run field

surveys with modern GNSS receivers and using professional software to process your data. By the end, you will know exactly how industries use this data to solve tracking, mapping, and logistics challenges in agriculture, disaster management, and environmental monitoring.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the principles, satellite constellations, signal structures, and positioning concepts of Global Navigation Satellite Systems.	U
2	Apply GNSS techniques for positioning, navigation, mapping, and geospatial data acquisition using modern GNSS equipment.	A
3	Analyze GNSS observations by identifying error sources, differential correction methods, and data processing techniques for improved positioning accuracy.	A
4	Develop practical skills in conducting GNSS surveys, processing spatial data, and interpreting positioning results for real-world geospatial applications.	A

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			
CO 4						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction to NAVSTARGPS**	10
	1	Introduction to satellite navigation and evolution of GNSS - Transit Navigation System - Timation Program - NAVSTAR GPS.	
	2	Principles of satellite positioning – Ranging - Trilateration - pseudo range measurements	
	3	Coordinate System – Reference Ellipsoid – Geoid – Datum – Types of Datum – WGS84.	
	4	Constellation of GPS - Orbital parameters	
	5	Components of GPS – Space Segment – Control Segment – User Segment.	
	6	NavIC – Coverage – Constellation – Positioning service	
	7	GNSS – Galileo – GLONASS - BeiDou	
2		**GPS Signal Structure**	10
	1	Overview of signal structure	
	2	GPS Signal components – C/A Code – P Code - Selective Availability, Anti Spoofing.	
	3	GPS Frequency Bands – L1 band, L2 band, L5 band.	
	4	Navigational Message – Structure - almanac and ephemeris data	
	5	Pseudorange measurement	
	6	Carrier phase observations	

3	**GPS Positioning Techniques.**		15
	1	Satellite geometry - Dilution of Precision (GDOP, PDOP, HDOP, VDOP)	
	2	Positioning methods: - Static Survey - Rapid Static – Kinematic - Stop-and-Go Survey	
	3	Sources of GNSS errors - Satellite clock errors - Orbital errors - Ionospheric delay - Multipath effects.	
	4	Differential GPS (DGPS) – Base Station – Rover receiver – Base Line – Post Processing	
	5	Satellite Based Augmentation Systems (SBAS) - GAGAN	
4	**Applications of GPS**		10
	1	GNSS in surveying and mapping	
	2	Transportation and logistics	
	3	Precision agriculture	
	4	Disaster management	
	5	Integration of GNSS with GIS, Remote Sensing	
5	**Teacher Specific Module-Practical**		
	Hands-on Module 1. Familiarization with handheld GNSS receiver. 2. Recording waypoints and tracks. 3. GNSS receiver configuration. 4. GNSS data download and processing 5. Area and distance measurement using GNSS. 6. Field mapping using GNSS and GIS.		30

References:

1. Hofmann-Wellenhof, B., Lichtenegger, H., & Wasle, E. **GNSS – Global Navigation Satellite Systems: GPS, GLONASS, Galileo and More.** Springer.
2. Misra, P., & Enge, P. **Global Positioning System: Signals, Measurements**

and Performance. Ganga-Jamuna Press.

3. Leick, A., Rapoport, L., & Tatarnikov, D. **GPS Satellite Surveying.** Wiley.
4. Kaplan, E. D., & Hegarty, C. **Understanding GPS/GNSS: Principles and Applications.** Artech House.
5. Seeber, G. **Satellite Geodesy.** Walter de Gruyter.
6. Lillesand, T., Kiefer, R., & Chipman, J. **Remote Sensing and Image Interpretation.**

Online Journals

1. *GPS Solutions* (Springer)
2. *Journal of Navigation*
3. *Journal of Geodesy*
4. *IEEE Transactions on Aerospace and Electronic Systems*
5. *Survey Review*

Online Libraries and Learning Resources

1. GPS.gov
2. ISRO NavIC Portal
3. International GNSS Service (IGS)
4. ESA GNSS User Centre
5. UNAVCO GNSS Data Services
6. NASA Earthdata
7. National Centre for Geodesy, IIT Kanpur

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Research Methodology

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSC	300-399	KU6DSCGRS306	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description

This course will cultivate the student for pursuing investigations in different dimensions of geography as a spatio-temporal sciences. Paper will be helpful for understanding various approaches in geographical investigations and different methods of collection data in empirical research. This course will play a key role in introducing methods of sampling, analysis of data with different methods of presentation of results.

CO No.	Expected Outcome	Learning Domains
1	Understand philosophical underpinnings of research methods.	U
2	Detailed exposure of new geographical landscape as a study area.	A
3	In-depth knowledge of different field techniques.	An
4	Understanding field ethics and different tools of field study.	E

**Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	✓						
CO 2		✓					
CO 3			✓				
CO 4				✓			

Module	Unit	Content	Hrs (48+12)
I		**Geography as a Science**	12
	1	Geography as a Science	
	2	Approaches to the study of Geography- Systematic and Regional, Environmental and Humanistic	
	3	Four traditions in Geography- Earth Science tradition	
	4	Man –land tradition, Spatial tradition and Area studies tradition	
II		**Models and Paradigms**	12
	5	Data, Information and knowledge	
	6	Types of Knowledge- Practical, Theoretical, and Scientific knowledge	
	7	Science & Its characteristics	
	8	Fact, concept, hypothesis, theories, laws, and Models in the geographical explanation	
	9	Paradigms in geography	
III		**Data Collection**	12
	10	Identification of problems from Local geography-	
	11	Field work- Data collection- primary data	
	12	Methods of collection – Observation methods, interview	
	13	Schedules and Questionnaire and case study method	
	14	Secondary data -Published and unpublished sources	
	15	Selection of appropriate methods for data collection - problems in data	
IV		**Sampling and Analysis of Data**	12

	16	Sampling- purposes and principles of sampling-key terms in sampling	
	17	Population, sample, sampling frame, sampling estimate and sampling error- Types of sampling- Probability sampling	
	18	Simple random sampling, stratified, systematic, multi- stage, and cluster sampling-Non probability sampling- incidental, purposive, quota, and judgment sampling	
	19	Classification and tabulation of data; Processing and Analysis of collected Data: Editing;	
	20	Cartographic presentation: Need, significance, Selection of Cartographic methods- maps, diagrams, combination of maps and diagram.	
	21	Measurement of averages, ratios central tendency, dispersion and relationship.	
	22	Hypothesis testing, use of recent available computer added methodologies	
V	**Analysis of data and Report Writing**		12
	1	Writing literature reviews/ research articles	
	2	Writing Project Reports	
	3	Writing Chapters	
	4	Writing Dissertation	

Suggested Readings

1. Ahuja, Ram, Research Methods, Rawat Publications, 2018
2. Chorley, R.J. and P.Haggett(ed.) Models in Geography, Methuen London,1967.
3. Goode ,W.I .and P.K.Hatt. Methods in Social Research, McGraw Hill, Tokyo,1962
4. Harvey, David. Explanation in Geography, Edward Arnold London, 1971.
5. Iain Hey (eds) (2000). Qualitative Techniques in Human Geography. Oxford University Press
6. Kothari C.R. and Garg G. Research Methodology: Methods and

Techniques, New Age International Publisher, London. 2016.

7. Kumar Ranjit, Research Methodology, Sage Publication, New Delhi. 2016.
8. Minshull, R. Introduction to Models in Geography, Longman, London,1975.

9. Misra H.N.and V.P.Singh. Research Methodology in Geography: Social Spatial and Policy Dimensions.Rawat Publications New Delhi,1998.

10. Misra, Harikesh N. Research Methodology in Geography. Rawat Publication. 2015

11. Murthy K. L. Narsimha. Research Methodology in Geography. Concept Publication. New Delhi.2014.

12. Prasad H. Research Methods and Techniques in Geography, Rawat Publication New Delhi 1992

13. Sheskin, I.M. Survey Research for Geographers, Scientific Publishers, Jodhpur,1987.

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	10
b)	Test Paper-2	
c)	Assignment	10
d)	Seminar	10
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Spatial Planning and Development

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VII	DSC	400-499	KU7DSCGRS401	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Spatial planning is a critical process for guiding the sustainable development and management of land and resources within a geographical area. This course provides students with an in-depth understanding of the principles, methods, and practices of spatial planning and its role in shaping communities, regions, and landscapes. Through a multidisciplinary approach, students will explore the intersection of environmental management, social equity, and economic development to address complex spatial challenges.

Course Prerequisite: NIL Course

Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Examine the major planning paradigms and their applications; and articulate processes leading to regional growth and development and provide rationales for planned interventions	An
2	Equip students with thorough knowledge of the concepts, theories and issues in Regional Planning and Development	U
3	Analyse the meaning and concept of modern economic growth; and Examine various Development issues and dimensions of Regional inequalities	A
4	Evaluate the salient features of Indian planning, Provide service to government, communities, and	E

	others concerned with urban and regional planning	

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1			✔	✔			
CO 2	✔	✔				✔	
CO 3	✔						✔
CO 4			✔			✔	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Concept of Spatial Planning**	10
	1	Place and space, concept of Region, Types Characteristics and Hierarchy	
	2	Regional Planning: Scope, objective, Principles, Methods, techniques, characteristics, significance,	
	3	Types of Regional Planning, Delimitations of regions, Purposes of regional planning,	
	4	Regional growth and development, Regional planning processes, Norms and Standards for Regional planning.	
2		**Models of Economic Development**	12
	1	Economic Systems, economic growth, Indicators and measurement of development-	
	2	Classical theory of economic development, Marxian approach	
	3	Schumpeter theory of economic development, Myrdal theories of circular causation, Leontief-input output model, Hirschman theory of Balanced and unbalanced growth,	

.	4	Francis Perroux-Growth pole theory, R.P. Misra Core Peripheral model and Growth Foci, Export Base Theory by Doughlass C North	

.	**Spatial pattern of Regional Imbalance**		
3	1	Development issues and challenges Vicious cycle of poverty- The dependency theory of under development-	12
	2	Theories of limits to Growth Model and beyond the limits, Studies in regional imbalance-Bimaldas Gupta, Hemalatha Rao, Ashok Mehta and V.Nadh	
	3	Regional development strategies: Growth Center, Special Economic Zones, watershed approach, micro level planning	
	4	Sustainable development- Millennium Development Goals and UN Agenda 21.	
4	**Spatial Planning in India**		11
	1	History of planning in India, Five year Plans and Niti Ayog, Government Planning Programmes in India,	
	2	Economic development and Regional Imbalance in India-	
	3	Micro and Multilevel planning, Rural and urban planning, Decentralized Planning in India,	
	4	Disaster management , Watershed Based Planning, recent trends in Planning	
5	**Teacher Specific Module**		
	Directions		
	Project on measuring regional imbalances by taking district as the unit of analysis. Data may be collected from census of India, panchayath statistics etc.		30

Essential Readings:

1. Chandna, R. C. (2000): Regional Planning: A Comprehensive Text. Kalyani Publishers., New Delhi.
2. Chaudhuri, J. R. (2001): An Introduction to Development and Regional Planning with special reference to India. Orient Longman, Hyderabad.
3. Cowen, M.P. and Shenton, R.W. (1996): Doctrines of Development, Routledge, London.
4. Doyle, T. and McEachern, D. (1998): Environment and Politics. Routledge, London.
5. Friedmann, J. (1992): Empowerment: The Politics of Alternative Development. Blackwell, Cambridge MA and Oxford.
6. Friedmann, J. and Alonso, W. (ed.) (1973): Regional Development and Planning. The MIT Press, Mass.
7. Hettne, B., Inotai, A. and Sunkel, O. (eds.) (1999 – 2000): Studies in the New Regionalism. Vol. I-V. Macmillan Press, London.
8. Isard, W. (1960): Methods of Regional Analysis. MIT Press, Cambridge, MA.

9. Kuklinski, A. R. (1972): Growth Poles and Growth Centres in Regional Planning. Mouton and Co., Paris.

10. Kuklinski, A.R. (ed.) (1975): Regional Development and Planning: International Perspective, Sijthoff-Leydor.
11. Leys, C. (1996): The Rise and Fall of Development Theory. Indian University Press,Bloomington, and James Curry, Oxford.

Suggested Readings:

1. Mahapatra, A.C. and Pathak, C. R. (eds.) (2003): Economic liberalisation and Regional Disparities in India. Special Focus on the North Eastern Region. Star Publishing House, Shillong.
2. Mahesh Chand and Puri V K (2011), Regional Planning in India, Allied Publishers Private Limited, New Delhi.
3. Misra, R. P. (ed.) (1992): Regional Planning: Concepts, Techniques, Policies and CaseStudies. 2nd edition. Concept Publishing Company., New Delhi.
4. Misra, R.P. and Natraj, V.K. (1978): Regional Planning and National Development. Vikas, New Delhi.
5. Nath, V. 2009. Regional Development and Planning in India, Concept Publishing Company.
6. Sundaram K V 1997, Decentralised Multi level Planning – Principles and Practice, Concept Publishing Company, New Delhi

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Disaster Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VII	DSC	400-499	KU7DSCGRS402	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

course designed to provide students with hands-on experience in understanding, assessing, and mitigating disaster risks. This course focuses on applying theoretical knowledge to real-world scenarios through project-based learning. Students will work on projects that simulate disaster risk reduction (DRR) and management efforts, preparing them for careers in disaster management, emergency response, and related fields.

Course Prerequisite: NIL Course

Outcomes:

CO No	Expected Outcome	Learning Domains
1	Demonstrate a solid understanding of the fundamental concepts and principles of disaster risk reduction and management.	U
2	Identify and evaluate various types of disaster risks, assess their potential impacts on communities, and utilize risk assessment tools and methodologies.	An
3	Create and implement effective disaster risk reduction strategies and preparedness plans tailored to specific hazards and community needs.	C
4	Work effectively in multidisciplinary teams to design and implement comprehensive disaster management solutions.	A
5	Integrate modern technologies, such as Geographic Information Systems (GIS), in the assessment and management of disaster risks.	E
6	Articulate disaster risk reduction strategies and management plans clearly and persuasively to diverse stakeholders, including community members, policymakers, and emergency responders.	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2		✓	✓				
CO 3		✓			✓		
CO 4			✓				✓
CO 5			✓	✓			
CO 6						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Conceptual Basis**	12
	1	Disaster Management- Concepts: Hazard and Disaster (Classification), Risk, Vulnerability, Disaster Management, Disaster Risk Reduction, Resilience	
	2	Disaster Management Cycle	
	3	Community Based Disaster Management	
	4	HRVC Analysis and Mapping	
2		**Natural Disasters: Hydrological and Mass-Movement Hazards**	12
	1	Flood: Causes, Impact, Distribution and Mapping	
	2	Drought: Causes, Impact, Distribution and Mapping	

	3	Coastal Erosion: Causes, Impact, Distribution and Mapping	
	4	Landslide: Causes, Impact, Distribution and Mapping	

3	**Natural Disasters: Tectonic and Meteorological Hazards**		12
	1	Earthquake: Causes, Impact, Distribution and Mapping	
	2	Tsunami: Causes, Impact, Distribution and Mapping	
	33	Cyclone: Causes, Impact, Distribution and Mapping	
	4	Heat Waves: Causes, Impact, Distribution and Mapping	
4	**Human Made and Biological Hazards**		12
	1	Fires: Causes, Impact, Distribution and Mapping	
	2	Industrial: Causes, Impact, Distribution and Mapping	
	3	Nuclear: Causes, Impact, Distribution and Mapping	
	4	Epidemic: Causes, Impact, Distribution and Mapping	
5	**Teacher Specific Module**		12
	Directions		
	• Project 1- it should be field-based case study. Conduct a field survey for a duration not exceeding 10 days to a locality recently affected by any of the hazards covered in the syllabus. • Project 2- it should be local / college-based. • Project 3- Prepare a CBDM Plan for any of the locality chosen for Project 1 and 2. • Project 4- Conduct a Hazard, Risk, Vulnerability and Capacity Analysis (HRVC) of any selected hazard for a state of interest. The analysis should be at district level using secondary data sources.		

Essential Readings:

1. Coppola, D. P. (2006). Introduction to international disaster management. Elsevier.
2. Fuchs, S., & Thaler, T. (Eds.). (2018). Vulnerability and Resilience to Natural Hazards. Cambridge University Press.
3. Kapur ,Anu(2010). Vulnerable India: A Geographical Study Of Disasters. Sage Publications.
4. Singh, J. (2007). Disaster Management: Future Challenges and Opportunities. IK International Pvt. Ltd, New Delhi.
5. Smith, Keith (2013). Environmental Hazards: Assessing risk and reducing disasters
6. Wisner, B., Blaikie P et al. (2004). At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge Taylor and Francis Group.

Suggested Readings:

1. Government of India. (2011). Disaster Management in India. Delhi, India: Ministry

of Home Affairs.
2. Government of India. (2008). Vulnerability Atlas of India. New Delhi, India: Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India
3. Modh, S. (2010). Managing Natural Disaster: Hydrological, Marine and Geological Disasters. Delhi, India: Macmillan.

4. Ramkumar, M. (2009). Geological Hazards: Causes, Consequences and Methods of Containment. New Delhi, India: New India Publishing Agency.
5. Stoltman, J.P., et al. (2004). International Perspectives on Natural Disasters. Dordrecht, the Netherlands: Kluwer Academic Publications.

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper - 1	
b)	Test Paper - 2	
c)	Practical Record File	15
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	15
Total		**100**

Database Management System

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VII	DSC	400-499	KU7DSCGRS403	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Major 18 - Database Management System

Course Description:

This course provides undergraduate students with a comprehensive introduction the principles of database management, and spatial data organization. It introduces the concepts of Database Management Systems (DBMS) and their role in storing, managing, querying, and analyzing spatial and non-spatial data. Students will learn the fundamentals of data modelling, database design, and the relational database model, along with the use of Structured Query Language (SQL) for data retrieval and management. The course further explores Spatial Database Management Systems (SDBMS), highlighting spatial data types, spatial indexing, topology, and spatial queries used in modern GIS applications. Students will gain practical experience in creating databases, executing SQL queries, managing geospatial datasets, for solving real-world geographical problems.

Course Pre requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamental principles of database management, and spatial data organization.	U
2	Develop knowledge on the significance of Database Management Systems in storing, managing, querying, and analyzing spatial and non-spatial data.	A

3	Apply the basic principles of Spatial Database Management Systems to create databases, executing SQL queries and managing geospatial datasets	C

Remember(R), Understand(U), Apply(A), Analyse (An), Evaluate(E) , Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction to DBMS and Geoinformatics**	10
	1	Database Management System (DBMS): Terms and terminologies	
	2	Problems with Traditional File-Based Systems; Advantages of DBMS	
	3	Components and function of DBMS; Types of DBMS Architecture	
	4	Role of DBMS in GIS	
2		**Data Modelling and Databases**	15
	1	Entity relationship (ER) model and Unified Modelling Language (UML)	
	2	Database Design: Keys, integrity constraints, and normalization	
	3	Data Models: Hierarchical, network, relational, and object-oriented models	
	4	Relational Algebra: Core operations, derived operations, and joins	
3		**Structured Query Language (SQL) and Spatial Queries**	10
	1	Standard SQL: Data Definition (DDL) and Data Manipulation (DML)	
	2	Advanced Queries: Nested subqueries, aggregate functions, and views	
	3	Spatial Extensions: Geometry data types, spatial operators, and spatial joins	

	4	Spatial SQL: Writing queries to calculate area, perimeter, distance, and intersection	
4	**Spatial Database Management Systems (SDBMS)**		10
	1	Spatial Taxonomy: Representation of vector and raster data	
	2	Vector Storage: Geometry Simplification and Structural Encoding	
	3	Raster Storage: Block coding, run-length encoding, and quadtrees	
	4	ACID Properties, Concurrency and Data Security	
5	**Practical**		30
	1	Creating ER diagrams for a local urban planning scenario	
	2	Spatial Queries: Executing geographic joins and buffer analysis using PostGIS commands.	
	3	Geodatabase Creation: Setting up and importing raster/vector data into an Esri Geodatabase.	
	4	Setting up and importing raster/vector data into GeoPackage	

Essential Readings:

1. Connolly, T. M., Begg, C. E. Database Systems: A Practical Approach to Design, Implementation, and Management, 6th edition, Pearson, 2019.
2. Elmasri, R., Navathe, B. S. Fundamentals of Database Systems, 7th Edition, Pearson Education, 2015.
3. Murach J. Murach's MySQL, 3rd edition, Pearson, 2019.
4. Ramakrishnan, R., Gehrke J. Database Management Systems, 3rd Edition, McGraw Hill, 2014.
5. Rigaux, P., Scholl, M., Voisard, A. (Latest Edition). Spatial Databases: With Application to GIS. United Kingdom: Elsevier Science, 2002.
6. Shekhar, S., Chawla, S. Spatial databases (Latest Edition). Prentice Hall, 2003.
7. Silberschatz, A., Korth, H. F., Sudarshan, S. Database System Concepts. United Kingdom: McGraw-Hill Education, 2011.
8. Yeung, A. K., Hall, G. B., Hall, G. B. Spatial Database Systems: Design, Implementation and Project Management (Latest Edition). Germany: Springer Netherlands, 2007.

Evaluation Type	Marks	Evaluation Type	Marks	Total

Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Programming with Python in GIS and Remote Sensing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VII	DSC	400-499	KU7DSCGRS404	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description	This course introduces undergraduate students to the fundamentals of programming using Python for applications in Geographic Information Systems (GIS) and Remote Sensing. It focuses on basic Python concepts, spatial data handling, and the use of key Python libraries for geospatial analysis. The course also introduces cloudbased geospatial analysis using Google Earth Engine integrated with Google Colab. Emphasis is placed on practical learning for spatial data processing, visualization, and simple geospatial modeling.	
Course Outcomes	1. Understand basic programming concepts using Python. 2. Apply Python for handling spatial and non-spatial data. 3. Use Python libraries for GIS and Remote Sensing analysis. 4. Perform basic geospatial operations and visualization. 5. Execute cloud-based geospatial analysis using Google Earth Engine.6. Develop simple scripts for solving real-world geographic problems.	Learning Domains 1. 2. 3. 4. 5.
Course Prerequisite	• Basic knowledge of Geography• Fundamentals of GIS and Remote Sensing• Basic computer skills (file handling, internet usage)• No prior programming knowledge required	

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1							
CO							

2							
CO 3							

Contents for Classroom Transaction

Sl.No.	Module	Unit	Hours
1 (Theory)	Introduction to Python Programming	1. Basics of programming and Python environment setup 2. Variables, data types, operators, and expressions 3. Conditional statements (if, else, elif) 4. Loops (for, while) and basic functions	10
2 (Theory)	Python for Data Handling	1. Lists, tuples, dictionaries, and sets 2. File handling (reading and writing files) 3. Introduction to NumPy for numerical data 4. Introduction to Pandas for tabular data	12
3 (Theory)	Python in GIS	1. Introduction to geospatial data (raster and vector) 2. Working with Shapefiles and GeoJSON 3. Introduction to GeoPandas and Shapely 4. Basic spatial operations (buffer, overlay, clipping)	12
4 (Theory)	Remote Sensing & Cloud Computing	1. Introduction to Remote Sensing data in Python 2. Basics of raster processing using Rasterio 3. Introduction to Google Earth Engine 4. Using Google Colab for GEE scripting and visualization	11
5 (Practical)	Lab Work	1. Writing basic Python programs and scripts 2. Data analysis using Pandas and NumPy 3. GIS operations using GeoPandas (buffer, clip, overlay) 4. Remote sensing analysis using Google Earth Engine in Google Colab	30

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Essential References

1. Zelle, J. M. (2017). Python programming: An introduction to computer science (3rd ed.). Franklin, Beedle & Associates. https://mcsp.wartburg.edu/zelle/python/
2. VanderPlas, J. (2016). Python data science handbook. O'Reilly Media. https://jakevdp.github.io/PythonDataScienceHandbook/
3. Gorelick, N., Hancher, M., Dixon, M., Ilyushchenko, S., Thau, D., & Moore, R. (2017). Google Earth Engine: Planetary-scale geospatial analysis. Remote Sensing of Environment, 202, 18–27. https://doi.org/10.1016/j.rse.2017.06.031
4. Google Earth Engine Documentation. https://developers.google.com/earth-engine
5. GeoPandas Documentation. https://geopandas.org
6. Oliphant, T. E. (2006). A guide to NumPy. Trelgol Publishing. https://numpy.org/doc/stable/
7. McKinney, W. (2010). Data structures for statistical computing in Python. Proceedings of the 9th Python in Science Conference, 51–56. https://doi.org/10.25080/Majora-92bf1922-00a
8. Bivand, R. S., Pebesma, E., & Gómez-Rubio, V. (2013). Applied spatial data analysis with R (2nd ed.). Springer. https://link.springer.com/book/10.1007/978-1-4614-7618-4
9. Rey, S. J., & Anselin, L. (2010). PySAL: A Python library of spatial analytical methods. The Review of Regional Studies, 40(1), 5–27. https://pysal.org
10. NumPy Documentation. https://numpy.org
11. Pandas Documentation. https://pandas.pydata.org
12. Shapely Documentation. https://shapely.readthedocs.io
13. GDAL Documentation. https://gdal.org
14. Earth Engine Python API Documentation. https://developers.google.com/earth-engine/guides/python_install

Suggested References

1. Lutz, M. (2013). Learning Python (5th ed.). O'Reilly Media.
https://learning-python.com/
2. McKinney, W. (2017). Python for data analysis (2nd ed.). O'Reilly Media.
https://wesmckinney.com/book/
3. Lawhead, J. (2015). Learning Geospatial Analysis with Python (2nd ed.). Packt Publishing.
https://www.packtpub.com
4. Rasterio Documentation.
https://rasterio.readthedocs.io
5. Google Colab Documentation.
https://colab.research.google.com
6. Graser, A. (2019). Learning QGIS (3rd ed.). Packt Publishing.
https://www.packtpub.com
7. Zandbergen, P. A. (2020). Python scripting for ArcGIS Pro. Esri Press.
https://www.esri.com/en-us/esri-press
8. Neteler, M., & Mitasova, H. (2008). Open source GIS: A GRASS GIS approach (3rd ed.). Springer.
https://link.springer.com/book/10.1007/978-0-387-68574-8
9. Arribas-Bel, D. (2014). Accidental, open and everywhere: Emerging data sources for the understanding of cities.
Applied Geography, 49, 45–53. https://doi.org/10.1016/j.apgeog.2013.09.012
10. PySAL Documentation. https://pysal.org
11. Folium Documentation. https://python-visualization.github.io/folium/
12. Matplotlib Documentation. https://matplotlib.org
13. Seaborn Documentation. https://seaborn.pydata.org
14. Scikit-learn Documentation.
https://scikit-learn.org

Application of AI in Geoinformatics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VIII	DSC	400-499	KU8DSCGRS405	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Artificial Intelligence (AI) is transforming the field of Geoinformatics by enabling intelligent analysis of spatial data, automating image interpretation, and improving decision making in environmental and geographic applications. This course introduces students to the fundamental concepts of AI and their applications in Remote Sensing, GIS and spatial analysis. Fromm this course students gain practical experience with ChatGPT, Claude AI, Nano Banana, Google Gemini, Google Earth Engine and Python-based AI tools for simplifying spatial analysis and solving geospatial problems efficiently.

Course Pre requisite : NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamentals of AI and Machine Learning in Geoinformatics.	U
2	Apply AI tools for processing, visualization and interpretation of geospatial data.	A
3	Develop AI-assisted geospatial solutions using modern software and cloud platforms like Microsoft Visual Studio, Google Colab and Google Earth Engine	A
4	Design AI-assisted geospatial workflows or solutions for real-world applications using modern geoinformatics tools and platforms like GEE Application and Interactive Web Mapping etc	C

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓		✓		✓		
CO 2				✓			
CO 3					✓		

COURSE CONTENTS

MODULE	UNIT	DESCRIPTION	HOURS
1		**Fundamentals of AI**	10
	1	History and Evolution of Artificial Intelligence (AI)	
	2	Importance and scope of AI in	
	3	Types of AI: Machine Learning, Deep Learning, and Generative AI	
	4	Understanding the important AI libraries available for spatial data processing	
	5	Artificial Intelligence and its application in Geoinformatics such as GEE, Google Colab, Visual Studio, Geolibre, Git, and Jupyter Notebook	

Contents for Classroom Transaction

2		**AI in Remote Sensing**	10
	1	Application of AI in satellite data downloading and preprocessing	
	2	Introduction of (Segment Anything Model) SAM and its application	
	3	Introduction of Alpha Embedding Google Deepmind Project and its application in Land use land cover classification	
	4	Introduction of SAR data, Night light data, various indices preparation using AI	

	5	Create GEE interactive app for various data processing and downloading	

	Application of AI in GIS		
3	1	Application of AI in vector data processing including overlay analysis, Projection and extract geometry inferences	15
	2	Application of AI in Raster data processing including DEM based analysis	
	3	Application of AI in landscape analysis, environmental management, disaster management and climate change analysis	
	4	Create AI based interactive web application for resource management	
4	**Introduction of Modern AI tools**		10
	1	Introduction of open-source plugin: GeoAI, AI Edit, Deepness, Geolens	
	2	Application of web.geolibre.app and its importance	
5	**Teacher Specific Module**		
	Directions		
	Practicals 11. Prompt engineering for GIS 12. LULC classification, Object Detection using SAM and GEE 13. Spatial analysis using Python 14. Create web map for micro-level resource management		30

Essential Readings:

1. Russell, S., & Norvig, P. (2020). *Artificial intelligence: A modern approach* (4th ed.). Pearson. ISBN: 978-0134610993.
2. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press. ISBN: 978-0262035613.
3. Lillesand, T. M., Kiefer, R. W., & Chipman, J. W. (2015). *Remote sensing and image interpretation* (7th ed.). John Wiley & Sons. ISBN: 978-1118343289.
4. Burrough, P. A., & McDonnell, R. A. (1998). *Principles of geographical information systems*. Oxford University Press. ISBN: 978-0198233657.
5. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). *Geographic information science and systems* (4th ed.). John Wiley & Sons. ISBN: 978-1118676950.
6. Jensen, J. R. (2015). *Introductory digital image processing: A remote sensing perspective* (4th ed.). Pearson. ISBN: 978-0134058160.
7. Chang, K.-T. (2019). *Introduction to geographic information systems* (9th ed.). McGraw-Hill Education. ISBN: 978-1259929649.
8. Foody, G. M., & Mathur, A. (Eds.). (2018). *Machine learning in remote sensing and GIS*. CRC Press. ISBN: 978-1138747234.

9. Bonaccorso, G. (2020). *Machine learning algorithms* (2nd ed.). Packt Publishing. ISBN: 978-1838820299.
10. Géron, A. (2022). *Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow* (3rd ed.). O'Reilly Media. ISBN: 978-1098125974.

Suggested Readings:

1. Wu, Q. (2026). *GeoAI with Python: A practical guide to open-source geospatial AI*. Independently Published. ISBN (Print): 979-8253507414; ISBN (PDF): 979-8993859729.
2. Rey, S. J., Arribas-Bel, D., & Wolf, L. J. (2023). *Geographic data science with Python*. CRC Press. ISBN: 978-1032242408.
3. Molin, S. (2021). *Hands-on geospatial analysis with Python: Implement GIS, remote sensing, and mapping using Python libraries*. Packt Publishing. **ISBN:** 978-1837639175.

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Principles of Photogrammetry

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VIII	DSC	400-499	KU8DSCGRS406	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This course introduces the fundamental principles and applications of Photogrammetry with emphasis on aerial photography, stereoscopic vision, photogrammetric measurements, mapping techniques, and modern digital photogrammetry. The course enables students to understand the acquisition, interpretation, and analysis of spatial information from aerial photographs and drone imagery for geographic and environmental studies. Through theoretical concepts and practical applications, learners develop skills in spatial measurement, terrain analysis, map preparation, and geospatial data generation for applications in surveying, resource management, urban planning, disaster management, and environmental monitoring.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the principles, concepts, and techniques of photogrammetry and aerial photography for spatial data acquisition and terrain representation.	U
2	Apply photogrammetric methods and stereoscopic interpretation techniques for mapping, measurement, and spatial analysis.	A
3	Demonstrate practical skills in handling aerial photographs, drone imagery, and digital photogrammetric tools for geospatial applications.	A
4	Develop analytical and communication skills by preparing and interpreting photogrammetric outputs for scientific, planning, and societal applications.	

**RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Fundamentals of Digital Image Processing**	10
	1	Introduction to Photogrammetry - History and development of photogrammetry	
	2	Principles and types of Photogrammetry - Aerial photography and its characteristics	
	3	Geometry of aerial photographs – Vertical and Oblique Photographs	
	4	Relief displacement and image distortions	
	5	Stereoscopic vision and parallax	
	6	Introduction to photogrammetric instruments	

	Image Enhancement Techniques	

2	1	Elements of aerial photo interpretation - Keys	12
	2	Principles of stereoscopic interpretation	
	3	Measurement of height and distance from photographs	
	4	Scale of Vertical photographs – Scale over flat terrain, Scale over variable terrain, Other scale measurement methods.	
		Photo mosaics and orthophotos	
		Ground control points and referencing	
		Flight planning concepts	
		Errors and limitations in aerial photography	
		Introduction to drone-based imagery	
3	**Digital Photogrammetry**		
	1	Introduction to digital photogrammetry	12
	2	Digital image acquisition and processing	
		Softcopy photogrammetry concepts	
	3	Digital elevation models (DEM) and terrain analysis	
	4	Block adjustment– Interior Orientation, Exterior Orientation	
		Orthorectification techniques	
		3D terrain visualization and modeling	
		Mosaics and types of mosaics	
4	**Applications of Photogrammetry**		
	1	Applications in topographic mapping	11
	2	Agriculture and land resource studies	
	3	Forestry and biodiversity mapping	
	4	Environmental monitoring applications	
	Teacher Specific Module		

5	**Practicals** 7. Familiarization of marginal informations of aerial photographs 8. Orientation of Stereopaire 9. Stereoscopic Neat Model Calculation 10. Interpretation of aerial 11. Calculation of Scale of vertical photograph. 12. Stereo test analysis 13. Use of Parallax bar and determination of Height from stereo pair	30

References:

7. Wolf, P. R., Dewitt, B. A., and Wilkinson, B. E. *Elements of Photogrammetry with Applications in GIS*. McGraw-Hill..
8. Lillesand, T. M., Kiefer, R. W., and Chipman, J. *Remote Sensing and Image Interpretation*. Wiley.
9. Kraus, K. *Photogrammetry: Geometry from Images and Laser Scans*. Walter de Gruyter.
10. Avery, T. E. and Berlin, G. L. *Fundamentals of Remote Sensing and Airphoto Interpretation*. Pearson.
11. Slama, C. C. *Manual of Photogrammetry*. American Society for Photogrammetry and Remote Sensing.

Online Journals

6. Remote Sensing Journal (MDPI)
7. ISPRS Journal of Photogrammetry and Remote Sensing
8. International Journal of Remote Sensing
9. IEEE Transactions on Geoscience and Remote Sensing
10. Journal of Applied Remote Sensing

Online Libraries and Learning Resources

1. NASA Earthdata
2. USGS EarthExplorer
3. ESA Copernicus Open Access Hub
4. Google Earth Engine Documentation
5. FAO GeoNetwork Open Source Portal

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Web Technology for Geoinformatics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VIII	DSC	400-499	KU8DSCGRS407	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:
This course deals with the basics of web technologies and applications to Geoinformatics. It introduces the basics of Web development, such as HTML5, CSS3, JavaScript, client-server architecture, and responsive design, before moving on to interactive Web GIS development with the latest mapping libraries: Leaflet, Open Layers and MapLibre GL JS. The Course also covers aspects of server-side Web GIS technologies, spatial databases, GeoServer, RESTful APIs and OGC web services for the publication and management of geospatial data. Students will gain practical experience with web cartography, online geoprocessing, cloud-based GIS, Google Earth engine, mobile GIS and real-time geospatial applications. By the end of this course students should be able to develop, design and implement interactive, Web-based geospatial applications using modern, open-source Web GIS technologies.

Course Pre requisite : NIL

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamental concepts of web technologies, client-server architecture, HTML5, CSS3, JavaScript, and the principles of Web GIS	U
2	Understand the modern Web GIS technologies, spatial data formats, interactive mapping libraries, spatial databases, and OGC web services for publishing and visualizing geospatial information.	U

3	Analyze web mapping workflows, spatial databases, geoprocessing techniques, and cloud-based GIS platforms to identify appropriate solutions for web-based geospatial applications.	A
4	Create responsive and interactive web-based geospatial applications by integrating client-side and server-side technologies, spatial databases, cloud services, and emerging Web GIS tools.	C

Remember (R), Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓				✓		
CO 2				✓			
CO 3					✓		

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
	Introduction to Web Technologies		10
1	1	Introducing the fundamental concept of HTML, Web browsers and web servers, Client-server architecture, URL, HTTP, HTTPS, Static and Dynamic Websites.	
	2	Introduction to HTML5 and its importance, introducing the fundamental ideas of JavaScript	
	3	Introduction to CSS3, Responsive web page designing, DOM manipulation, Browser developer tools (Inspect element, Network tab, Console), Version control basics (Git/GitHub)	
2	**Client-Side Web GIS Development**		12
	1	JavaScript for interactive web applications	

	2	GeoJSON as a data format, Leaflet.js, OpenLayers, MapLibre GL JS, Interactive Map Controls, Pop-ups, markers, and overlays	
	3	Layer control and layer switching (Thematic overlays, Toggling), Event handling on maps (Click events, Hover, Zoom-based behavior), Client-side spatial operations using Turf.js	
	4	Base map and tile Services, Coordinate Systems in Web GIS	
3	**Server-Side Web GIS and Spatial Databases**		13
	1	Web application architecture, RESTful APIs	
	2	Introduction to Node.js or Python, Spatial Databases, PostgreSQL and PostGIS, Spatial SQL, Spatial indexing (R-tree, GiST indexes in PostGIS),	
	3	Data import workflows (Loading Shapefiles, GeoJSON, and CSV with coordinates into PostGIS), GeoServer, Publishing OGC services (WMS, WFS, WMTS, WCS)	
4	**Web Cartography and Geoprocessing**		10
	1	Web map design principles, Tile maps and vector tiles, Choropleth maps, Heatmaps, Thematic cartography for the web	
	2	Geocoding and Reverse Geocoding	
	3	Geoprocessing on the web, QGIS Server, Deployment basics	
5	**Cloud GIS, Emerging Trends**		30
	1	Cloud-native geospatial: Cloud Optimized GeoTIFF (COG), STAC (SpatioTemporal Asset Catalog), Tile services on AWS/GCP/Azure	
	2	Google Earth Engine's web interface and its Application	
	3	Introducing the Concepts of Mobile GIS	
	4	Introduction to real-time data and sensor web.	

Essential Readings:

1. Wu, Q. (2026). GeoAI with Python: A practical guide to open-source geospatial AI. Independently Published. ISBN (Print): 979-8253507414; ISBN (PDF): 979-8993859729.
2. Web GIS: Principles and Applications, Pinde Fu and Jiulin Sun, ESRI Press, 2011
3. GIS for Web Developers. Adding where to your web applications, Davis, S, First Edition, The Pragmatic Programmers LLC, 2007.
4. Steven Holzner, "PHP: The Complete Reference" 1st Edition TATA McGraw Hill 2008 ISBN: 9780070223622

5. Stefano Iacovella, Brian Youngblood "GeoServer Beginner's Guide" Packt Publishing, 2nd Revised Edition, 2017, ISBN-13: 978-1849516686
6. Anuj Tiwari, Kamal Jain, Concepts and Applications of WEBGIS, Nova Science Publishers,2017, ISBN-1536127795.
7. Fu, P., & Sun, J. (2011). Web GIS: Principles and Applications. ESRI Press. ISBN: 9781589482456.
8. Iacovella, S., & Youngblood, B. (2017). GeoServer Beginner's Guide (2nd ed.). Packt Publishing. ISBN: 9781785287893.
9. Davis, S. (2007). GIS for Web Developers: Adding Where to Your Web Applications. Pragmatic Bookshelf. ISBN: 9780977616633.
10. Kraak, M. J., & Ormeling, F. (2020). Cartography: Visualization of Geospatial Data (4th ed.). CRC Press. ISBN: 9780367335250.
11. Mitchell, T. (2005). Web Mapping Illustrated: Using Open Source GIS Toolkits. O'Reilly Media. ISBN: 9780596008659.
12. PostGIS Project Steering Committee. (2024). PostGIS Manual. The PostGIS Development Group.
13. Open Source Geospatial Foundation (OSGeo). (2024). GeoServer User Manual.
14. Leaflet Development Team. (2024). Leaflet JavaScript Library Documentation.
15. Google Earth Engine Team. (2024). Google Earth Engine Developer Guide.

Suggested Readings / Videos:

1. https://felix-rz.github.io/pdf/2013_Tutorial_GIS.pdf
2. AI4EO Platforms and Best Practices - YouTube

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

PROJECT

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- A four-year UG Honours Degree with Research in the Major Discipline shall be awarded to those who complete the KU-FYUGP with a specific number of Courses of 177 credits including 12 credits from a graduate project /dissertation in their major discipline. Students who aspire to pursue research as a career may opt for Honours with a Research stream in the fourth year.
- A 4-year UG Honours Degree in the Discipline/ Disciplines shall be awarded to those who complete the KU-FYUGP with a specific number of Courses with 177 credits including an optional graduate project/ dissertation up to 12 credits in their major discipline.
- The recognized research departments/ departments with at least two faculty with PhD may be permitted to offer the Honours with Research program 3.9 The number of seats for the Honours with Research shall be determined as per the availability of eligible faculty.
- The selection criteria for Honours with Research stream shall be in accordance with the guidelines of UGC or as approved by Kannur University. Students who secure 75% marks and above (equivalent, CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the fourth year
- Students who have chosen the Honours with Research stream shall be mentored by a faculty with a PhD.
- The mentor shall prescribe suitable advanced-level courses for a minimum of 20 credits to be taken within the institutions along with the papers on research methodology, research ethics, and research topic-specific courses for a minimum of 12 credits which may be obtained either within the institution or from other recognized institutions, including online and blended modes.
- These students who have opted for the Honours with Research should complete a research project under the guidance of the mentor and should submit a research report for eternal evaluation. They need to successfully defend the research project to obtain 12 credits under a faculty member of the University/College. The research shall be in the Major/allied discipline.

GUIDELINES FOR THE PROJECT IN HONOURS PROGRAMME AND HONOURS WITH RESEARCH PROGRAMME

1. Project can be in Geography or allied disciplines.
2. Project should be done individually.
3. Project work can be of experimental/ theoretical/ computational/Quantitative/ Qualitative or exploratory in nature
4. The various steps in project works are the following:
    - Wide review of a topic.
    - Investigation on a problem in systematic way using appropriate techniques.
    - Systematic recording of the work.
    - Reporting the results with interpretation in a standard documented form.
    - Presenting the results before the examiners.
5. Students are encouraged to employ suitable methodologies tailored to the nature of the problem at hand. Studies may encompass quantitative, qualitative, or mixed methods approaches.
6. Project reports must utilize A4 sized pages printed on both sides.
7. The report's length should range from a minimum of 40 pages to a maximum of 80 pages, inclusive of references.

8. Adherence to the latest APA format is required for report preparation.
9. Two printed copies of the final study report must be submitted by students.
10. Students are required to include a plagiarism check report with their study submission. Any reputable plagiarism-checking software may be utilized for this purpose, in accordance with the University of Calicut's plagiarism regulations.
11. During the Project the students should make regular and detailed entries in to a personal log book through the period of investigation. The log book will be a record of the progress of the Project and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Project supervisor should periodically examine and countersign the log book.
14The log book and the typed report must be submitted at the end of the Project. A copy of the report should be kept for reference at the department. A soft copy of the report too should be submitted, to be sent to the external examiner in advance.
15.It is desirable, but not mandatory, to publish the results of the Project in a peer reviewed journal.
16The project report shall have an undertaking from the student and a certificate from the research supervisor for originality of the work, stating that there is no plagiarism, and that the work has not been submitted for the award of any other degree/ diploma in the same institution or any other institution.
17.The project proposal, institution at which the project is being carried out, and the project supervisor should be prior-approved by the Department Council of the college where the student has enrolled for the UG (Honours) programme.

EVALUATION OF PROJECT

- The evaluation of Project will be conducted at the end of the eighth semester by both internal and external modes.
- The Project in Honours programme as well as that in Honours with Research programme will be evaluated for 300 marks. Out of this, 90 marks is from internal evaluation and 210 marks, from external evaluation.
- The internal evaluation of the Project work shall be done through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme. 30% of the weightage shall be given through this mode.
- The remaining 70% shall be awarded by the external examiner appointed by the University.
- The scheme of continuous evaluation and the end-semester viva-voce of the Project shall be as given

below:

Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)	Weightage
Continuous evaluation of project work through interim presentations and reports by the committee internally constituted by the Department Council	90	30%
End-semester viva-voce examination to be conducted by the external examiner appointed by the university	150	50%
Evaluation of the day-to-day records and project report submitted for the end-semester viva–voce examination conducted by the external examiner	60	20%
Total Marks	300	

INTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research)
1	Skill in doing project work	30
2	Interim Presentation and Viva-Voce	20
3	Punctuality and Log book	20
4	Scheme/ Organization of Project Report	20
	Total Marks	90

EXTERNAL EVALUATION OF PROJECT

Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research) 12 credits
1	Content and relevance of the Project, Methodology, Quality of analysis, and Innovations of Research	50
2	Presentation of the Project	50
3	Project Report (typed copy), Log Book and References	60
4	Viva-Voce	50
	Total Marks	210

INTERNSHIP

- All students shall undergo a Field Trip/Summer Internship/Apprenticeship in a Firm, Industry or Organization; or Training in labs with faculty and researchers or other Higher Education Institutions (HEIs) or research institutions.
- Students shall be provided with opportunities for internships with local industries, business organizations, agriculture, health and allied sectors, Local Government institutions (such as panchayats, municipalities), State Planning Board, State Councils/ Boards, elected representatives to the parliament/state assembly/panchayath, media organizations, artists, crafts persons etc. These opportunities will enable the students to actively engage with the practical aspects of their learning and to improve their employability.
- Summer Internship, Apprenticeship, Community outreach activities, etc. shall require 90-120 hours/15-20 days of engagement to acquire 2 credits.

GUIDELINES FOR INTERNSHIP

1. Internship can be in Geography or allied disciplines.
2. There should be minimum 90 hrs. of engagement from the student in the Internship.
3. Summer vacations (After Fourth Semester) can be used for completing the Internship.
4. The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.
5. The log book and the typed report must be submitted at the end of the Internship.
6. The institution at which the Internship will be carried out should be prior-approved by the Department Council of the college where the student has enrolled for the UG Honours programme.

7. Upon program completion, students are required to submit a report in the specified format provided by the external internship supervisor. This report must include the agency/institute certificate, attendance statement, work details, and acquired skills/knowledge.
8. In cases where students intern within the institute, a designated faculty member will serve as the external supervisor.

FORMAT OF THE INTERNSHIP REPORT

1. Title page
2. Statement of attendance forwarded by the external supervisor
3. Internship Certificate, from where the internship is done which contains Name of internship centre, the area of internship, duration, performance evaluation, and date, should be included and signed by the internship supervisor and head of the internship institution, internal supervisor and principal.
4. Introduction-Details and Profile of the institute
5. Report - should contain the timeline of the work, report of the work done. At the end of the report, an introspective report of the participants on their experience, new learning etc should be added
6. Summary
7. Appendix include any supplementary materials like modules developed, cases recorded, notable interventions etc.

EVALUATION OF INTERNSHIP

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme.
- The credits and marks for the Internship will be awarded at the end of semester 5.
- The scheme of continuous evaluation and the end-semester viva-voce examination based on the submitted report shall be as given below:

Sl. No.	Components of Evaluation of Internship		Marks for Internship 2 Credits	Weightage
1	Continuous evaluation of internship through interim presentations and reports by the committee internally constituted by the Department Council	Acquisition of skill set	10	40%
2		Interim Presentation and Viva-voce	5	
3		Punctuality and Log Book	5	
4	Report of Institute Visit/ Study Tour		5	10%
5	End-semester viva-voce examination to be conducted by the committee internally constituted by the Department Council	Quality of the work	6	35%
6		Presentation of the work	5	
7		Viva-voce	6	
8	Evaluation of the day-to-day records, the report of internship supervisor, and final report submitted for the end semester viva–voce examination before the committee internally constituted by the Department Council		8	15%
	Total Marks		50	

Minor Courses

Weather and Climate Change

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC	100-199	KU1DSCGRS102	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category#**	**Evaluation Tools used**
CO1	Understand the fundamental principles governing atmospheric processes and their role in shaping weather patterns and climate systems.	U	C	Instructor created exams / Quiz

CO2	2. Analyze the mechanisms driving weather phenomena such as precipitation, temperature variations, and atmospheric circulation.	E	C	Analyze spatial data related to weather phenomena, such as precipitation patterns, temperature distributions, and atmospheric circulation features.
CO3	3. Evaluate the impacts of human activities on climate change and recognize strategies for mitigation and adaptation.	An	C	Identify potential risks associated with various human activities on climate change.
CO4	4. Interpret climate data and models to forecast future climate trends and variability.	Ap	C	Assesses vulnerabilities and potential impacts on ecosystems, economies, and communities.
CO5	5. Demonstrate proficiency in using meteorological instruments and techniques for weather observation and analysis.	U	C	Instructor created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	6. Communicate effectively about weather and climate-related topics, fostering public understanding and engagement in climate action.	Ap	C	Discussion

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)
I		**Introduction to Weather and climate**	**10**
	1	Earth and Climate of the Earth	
	2	The Atmosphere-Sun-Earth relationship,	3
	3	Solstices and equinoxes,	4
	4	Motion of earth	2
II		**Atmosphere and its components**	**10**
	5	Structure of the atmosphere,	1
	6	Chemical Physical and composition of the atmosphere,	3
	7	Terrestrial Radiation Troposphere to Thermosphere, Gaseous structure	3
	8	Significance of Ozone, Green House Gases, water vapour and aerosols, Pollutants PM2.5, PM10, radiation energy balance	3
		Circulation of Atmosphere	**15**
	9	Global Pressure belts	2
	10	Winds	2
	11	Macro scale winds	1
	12	Meso scale winds	2
	13	Micro scale winds	2
	14	Global circulation	1

	15	Single cell circulation	1
	16	Three cell circulation	2
	17	Global winds and ocean currents	2
IV	**Precipitation and Water Balance**		**10**
	18	Cloud cover,	1
	19	cloud types ,	2
	20	Types of precipitation, and	2
	21	Cyclones; cyclogenesis	2
	22	Anticyclones ,Weather, Climate change and variability	3
V	**Course Project**		**30**
	1	Exercise 1: Understanding Structure and functions of the Indian Meteorological Department (IMD). Exercise 2: Collection of climatic data from IMD website. https://mausam.imd.gov.in/bengaluru/ Exercise 3: Plotting of downloaded climatic data using graphical methods 2 Weather Observations: Record daily weather observations such as temperature, precipitation, wind speed, and cloud cover. 3.Analyze historical weather data: Access climate databases or online resources to retrieve historical weather data for your region. Analyze trends in temperature, precipitation, and extreme weather events over time 4.Identify potential impacts of climate change on your local area, such as sea-level rise, changing precipitation patterns, or increased frequency of heatwaves.	20
	2	1.Measurement of weather elements using analogue instruments: Mean daily temperature, air pressure, relative humidity, and rainfall 2. Interpretation of a daily weather map of India (any two): PreMonsoon, monsoon, and post-monsoon	10

	3	3. Construction and interpretation of monthly rainfall dispersion diagram (quartile method). Climatic water budget 4. Construction and interpretation of hythergraph and climograph (after Taylor	

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	3	3	3	3	3	3	3	3	3
CO 2	3	3	3	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	3	3	3	3	3	3	3
CO 4	3	3	3	3	3	3	3	3	3	3	3	3
CO 5	3	3	3	3	3	3	3	3	3	3	3	3
CO 6	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Climate Change and Sustainable Development

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC	100-199	KU2DSCGRS108	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Recognize the interdependencies between climate change and sustainable development goals, elucidating the impacts on ecosystems, economies, and societies.	U	C	Instructorcreated exams / Quiz

CO2	Evaluate strategies for mitigating greenhouse gas emissions and enhancing resilience to climate-related challenges, fostering sustainable development pathways.	E	C	Assigning case studies related to successful and unsuccessful conservation efforts can encourage students to critically analyze the factors contributing to their outcomes and derive lessons for future conservation initiatives.
CO3	Analyze the socio-economic implications of climate change policies and initiatives, considering equity and justice concerns.	An	C	Assigning research papers on specific conservation topics allows students to delve deep into the scientific literature, understand key concepts, and develop analytical and writing skills.
CO4	Apply interdisciplinary approaches to address complex environmental problems, integrating knowledge from fields such as ecology, economics, and social sciences.	Ap	C	Assigning tasks that involve analyzing conservation policies, regulations, and management plans
CO5	Communicate effectively about climate change issues, engaging diverse stakeholders and advocating for sustainable development practices.	U	C	Instructorcreated exams / Quiz/ Seminars/ Instructorcreated exams / Quiz

CO6	Propose innovative solutions and policies for promoting climate resilience and achieving sustainable development objectives at local, national, and global scales.	Ap	C	Discussion

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)
I	Introduction to Climate Change concepts		**10**
	1	Global Issues and challenges of Climate Change:	
	2	Global climate systems, Causes and Consequences	
	3	Green House gases, warming world, atmospheric pollutants cause, IPCC: climate variability and extremes,	
	4	Effects of global warming	
II	**Sustainable Development**		**10**
	5	Definitions of sustainability: Scope and emerging trends;	
	6	Climate and Sustainable Development Sustainable Development Goals: An overview; National and State Policies; Role of planning department in its implementation:	
	7	Sustainable cities, sustainable food,	
	8	Sustainable communities	
III	**International and national initiatives**		**15**
	9	UNFCC	
	10	Montreal protocol,	
	11	National Action Plan on Climate Change NAFCC;	
	12	State action plan on climate change,	
	13	International cooperation's, policies,	

	14	Conference of Parties (COP)and nationally determined contributions (NDCs)	
	15	SAPCC, district and local bodies, scenarios,	
	16	Trajectories, A1, A2, B1 , scenarios,	
	17	RCP trajectories	
IV	**Impacts of climate change**		**10**
	18	Climate Change: Forest and Biodiversity	
	19	Climate Change: Agriculture and Food Security	
	20	Climate Change and Water	
	21	Climate Change: Coastal Ecosystem and fisheries	
	22	Climate change and Urban habitat Climate change and Transport network / Energy sector	
	Sections from References:		
V	Sustainable Development **and Course Project**		**30**
	1	1. Impact Assessment: Conduct a field study to assess the effects of climate change on a local ecosystem or community, documenting changes in temperature, precipitation, biodiversity, and socioeconomic indicators. 2. Policy Analysis: Analyze climate change policies and sustainable development strategies implemented by governments or organizations, evaluating their effectiveness, equity implications, and potential for long-term sustainability. 3. Community Engagement: Organize a community workshop or forum to raise awareness about climate change impacts and discuss local adaptation and mitigation measures, encouraging active participation and collaboration among residents.	
	2	Project: Sustainable Development Project: Develop a sustainability project focusing on renewable energy, waste management, or resource conservation, aiming to reduce carbon emissions and promote	
		resilience in a specific area or community. Scenario Planning: Facilitate a scenario planning exercise where participants explore alternative futures under different climate change scenarios, identifying key vulnerabilities, opportunities, and adaptive strategies for sustainable development.	
	Sections from References:		

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	2	-	3	3	3	-	2	-	-	3
CO 2	3	-	-	-	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	3
CO 4	3	-	2	3	3	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	3	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Mitigation and Adaptation to Climate Change

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS203	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used

CO1	Understand the concepts of mitigation and adaptation in the context of climate change, distinguishing between strategies aimed at reducing emissions and those focused on building resilience.	U	C	Instructorcreated exams / Quiz
CO2	Evaluate the effectiveness of various mitigation measures, including renewable energy deployment, carbon capture and storage, and sustainable land use practices.	E	C	Organizing debates or roleplaying exercises where students take on different stakeholder perspectives
CO3	Analyze the socio-economic	An	C	Organizing field
	implications of climate change adaptation strategies, considering factors such as equity, vulnerability, and community resilience.			trips or practical exercises that involve conducting habitat assessments, biodiversity surveys, and ecosystem service evaluations can provide handson experience and reinforce theoretical knowledge.
CO4	Apply knowledge of climate science and policy frameworks to assess the feasibility and implementation challenges of mitigation and adaptation initiatives.	Ap	C	Critical Discussions and Seminars
CO5	Develop interdisciplinary solutions to climate change challenges, integrating scientific, technological, economic, and social perspectives.	U	C	Group Projects
CO6	Communicate effectively about mitigation and adaptation strategies, advocating for informed decisionmaking and collective action to address climate change impacts.	Ap	C	Community Engagement Projects

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)
I		**Mitigation and adaptation**	**10**
	1	Measures of mitigation action: Emission Reductions, Carbon sequestration and trading,	
	2	Clean development mechanism, clean energy, green energy,	
	3	Alternative energy sources, bio fuels, afforestation Measures of adaptation action: early warnings, disaster preparedness, capacity building, building resilient infrastructure, resilience building,	
	4	Integrated land use planning	
II		**Impact Assessments in Climate change**	**15**
	5	IPCC s Reports 1 to 6th assessment (AR6) Scenarios,	
	6	Trajectories, A1, A2, B1 , scenarios, RCP trajectories	
	7	National Action Plan on Climate Change NAFCC; State action plan on climate change,	
		WMO	
	8	UNFCC , IMD, IITM	
	9	Primary survey, statistical analysis: Mean, Median Mode- standard deviation-coefficient of variation- Correlation and Regression Modelling tools	
	10	Agencies working, Global climate forecast systems	
	11	Remote sensing/ GIS/ Radars/ GPS/ Satellites/ Drones	
	12	Climate Change: Forest and Biodiversity	
	13	Climate Change: Agriculture and Food Security	

	14	Climate Change and Water	
III	**Vulnerability concepts and assessments**		**10**
	15	Concepts on Exposure,	
	16	Sensitivity and Adaptive Capacity	
	17	Methodologies for Vulnerability Assessments Top down and bottom-up methods:	
IV	**Disasters and Sustainable Solutions**		**10**
	18	Disaster concepts	
	19	Disaster risk reductions Early warnings, preparedness	
	20	projected climatic and ecological changes	
	21	Nature based solutions, community-based v/s technological solutions	
	22	Regional planning	
V			**30**
	1	Conduct energy audits in residential or commercial buildings to identify opportunities for energy efficiency improvements. - Implement measures such as installing energy-efficient lighting, appliances, and HVAC systems.	
	2	- Implement waste reduction programs such as composting, recycling, and source reduction in households, schools, or workplaces.	
	2	Promote alternatives to single-occupancy vehicles such as carpooling, public transit, biking, or walking. Organize community events like bikesharing programs or car-free days to encourage sustainable transportation choices. Participate in habitat restoration projects such as tree planting, wetland restoration, or coastal dune stabilization to enhance ecosystem resilience.	
	Sections from References:		

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Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6

CO1	3	-	2	-	3	-	3	-	2	-	2	3
CO2	3	-	-	3	-	-	3	-	-	-	-	3
CO3	2	-	3	2	-	-	2	-	3	2	3	-
CO4	3	-	2	3	-	-	3	-	2	3	-	-
CO5	3	3	-	-	-	-	3	3	-	-	-	3
CO6	-	-	2	2	3	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Introduction to Disaster Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC	100-199	KU1DSCGRS103	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Introduction to Disaster Management provides a foundational understanding of disaster risk reduction, response, and recovery. Topics include disaster types, risk assessment, emergency planning, and community resilience. Through case studies and practical exercises, students learn to analyze disaster impacts and implement effective management strategies. This course equips learners with essential skills to mitigate risks and support communities in times of crisis.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the principles and concepts of disaster management.	U	C	Written exams assessing knowledge of disaster management theories and terminology.
CO2	Identify different types of disasters, their causes, and their impacts on communities.	E	C	Research projects or presentations on specific disasters, analyzing causes, impacts, and responses
CO3	Develop skills in risk assessment, preparedness, response, and recovery strategies.		P	Simulation exercises where students develop emergency response plans for hypothetical disaster scenarios.
CO4	Analyze and evaluate disaster management policies and practices.	A	C	Case studies requiring students to critique existing disaster management policies and propose improvements.
CO5	Demonstrate effective communication and collaboration in disaster management contexts.	E	F	Group projects or roleplaying activities simulating coordination between various stakeholders during a disaster response
CO6	Apply ethical considerations and cultural sensitivity in disaster management efforts.	A	P	Reflective essays or discussions on ethical dilemmas and cultural considerations in disaster response and recovery operations.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)
I	**Introduction to disaster**		**10**
	1	Concepts of Disaster	1
	2	Concepts of Hazard	3
	3	Concepts of Vulnerability and Resilience	4
	4	Concept of Risks	2
II	**Types of disaster.**		**10**
	5	Natural Disasters,	1
	6	Man-Made Disasters,	3
	7	Complex Disasters,.	3
	8	Pandemic Disasters	3
III	**Study of Important disasters-Global dimensions of disasters, Overview of Disasters in India.**		**15**
	9	Global Dimensions of Disasters:	2
	10	Overview of Disasters in India:	2
	11	Case Studies of Specific Disasters:	1
	12	Community Resilience and Disaster Preparedness:	2
	13	Technological Innovations and Disaster Management:	2
	14	Public Health and Disaster Management:	1
	15	Environmental Management and Disaster Risk Reduction	1

	16	Social Vulnerability and Equity in Disaster Management	2
	17	Policy Analysis and Institutional Frameworks	2
IV	**Vulnerability Profile of India**		**10**

	18	Physical Vulnerability	1
	19	Socio-economic Vulnerability	2
	20	Healthcare Infrastructure and Vulnerability	2
	21	Environmental Degradation and Vulnerability	2
	22	Displacement and Migration Patterns	3
			30
V	1	. Practical Exercises for Fundamentals of Disaster Management: 1. Disaster Risk Assessment Simulation: - Conducting field assessments to identify hazards, vulnerabilities, and risks in a local community. - Analyzing data collected to prioritize risks and develop mitigation strategies. - Presenting findings and recommendations to stakeholders. 2. Emergency Response Drill: - Organizing and participating in an emergency response exercise simulating a disaster scenario (e.g., earthquake, flood, fire). - Practicing roles and responsibilities of emergency responders, including search and rescue, first aid, and evacuation procedures. - Evaluating the effectiveness of the response and identifying areas for improvement. 3. Community Preparedness Workshop: - Facilitating workshops with community members to raise awareness about disaster risks and preparedness measures.	30

		- Conducting hands-on training sessions on basic first aid, fire safety, and evacuation procedures. - Developing community emergency plans and establishing communication networks for rapid response. 4. Damage Assessment and Needs Analysis: - Conducting post-disaster damage assessments to determine the extent of infrastructure damage and humanitarian needs. - Utilizing assessment tools and techniques to collect and analyze data on affected populations, shelter, water, sanitation, and health services. - Collaborating with local authorities and humanitarian organizations to prioritize response efforts and allocate resources effectively. 5. Risk Communication Exercise: - Developing risk communication materials (e.g., brochures, posters, social media campaigns) tailored to different target audiences. - Conducting mock public awareness campaigns to disseminate information on disaster risks, preparedness measures, and evacuation procedures. - Evaluating the effectiveness of communication strategies through surveys, focus groups, or community feedback. 6. GIS Mapping and Spatial Analysis: - Using Geographic Information Systems (GIS) tools to map hazard zones, vulnerable populations, critical infrastructure, and evacuation routes. - Analyzing spatial data to assess the potential impact of disasters and identify areas at higher risk. - Integrating GIS mapping into disaster management planning and decision-making processes. These practical exercises provide hands-on experience and skills development opportunities for students to apply theoretical		
		concepts and principles of disaster management in real-world scenarios.		

	Sections from References:			

Books and References:.

1. Blanchard, B. W. (2017). Disaster Management Handbook. Butterworth-Heinemann.
2. Coppola, D. P. (2015). Introduction to International Disaster Management. Butterworth-Heinemann.
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4. Kapucu, N., & Liou, K. T. (2014). Disaster and Development: Examining Global Issues and Cases. Springer.
5. Koenig, K. L., & Schultz, C. H. (2012). Koenig and Schultz's Disaster Medicine: Comprehensive Principles and Practices. Cambridge University Press.
6. McEntire, D. A. (2007). Introduction to Homeland Security: Understanding Terrorism with an Emergency Management Perspective. Wiley.
7. Quarantelli, E. L. (1998). What is a Disaster?. Routledge.
8. Rodriguez, H., Quarantelli, E. L., & Dynes, R. R. (2006). Handbook of Disaster Research. Springer.
9. Tierney, K. J. (2014). The Social Roots of Risk: Producing Disasters, Promoting Resilience. Stanford University Press.
10. Waugh, W. L., & Tierney, K. J. (2017). Disasters and Disaster Management. Routledge.

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Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	1	2	-	3	-	3	-	2	-	-	2
CO 2	3	-	-	-	-	-	3	-	-	-	-	-
CO 3	2	-	3	2	3	-	2	-	3	2	-	-

CO4	3	-	2	3	-	-	3	-	2	3	-	3
CO5	3	3	-	-	-	-	3	3	-	-	-	-
CO6	-	-	2	2	-	-	-	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Disaster Management Processes

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC	100-199	KU2DSCGRS109	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Disaster Management Processes" provides an overview of the comprehensive cycle of disaster management, including mitigation, preparedness, response, and recovery. Students explore the principles, strategies, and techniques essential for effective disaster planning, coordination, and resilience-building in the face of natural and manmade hazards.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand the stages and principles of disaster management.	U	C	Written assessments evaluating knowledge of disaster management frameworks, including the disaster cycle and key principles.

CO2	Develop skills in disaster risk assessment and mitigation.	E	C	Practical exercises assessing the ability to identify and prioritize risks, develop mitigation strategies, and implement risk reduction measures.
CO3	Demonstrate proficiency in emergency preparedness planning.	C	P	Review and analysis of emergency preparedness plans, assessing completeness, effectiveness, and alignment with best practices.
CO4	Apply effective communication and coordination in disaster response.	A	P	Role-playing exercises simulating communication and coordination among stakeholders during disaster response scenarios.

CO5	Analyze post-disaster recovery and reconstruction processes.	An		Case studies and presentations evaluating postdisaster recovery efforts, including assessments of rebuilding initiatives and community resilience.
CO6	Evaluate the effectiveness of disaster management policies and strategies.	E	F	Research projects or policy analyses assessing the
				impact of disaster management policies on disaster outcomes and community resilience
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	**Unit**	**Content**	**Hrs (45 +30)**
I	**Basic Principles of Disaster Management**		**10**
	1	Preparedness: . Mitigation. Response Recovery	1
	2	Scope of Disaster Management	3
	3	Role of Geography in Disaster Management	4

	4	Hazard Mapping. Spatial Planning Evacuation Planning Geographic Information Systems (GIS):	2
II	**Mitigation and Management techniques of Disaster–**		**10**
	5	Prevention, Mitigation,	1
	6	Preparedness, Response.	3
	7	Recovery, Rehabilitation,	3
	8	Key Phases of Disaster Management- pre – Disaster, During Disaster, Post Disaster	3
III	**Major Disasters**		**15**
	9	Earthquake Types:	2
	10	Magnitude and Intensity of Earthquakes:	2
	11	Seismic Zones of India:	1
	12	Flood Types:	2
	13	Flood Management:	2
	14	Drought Types:	1
	15	Drought Management:	1
	16	Landslide Types:	2
	17	Landslide Management:	2
IV	**Disaster management policy**		**10**
	18	Policy Objectives:	1
	19	Legal and Institutional Framework:	2
	20	Risk Assessment and Planning:	2
	21	Preparedness and Response	2
	22	Recovery and Reconstruction	3
V			**30**

	1	3. Stakeholder Role-Play Simulation: - Identify key stakeholders involved in disaster management and response efforts in Kerala, such as government agencies, local communities, NGOs, businesses, and environmental organizations. - Assign each participant a specific stakeholder role to role-play during the simulation exercise. - Provide participants with background information about the assigned stakeholder's interests, objectives, and responsibilities in relation to disaster management. - Present a scenario based on one of the case studies and facilitate a simulation exercise where participants interact with each other in their respective stakeholder roles to address the social, economic, and environmental impacts of the disaster	20

	2	Field Trip and Impact Assessment: - Organize a field trip to a location affected by one of the recent disasters in Kerala, such as Pettimudi, Kavalappara, or Pathumala. - Facilitate a guided tour of the affected area, allowing participants to observe firsthand the social, economic, and environmental impacts of the disaster. - Encourage participants to document their observations through photographs, videos, or written notes. - After returning from the field trip, facilitate a group discussion to debrief the experience and analyze the observed impacts, focusing on both immediate and long-term effects on the affected communities and ecosystems. Community Resilience Workshop: - Organize a workshop focused on building community resilience to disasters, using case studies from Kerala to illustrate key concepts and challenges. Invite experts in disaster management, community development, and environmental conservation to lead discussions and interactive activities. - Facilitate group brainstorming sessions to identify potential resiliencebuilding strategies tailored to the specific social, economic, and environmental context of Kerala. - Encourage participants to develop action plans for enhancing community preparedness, response, and recovery efforts in the face of future disasters	10

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	2	-	3	-	2	2	2	-	-	3
CO 2	3	1	-	-	-	-	2	-	-	-	2	-

CO3	2	-	3	2	-	3	2	2	3	2	-	-
CO4	3	-	2	3	-	-	3	-	2	3	-	-
CO5	3	3	-	-	-	-	3	3	-	-	-	-
CO6	-	-	2	2	-	-	2	-	2	2	1	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Disaster Mitigation and Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS204	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

" Disaster Mitigation and Management explores the spatial aspects of natural and human-induced disasters. Students analyze geographical patterns, vulnerabilities, and responses to disasters worldwide. Emphasis is placed on understanding the role of geography in effective mitigation, preparedness, response, and recovery efforts to enhance community resilience.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understand spatial patterns of natural and humaninduced disasters.	U	P	Quizzes and Exams
CO2	Analyze geographical vulnerabilities and risk factors associated with disasters.	A	F	Case Study Analysis
CO3	Evaluate strategies for disaster mitigation, preparedness, and response within different geographical contexts.	E	C	GIS Projects
CO4	Apply geographic information systems (GIS) and remote sensing techniques to assess disaster risk and	A	P	Class Presentations
	support decision-making.			
CO5	Demonstrate knowledge of the role of geography in enhancing community resilience to disasters.	E	F	Research Papers

CO6	Critically assess case studies and real-world examples of disaster management practices.	C	M	. Participation and Discussions

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)
I		**Introduction to Disaster Management**	**10**
	1	Disaster Management: Meaning & Concepts:	1
	2	Methods & Approaches in Disaster Management	3
	3	Natural Disasters and Their Management in India	4
	4	Anthropogenic Disasters and Their Management in India:	2
		Sections from References:	
II		**Risk and Vulnerability Analysis -**	**10**
	5	Risk: Its concept and analysis -	1
	6	Risk Reduction -Vulnerability: Its concept and analysis	3
	7	Strategic Development for Vulnerability Reduction	3
	8	Disaster Preparedness Plan - Prediction, Early Warnings and Safety Measures of Disaster.	3
		Sections from References:	
III		**Inter-Relationship Between Disasters and Developments**	**15**
	9	Factors Affecting Vulnerabilities:	2
	10	Differential Impacts of Disasters:	2
	11	Impact of Development Projects:	1
	12	Climate Change Adaptation:	2
	13	IPCC Scenarios:	2
	14	Scenarios in the Context of India:	1
	15	Relevance of Indigenous Knowledge:	1
	16	Appropriate Technology:	2
	17	Local Resources:	2

	Sections from References:		
IV	**Role of Information Technology in Disasters and Training, awareness program on disaster**		**10**
	management		
	18	Disaster management Information System - Organizing and effective dissemination of information:	1
	19	feedback for improving information - Role of Communication in Disasters,	2
	20	Community Level Disaster Management, Government Initiatives on Disaster Management.,	2
	21	India's National Policy on Disaster Management, - National Guidelines and Plans on Disaster Management,	2
	22	Role of Government, Non-Government and Inter-Governmental Agencies.	3
	Sections from References:		
V	**Practical**		**30**

	1	1. Community-Based Disaster Management Simulation: - Organize a community-level disaster management simulation exercise in collaboration with local authorities and community organizations. - Divide participants into groups representing different sectors of the community, such as households, schools, businesses, and healthcare facilities. - Simulate various disaster scenarios (e.g., earthquake, flood, cyclone) and instruct each group to develop and implement their disaster response and recovery plans. - Facilitate debriefing sessions after the simulation to discuss lessons learned, identify strengths and weaknesses in community preparedness, and brainstorm improvements. 2. Awareness Campaign and Training Workshops: - Conduct a series of awareness campaigns and training workshops on disaster management in collaboration with local government agencies, NGOs, and community leaders. - Develop interactive training modules covering topics such as disaster risk assessment, emergency response procedures, first aid, search and rescue techniques, and evacuation drills. - Utilize multimedia resources, role-playing activities, and hands-on demonstrations to engage participants and enhance learning outcomes. - Evaluate the effectiveness of the training program through pre- and posttraining assessments, participant feedback surveys, and follow-up evaluations of community preparedness and response capabilities.	20
		3. Study of Government Initiatives on Disaster Management: - Assign students or participants to research and analyze government initiatives on disaster management at the national, state, and local levels. - Task them with reviewing relevant policies, programs, and funding allocations aimed at enhancing disaster preparedness, response, recovery, and resilience. - Encourage critical analysis of the strengths and weaknesses of existing government initiatives, considering factors such as governance structures, institutional capacity, coordination mechanisms, and community engagement strategies.	

		- Facilitate group discussions or presentations to share findings and recommendations for improving government efforts in disaster management.	
	2	4. Role-Playing Exercise: Inter-Governmental Coordination: - Organize a role-playing exercise to simulate inter-governmental coordination and collaboration in disaster management. - Assign participants to represent different levels of government (national, state, local), as well as non-governmental organizations, international agencies, and community representatives. - Present a hypothetical disaster scenario and instruct participants to negotiate and coordinate their respective roles and responsibilities in response and recovery efforts. - Facilitate debriefing sessions to identify challenges, lessons learned, and best practices in inter-governmental cooperation and coordination during emergencies. 5. Development of Community Disaster Management Plans: - Facilitate workshops or community meetings to develop community-level disaster management plans in alignment with India's National Policy on Disaster Management and national guidelines. - Engage community members, local authorities, NGOs, and other stakeholders in a participatory planning process to assess hazards, vulnerabilities, and capacities, and prioritize actions for risk reduction and response. - Guide participants in drafting actionable and context-specific disaster management plans, including early warning systems, evacuation routes, emergency shelters, communication protocols, and resource mobilization strategies.	10

		- Encourage on going review, updating, and dissemination of the community plans, fostering ownership and resilience-building at the grassroots level. Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Kerala.	
		1. Cutter, S. L., Mitchell, J. T., & Scott, M. S. (Eds.). (2000). Revealing the Geography of Hazards: An Approach to Understanding Catastrophic Events. Guilford Press. 2. Bankoff, G., Frerks, G., & Hilhorst, D. (Eds.). (2004). Mapping Vulnerability: Disasters, Development, and People. Earthscan Publications. 3. Smith, K. (2013). Environmental Hazards: Assessing Risk and Reducing Disaster (6th ed.). Routledge. 4. Kreimer, A., Arnold, M., & Carlin, A. (1999). Building Safer Cities: The Future of Disaster Risk. The World Bank. 5. Hewitt, K. (Ed.). (1997). Interpretations of Calamity: From the Viewpoint of Human Ecology. Routledge.	

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	2	3	-	2	-	2	3
CO 2	3	-	-	-	1	-	3	2	-	-	-	-
CO 3	2	-	3	2	-	1	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	2	-

CO 5	3	3	-	-	-	-	3	3	-	-	-	3
CO 6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Introduction to Remote Sensing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC	100-199	KU1DSCGRS104	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Gain a solid understanding of the basic principles of remote sensing, including electromagnetic radiation, sensor types, platforms, and the interaction of energy	U	C	Instructor-created exams / Quiz

	with Earth's surface features and atmosphere.			
CO2	Learn about different remote sensing platforms (satellites, aircraft, drones) and sensors (optical, thermal, microwave) and their characteristics, capabilities, and applications..	E	C	Discussion / Practical Assignments
CO3	Develop proficiency in interpreting remote sensing imagery to identify and analyze various land cover and land use features, such as vegetation, water bodies, urban areas, and geological formations.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Acquire skills in remote sensing image processing techniques, including image enhancement, classification, change detection, and normalization, to extract meaningful information from raw remote sensing data	Ap	C	Discussion / Practical Assignments
CO5	Learn about the characteristics and specifications of thermal sensors, including sensor types, spectral bands, spatial and radiometric resolutions, and their influence on thermal image quality and interpretation..	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Explore the diverse applications of remote sensing across various disciplines, including environmental science, agriculture, forestry, geology, urban planning, disaster management, and climate change studies, and understand how remote sensing technology contributes to addressing global challenges and sustainable development.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)	
I	**Foundations of Remote Sensing**		**10**	
	1	Remote sensing – history & development, definition.	1	
	2	Energy resources, radiation principles, EM Radiation and EM Spectrum – Atmospheric Window	3	
	3	Energy interaction in the atmosphere, Energy interactions with earth surface feature.	4	
	4	Ideal and Real Remote sensing.	2	
II	**Elements of Photographic System**		**10**	
	5	Fundamentals of Photogrammetry – Analog, Analytical and Digital, Perspective and Orthographic Projection.	1	
	6	Aerial Photography: Types, Scale, Forward Overlap, Lateral Overlap	2	
	7	Geometric elements of vertical photographs – Marginal Information	2	
	8	Photographic films, Filters-Types; Aerial cameras types	2	
	9	Fundamentals of Air photo Interpretation: Basic Photo interpretation equipment; Elements of visual air photo interpretation.	3	
III	**Fundamentals of Satellite Remote Sensing**		**15**	
	10	Orbital characteristics of Remote sensing satellite - geostationary and sun-synchronous	1	
	11	Concept of platforms and types	2	
	12	Resolution of sensors—spatial, spectral, radiometric and Temporal Resolution, Multi Concept	3	

	13	Earth Resources Satellites -LANDSAT, SPOT, IRS, IKONOS satellite series	2	
	14	Meteorological satellites – INSAT, NOAA, GOES	2	
	15	Sensors – types and their characteristics, across track (whiskbroom) and along track (pushbroom) scanning	2	
	16	Optical mechanical scanners – MSS, TM, LISS, WiFS, PAN	1	
	17	Development of Indian Remote Sensing Mission	2	
IV	**Types of Remote Sensing**		**10**	
	18	Active Remote Sensing and Sensors	2	
	19	Passive Remote Sensing and Sensors	2	
	20	Thermal Remote Sensing and Sensors	2	
	21	Microwave or RADAR Remote Sensing and Sensors	2	
	22	LiDAR Remote Sensing and Sensors	2	
	:			
V	**Practical and Course Project**		**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. 1. Exploring satellite data products from various geoportals 2. Creating FCC / TCC 3. DEM Data Processing 4. Scale of Arial Photo 5. Land use Mapping	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using Remote sensing data products	10	
	Sections from References:			

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
6. Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)
7. Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind - Geographic Information Systems and Science (2005) (22nd ed.)(en)(536s)-Wiley (2005).
8. Carver, Steve_ Cornelius, Sarah_ Heywood, D. Ian - An introduction to geographical information systems [electronic resource]-Langara College (2015)

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	2	3	-	-	2	2	2	3		2
CO 2	-	-	-	2	2	-		2	3	2		

CO 3	2	-	3	2	-	-	3					2
CO 4	3	-	2	3	-	-						
CO 5	3	3	-	-	-	-			1			3
CO 6	-	-	2	2	-	-	3			1		2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Fundamentals of GIS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC	100-199	KU2DSCGRS110	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.

Course Outcomes (CO):

CO	**CO Statement**	**Cognitive Level**	**Knowledge Category #**	**Evaluation Tools used**
CO 1	Gain a solid understanding of the core principles and concepts of GIS, including spatial data types, coordinate systems, map projections, and data models, providing a foundation for advanced GIS analysis and application.	U	C	Instructor-created exams / Quiz

CO 2	Learn how to acquire, create, store, organize, and manage spatial data effectively using GIS software,	E	C	Discussion / Practical Assignments
	including techniques for data conversion, digitization, georeferencing, and metadata creation, ensuring data integrity and accessibility for analysis and decision-making..			
CO 3	Acquire proficiency in performing basic spatial analysis tasks such as overlay operations, proximity analysis, spatial querying, and statistical analysis, enabling you to extract meaningful insights and patterns from spatial data and support informed decision-making processes.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO 4	Develop skills in cartographic design and map production, including symbolization, labeling, map layout, and thematic mapping techniques, to effectively communicate spatial information and present analysis results in a visually appealing and informative manner	Ap	C	Discussion / Practical Assignments
CO 5	Understand the diverse applications of GIS across various disciplines such as urban planning, environmental management, transportation, public health, emergency response, and natural resource management, and recognize the role of GIS in addressing complex spatial problems and supporting sustainable development initiatives.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz

CO 6	Students will be introduced to commonly used Geospatial software tools such as ENVI, ArcGIS, QGIS, and Google Earth Engine, and learn how to perform spatial analysis	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals
- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Module	Unit	Content	Hrs (45 +30)	
I	**Introduction to GIS**		**10**	
	1	Definition, components, packages, capabilities and purpose of GIS	1	
	2	History of Geographic Information System, Development of GIS as an information and decision-making system	3	
	3	Nature of GIS – Real world and representations: Modelling, Maps, Databases and Spatial Databases - Geographic phenomena: fields, objects and boundaries.	3	
	4	Data types: nominal, ordinal, interval and ratio	3	
II	**Data Representation**		**10**	
	5	Definition- Maps and spatial information, Spatial entity vs Spatial Object.	2	
	6	Types of Data - spatial data, Attribute data, Thematic characteristics of Spatial Data	2	
	7	Sources of spatial data- sensors, survey data, air photos, satellite images and	4	

		field data		
	8	Encoding methods: Keyboard – digitization – electronic data transfer. Data editing: Checking and correcting errors in spatial and attribute data.	2	
III	**Data Models**		**15**	
	9	Data abstraction model in GIS	1	
	10	Raster Data Model – Characteristics, Structure.	2	
	11	Raster Data Compression Methods – RLE, Block, Chain, Quadtree	2	
	12	Raster Data sources – Primary and Secondary	2	
	13	Vector Data Model – Characteristics, Field based and Object based representation.	2	
	14	Spaghetti Data Model – Structure, Characteristics	2	

	15	Topological Data Model – TIGER, GBF-DIME, Topological Rules	1	
	16	Raster Data vs Vector Data – Advantages and Disadvantages	2	
	17	Spatio-Temporal Data model	1	
IV	**Spatial Analysis**		**10**	
	18	Spatial Querry, Attribute Querry	1	
	19	Raster Analysis – Map Algebra, Overlay Analysis	3	
	20	Vector Analysis – Proximity Analysis, Union, Intersection	2	
	21	Network analysis, Weighted Overlay Analysis	2	
	22	Spatial Interpolation – Exact and Inexact methods	2	

V	**Practical and Course Project**		**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. 1. Georeferencing 2. Spatial Data management – Digitizing and Editing 3. Spatial Analysis 4. Cartographic Representation	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using geospatial tools	10	

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
6. Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)
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8. Carver, Steve_ Cornelius, Sarah_ Heywood, D. Ian - An introduction to geographical information systems [electronic resource]-Langara College (2015)

Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V. Internal

assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	2	3	-	2	3	-	2	3	-	3
CO 2	-	-	-	2	2	-	-	-	-	2	2	-
CO 3	2	-	3	2	-	-	2	-	3	2	-	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	2	-	-	2	2	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Spatial Analysis

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS205	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Introduction Geoinformatics covers the integration of geospatial data and technologies for analysis and decision-making. It explores Geographic Information Systems (GIS), Remote Sensing (RS), Arial Photogrammetry, and their applications in mapping, environmental monitoring, urban planning, and natural resource management. Students learn data acquisition, manipulation, visualization, and spatial analysis techniques. The course emphasizes geospatial database management, metadata standards, and ethical considerations in geoinformatics. Practical exercises and projects enable students to develop skills in geospatial data handling, interpretation, and communication. Geoinformatics plays a crucial role in addressing contemporary challenges related to sustainable development and spatial planning.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Students develop a solid understanding of the fundamental concepts and principles of Geoinformatics, including geographic information systems (GIS), remote sensing, spatial data analysis, and photogrammetry	U	C	Instructor-created exams / Quiz
CO2	Gain proficiency in acquiring, organizing, and managing geospatial data from various sources such as	E	C	Discussion / Practical Assignments

	satellites, aerial imagery, GPS devices, and field surveys.			
CO3	Students learn techniques for geospatial data analysis, including spatial queries, overlay analysis, and geostatistical analysis, to derive meaningful insights from geospatial datasets.	An	C	Discussion / Practical Assignments / Internal Exams / Practicals
CO4	Learn basic spatial analysis techniques, including overlay analysis, proximity analysis, interpolation, and surface modelling, to analyze spatial relationships and patterns within geographic data..	Ap	C	Discussion / Practical Assignments
CO5	Students will gain proficiency in interpreting satellite images to identify and analyze different land cover and land use types, including urban areas, vegetation, water bodies, and other features.	U	C	Instructor-created exams / Quiz/ Seminars/ Instructor-created exams / Quiz
CO6	Students will be introduced to commonly used Geospatial software tools such as ENVI, ArcGIS, QGIS, and Google Earth Engine, and learn how to perform basic image processing and spatial data analysis tasks using these tools.	Ap	C	Discussion / Practical Assignments / Internal Exams / Practicals

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) #
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (45 +30)**	
	Introduction to Geoinformatics		**10**	
	1	What is Geoinformatics and its branches	1	
	2	Conceptual Understanding of Geographic Information System – Components, Logical Data Models – Raster Vector, Data Structures.	3	

I	3	Theorical understanding of Photogrammetry – Geometry of Vertical Photo, Types of Photos, Flight Planning Mission	3	
	4	Basic Principles of Remote Sensing – Radiation Laws, Types, Atmospheric Window, Resolutions	3	
II	**Raster Analysis**		**10**	
	5	Raster Data Explorations – Pixels, DN Values, Bands.	1	
	6	Local Operations – Map Algebra, Reclassification, Logical and Arithmetic Operations.	3	
	7	Neighbourhood Operations – Aggregations, Filtering Techniques – Low Pass, High Pass, Ende Enhancement	3	
	8	Zonal Operations – Cost Distance Analysis, Least Cost Path	3	
III	**Vector Analysis**		**15**	
	9	Attribute Data Management and Querry	1	
	10	Spatial Relationship and Spatial Querry	2	
	11	Mapping Tabular Data in GIS Environment	2	
	12	Proximity Analysis – Buffer Analysis, Multi Buffer Concept	2	
	13	Overlay Analysis – Point in Line, Point in Polygon, Line in Polygon, Polygon on Polygon	2	
	14	Raster Data Processing – Clipping, Erase, identify, Union & Intersection	2	
	15	Surface Analysis – Interpolation – IDW	1	
	16	Understanding Network Data Model	2	
	17	Shortest Path Analysis, Time and Distance based Shortest Path	1	
IV	**Image Analysis**		**10**	
	18	Basic Elements of Interpretation of Arial Photos	1	
	19	Determining the aerial photograph scale based on an aerial photograph and the measured ground size of objects	3	
	20	Creation of True Color Composition, False Color Composition from multiple bands	2	
	21	Preforming Supervised Classification and Unsupervised Classification	2	

	22	DEM Processing – Elevation, Slope, Aspect, Curvature, 3D mapping	2	
V	**Practical and Course Project**		**30**	
	1	Students have to do the following practical using Software Tools like QGIS, ArcGIS, ERDAS Imagine and ENVI. Vactor Analysis Raster Analysis DEM Data Processing Image Classification Scale of Arial Photo	20	
		Project:		
	2	Students have to do a mini project addressing any real-world scenario using geospatial tools	10	

Books and References:

1. Anji Reddy M (2001) Remote Sensing and Geographical Information System, B S Publications, Hyderabad.
2. James B Campbell and Randolph H W (2011) Introduction to Remote Sensing, Gulford Press, New York.
3. Jenson J R (2004) Remote sensing of the Environment, Pearson Education Pvt. Ltd, Delhi.
4. Basudeb Bhatta (2021) REMOTE SENSING AND GIS 3E, OUP India; 3rd edition (27 January 2021).
5. Lillesand T M, Kiefer R W and J W Chipman (2008) Remote sensing and Image Interpretation, John Wiley, New Delhi.
6. Chang, Kang-Tsung - Introduction to geographic information systems-McGraw-Hill Education (2016)
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Note: The syllabus has five modules. There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 20marks for the evaluation of practical will be based on Module V.

Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks). The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	1	2	3	-	3	2	2	2	3	-	3
CO 2	-	-	-	2	2	-	-	-	-	2	2	-
CO 3	2	-	3	2	-	-	2	2	3	2	-	-
CO 4	3	-	2	3	-	-	2	-	2	3	-	2
CO 5	3	3	-	-	-	-	2	3	-	-	-	-
CO 6	-	-	2	2	-	-	2	-	2	2	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Fundamentals of Surveying

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	DSC	100-199	KU1DSCGRS105	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

The course outcome of Fundamentals of Surveying aims to provide students with a foundational understanding of surveying principles and techniques. Students will learn basic concepts such as measurement, data collection, and mapping. They will develop skills in using surveying instruments and applying mathematical computations to analyze survey data. By the end of the course, students should be equipped with the knowledge and abilities necessary for entry-level surveying tasks and further study in the field.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Understanding of Basic Surveying Principles	U	C	Written Examinations assessing comprehension of foundational surveying concepts such as distance measurement, angles, and
				leveling.

CO2	Proficiency in Surveying Instrument Usage	E	C	Practical Assessments where students demonstrate the ability to properly operate and utilize basic surveying instruments like theodolites and tape measures.
CO3	Ability to Conduct Basic Surveying Measurements	An	C	Field Exercises requiring students to perform distance measurements, angle measurements, and basic leveling tasks accurately.
CO4	Skill in Data Collection and Documentation	Ap	C	Data Recording Assignments where students document field measurements and observations accurately and comprehensively.
CO5	Competence in Basic Mapping Techniques identification.	U	C	- Evaluative Tool: Mapping Projects where students create simple maps using collected survey data and basic cartographic principles.

CO6	Understanding of Safety Procedures in Surveying -	Ap	C	Evaluative Tool: Safety Assessments evaluating students' adherence to safety protocols during fieldwork, including proper equipment handling and Hazard

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) #
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (45 +30)**
I	**Concept of drawing & sheet layout following safety precautions.**		**12**
	1	Demonstrate of tools &equipment used in the Surveying.	1
	2	Introduction of safety equipment's and their uses.	3
	3	Use of drawing instruments and equipment's with care.	2
	4	Method of fixing of drawing sheet on drawing board.	2
	5	Layout of different size of drawing sheet and folding of sheets	2
	6	Instruments & equipment's used by Surveyor, their types and uses.	2

II	**Scales and Projection**		**13**
	7	Scale	1
	8	Representation of Scale	1
	9	Construction of Plain scale	1
	10	Diagonal scale	1
	11	Comparative scale	1
	12	Time scale	1
	13	Vernier scale	1
	14	Geometrical construction-lines, angles, triangles, quadrilaterals, and circles.	3
	15	Map Projection -Perspective projection- Non perspective projection	3	
III	**Classification of Survey, Signs & symbols**		**8**	
	16	Draw conventional signs & symbols used in surveying.	3	
	17	Classification of survey. Accuracy and speed in field & office work. Common terms used and definitions.	3	
	18	Conventional signs and symbols. Use of legends.	2	
IV	**Chain and Tape survey**		**12**	
	19	Linear measuring instruments	3	
	20	Tape Survey Chain survey – different types of chains	3	
	21	Equipment and instrument used to perform surveying& testing of chain.	3	
	22	Field book-types, methods of entry of check lines-its importance.	3	

V			**30**	
	1	Perform site survey Conduct a tape/chain survey of a small area with all details and plotting the map. Calculating the area of site. Prepare a site plan by the help of chain / tape.	30	

Books and References:

1. Moffitt, F. H., & Bossler, J. D. (2016). Elementary Surveying: An Introduction to Geomatics (15th ed.). Pearson.
2. Wolf, P. R., & Ghilani, C. D. (2017). Elementary Surveying: An Introduction to Geomatics (14th ed.). Pearson.
3. Kavanagh, B. F., & McGrath, T. R. (2017). Surveying Principles for Civil Engineers (2nd ed.). Wiley.
4. Davis, R. E., & Foote, F. (2014). Surveying: Theory and Practice. McGraw-Hill Education.
5. Brinker, R. C., & Minnick, R. W. (2017). Surveying Fundamentals and Practices (7th ed.). Pearson.
6. Govindasamy, G. K. (2016). Fundamentals of Surveying (2nd ed.). CRC Press.
7. Punmia, B. C., & Jain, A. K. (2017). Surveying (Vol. 1). Firewall Media.
8. Uren, J., & Price, W. F. (2014). Surveying for Engineers (5th ed.). Palgrave Macmillan.
9. Raymond, W. L., & Mittal, P. (2016). Fundamentals of Surveying and Levelling. S. K. Kataria & Sons.
10. McCormac, J. C., & Nelson, A. P. (2016). Surveying: Principles and Applications. Wiley.

Note: The syllabus has five modules.There should be total 22 units in the first four modules together, composed of the theory topics. The number of units in the last module can vary. There are 45 instructional hours for the first four modules and 30 hrs for the final one. Module Vis designed to equip students with practical skills. The 30marks for the evaluation of practical will be based on Module V.Internal assessments (30 marks) are split between the practical module (20 marks) and the first four modules (10 marks).The end-semester examination for the theory part will be based on the 22 units in the first four modules. The 70 marks shown in the last column, distributed over the first four modules, is only for the external examination.

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	-	2	1	3	3	2	-	2	-	2	2
CO 2	3	-	-	-	-	-	3	-	-	-	-	-
CO 3	2	-	3	2	-	-	2	-	3	2	2	-
CO 4	3	-	2	3	-	-	3	-	2	3	-	-
CO 5	3	3	-	-	-	-	3	3	-	-	-	-
CO 6	-	-	2	2	-	-	2	-	2	2	3	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Conventional Surveying

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC	100-199	KU2DSCGRS111	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Conventional Surveying provides a comprehensive introduction to the fundamental principles and practices of land surveying. Students explore topics such as measurement techniques, equipment usage, data analysis, and mapping. Emphasis is placed on developing proficiency in traditional surveying methods including chain and compass surveys, leveling, and traversing. Additionally, students learn about coordinate systems, map projections, and legal aspects of surveying. Through a combination of theoretical knowledge and practical exercises, this course equips students with the skills necessary to accurately measure and map land, making it essential for aspiring surveyors and professionals in related fields.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Demonstrate proficiency in traditional surveying techniques such as chain and compass surveys, leveling, and traversing.	U	C	Practical Assessments: Conducting field surveys using traditional surveying methods and equipment to assess proficiency

CO2	Apply measurement techniques effectively using appropriate equipment for accurate data collection.	E	C	Data Analysis Projects: Analyzing survey data collected during practical exercises to evaluate understanding and interpretation skills.
CO3	Analyze surveying data to create maps and interpret spatial information.	An	C	Map Creation Assignments: Creating maps from survey data to assess proficiency in map making and spatial visualization.
CO4	Understand and apply coordinate systems and map projections in surveying projects.	Ap	C	Written Examinations: Assessing theoretical knowledge through written exams covering topics such as coordinate systems, map projections, and legal aspects of surveying.
CO5	Identify and comply with legal regulations	U	C	Case Studies:

	and ethical considerations related to land surveying.			Evaluating understanding of legal regulations and ethical considerations through case studies related to land surveying.
CO6	Develop problem-solving skills through theoretical knowledge and practical exercises in surveying.	Ap	C	Problem-Solving Exercises: Assigning practical problems requiring application of surveying principles to assess problem-solving skills

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) #
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	**Unit**	**Content**	**Hrs (45 +30)**	
I		**Prismatic Compass Survey**	**13**	
	1	Survey using prismatic compass	1	
	2	Temporary adjustment of prismatic compass.	2	

	3	Measure fore & back bearing of a line. Measure true bearing of a line	2	
	4	Prismatic survey Open traverses	2	
	5	Prepare a closed prismatic compass measure the bearings, entry into field book, calculation of correct bearing and adjust.(Local attraction),	4	
	6	Determine the closing error and adjust. Plotting the same.	2	
II		**Plane table survey**	**11**	
	5	Perform the site survey using the plane table.	2	
	6	Demonstration of instrument used for plane table surveying &their uses	3	
	7	Set up the plane table (Centring, Levelling, Orientation)	3	
	8	Different method of plane tabling (Radiation, Intersection, Resection &Traversing)	3	
III		**Determination of Height using Indian Clinometer**	**11**	
	9	Indian clinometer	2	
	10	Uses of Indian Clinometer	2	
	11	Setting Instrument	3	
	12	Measuring angle and distance	2	
	13	Height Determination	2	
IV		**Perform the site survey using the Dumpy level**	**10**	
	14	Demonstration and setting up of dumpy level	1	
	15	performing temporary adjustments	2	
	16	Practice in staff reading	2	
	17	Practice in simple& differential leveling	2	

	18	Equate reduction of level(rise fall method, height of instrument method)comparison of method. profile levelling or longitudinal & cross section levelling, plotting the profile	3	
V			**30**	
	1	Prismatic compass survey	10	
	2	Plane table survey	10	
	3	Height determination using Indian clinometer	5	
	4	Dumpy level	5	

Books and References:.

1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V.Kulkarni Pune Vidyarthi Griha Prakashan.
2. Surveying and Levelling by Subramanian, Oxford University Press.
3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain , Laxmi

Publications.

4. Textbook of Surveying by C. Venkatramaiah , University Press.
5. Surveying for Engineers by John Uren & Bill Price, Palgrave Macmillan.
6. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	-	2	1	3	2	3	2	2	-	3	2
CO2	3	2	-	-	3	-	3	-	-	-	-	-
C	2	-	3	2	-	-	2	-	3	2	-	3

O 3												
C O 4	3	-	2	3	-	-	3	-	2	3	-	-
C O 5	3	3	-	-	2	-	3	3	-	-	-	2-
C O 6	-	-	2	2	-	2	-	-	2	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Digital Surveying

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	100-199	KU3DSCGRS206	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

Digital Surveying encompasses modern surveying techniques using advanced technology. It covers Theodolite Surveying, Auto Leveling, and Total Station operation, integrating digital tools for precise data collection and analysis. Students learn to utilize digital theodolites and auto levels for accurate angle and height measurements. Total Station principles are explored for electronic distance measurement and coordinate determination. The course emphasizes data processing and analysis using digital platforms. Through practical applications and theoretical instruction, students gain proficiency in utilizing digital tools for efficient surveying practices, preparing them for contemporary challenges in the field of surveying.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level	Knowledge Category#	Evaluation Tools used
CO1	Proficiency in utilizing digital theodolites, auto levels, and Total Stations for precise angle, height, and distance measurements in surveying projects.	U	C	Practical Assessments: Performance evaluation in utilizing digital theodolites, auto levels, and Total Stations for accurate measurements in field exercises.

CO2	Ability to integrate advanced technology into surveying practices for enhanced accuracy and efficiency in data collection and analysis.	E	C	Data Analysis Projects: Assessment of data processing and analysis skills through projects involving digital survey data.
CO3	Competence in conducting electronic distance measurements and coordinate determination using Total Station principles.	An	C	Total Station Operation Tests: Evaluation of proficiency in conducting electronic distance measurements and coordinate determination using Total Station equipment.
CO4	Understanding of data processing techniques and utilization of digital platforms for efficient analysis and presentation of survey data.	Ap	C	Digital Platform Exercises: Assessment of competence in utilizing digital platforms for data processing and analysis tasks.
CO5	Mastery of modern surveying techniques, including Theodolite Surveying, Auto Leveling, and Total Surveying, with a focus on digital tools and methodologies.	U	C	Theoretical Examinations: Testing understanding of Modern surveying techniques, including Theodolite Surveying, Auto Leveling, and Total Surveying, with a focus on digital methodologies.

CO6	Preparedness to address contemporary challenges in the field of surveying through practical applications and theoretical knowledge of digital surveying techniques	Ap	C	Case Studies: Application-based assessments to evaluate preparedness in addressing contemporary challenges in surveying using digital tools and techniques.

- Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Module	Unit	Content	Hrs (45 +30)	
I		**Theodolite survey**	**10**	
	1	Demonstration and set up of Theodolite	1	
	2	Perform permanent adjustment of Theodolite	3	
	3	Measurement of horizontal angle by various methods	4	
	4	Measurement of vertical angle, deflection angle	2	
	5	Determination of height of inaccessible object by Theodolite		
II		**Auto Level Surveying**	**10**	
	6	Introduction to levelling.	1	
	7	Types of levelling instrument	3	
	8	Technical terms used in levelling Temporary & permanent adjustment.	3	

	9	Different types of levelling Entry of level book. (Reduced level calculation method) Curvature & refraction effect sensitivity of bubble tube. Common error and their elimination	3	
III	**Total Station**		**15**	
	10	Introduction to Total Station Principle and Function	2	
	11	Use of Total station for data processing and analysis Electronic Distance Measurement Survey	2	
	12	Area Measurement Survey, Height Measurement Survey	3	
	13	Survey Data Post Processing, Survey Data Applications	2	
	14	Setting and functioning of Total Station.	2	
	15	Temporary adjustment of Total station	1	
	16	Measurement of angle &coordinates and heights	1	
	17	Traversing using Total station	2	
IV			**10**	
	18	Download survey data	1	
	19	Auto CAD	2	
	20	Import survey data to AutoCAD platform	2	
	21	Survey drawing practice using AutoCAD commands	2	
	22	Plan preparation and area calculation	3	
V			**30**	
	1	Surveying Theodolite	10	
	2	Surveying Auto leveling	10	
	3	Surveying Total Station	10	

Books and References:

1. Deakin, R. E., & Toth, C. K. (Eds.). (2016). Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences: 2008 ISPRS Congress Book (Vol. 37). CRC Press.
2. Haala, N., & Kada, M. (Eds.). (2014). Advances in 3D Geoinformation Systems (Lecture
3. Konecny, G. (2014). Advances in Mobile Mapping Technology (2nd ed.). CRC Press.
4. Li, Z. (Ed.). (2014). Advances in Topographic Mapping: Proceedings of the International Symposium on Topographic Mapping (Vol. 3). CRC Press.
5. Menna, F., Remondino, F., & Nocerino, E. (Eds.). (2014). Advances in Automated Photogrammetry and Remote Sensing. Springer.
6. Shan, J., & Toth, C. K. (Eds.). (2015). Topographic Laser Ranging and Scanning: Principles and Processing. CRC Press.
7. Shrestha, R. L., & Carter, W. E. (Eds.). (2016). Remote Sensing Technology in Forensic
8. Investigations: Geophysical Techniques to Locate Clandestine Graves and Hidden Evidence. CRC Press
9. Tang, L., & Wang, C. (Eds.). (2016). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer.
10. Trinder, J. C., & Morley, J. G. (Eds.). (2015). Modern Trends in Cartography: Selected Papers of CARTOCON 2014. Springer.
11. Zhou, G., & Toth, C. K. (Eds.). (2017). Advances in Mobile Mapping Technology (Lecture Notes in Geoinformation and Cartography). Springer.

Mapping of COs with PSOs and POs:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	-	2	2	3	-	2	-	3	3
CO 2	3	-	-	-	-	-	3	-	-	-	-	3
CO 3	2	-	3	2	-	-	2	-	3	2	-	2

CO4	3	-	2	3	-	-	3	-	2	3	-	3
CO5	3	3	-	-	-	2	3	3	-	-	3	3
CO6	-	-	2	2	-	-	-	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

World Regional Geography

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
I	DSC	100-199	KU1DSCGRS106		4	75
Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	2

Course Description:
World Regional Geography explores the spatial characteristics, cultural diversity, economic activities, and geopolitical dynamics of distinct regions across the globe. It examines the physical and human geography of regions such as North America, Europe, Asia, Africa, and Latin America, highlighting their unique landscapes, population patterns, historical legacies, and contemporary challenges. Through comparative analysis, students gain insights into the interconnectedness of global processes and the complexities of regional disparities and interactions.

Module	**Unit**	**Content**	**Hrs (45+30)**
I	**Region**		**10**
	1	Concept of a Region	1
	2	Formal Regions (Natural and Cultural)	3
	3	Functional Regions (Economic and Administrative)	4
	4	Perceptual Regions	2
II	**Equatorial and Tropical region**		**15**
	5	Location,	1
	6	Climate	3

	7	Natural Vegetation	3
	8	Human and Economic life in these regions	3
III	**Temperate region**		10
	9	Location,	
	10	Climate	
	11	Natural Vegetation	
	12	Human and Economic life in these regions	
IV	**Taiga region & Tundra regions**		10
		Location,	
		Climate	
		Natural Vegetation	
		Human and Economic life in these regions	
V	**Teacher Specific module**		**30**
	1	Prepare a report on human adaptation and challenges in different regions	15
	2	Prepare maps of the major climatic regions of the world	15

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Physical Geography of India

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	DSC	100-199	KU2DSCGRS112	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description:

This course in Physical Geography of India provides students with a comprehensive understanding of physical aspects of India. This course helps to develop an in-depth understanding the physical diversity of India.various physiographic units its formation and charecteristics. The student can acquire knowledge about the climate natural vegetation and wildlife of India in general. The student can analyse the relation between different physical features and thir interrelations and make inferences about the resource potentials of india.

Course Pre requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the physical diversity of India.	U
2	Develop knowledge on the significance of Physical landscape of india in addressing environmental and climatic issues.	A
3		A

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Location and setting**	10
	1	India location and Boundaries	
	2	Locational significance and Unity in diversity	
	3	Geological Divisions	
	4	Geopolitics of the Indian ocean	
2		**Physiography**	10
	1	Physiographic Divisions: - Himalaya:- formation -geosynclinal evolution and plate tectonics, characteristics, divisions, human adaptation	
	2	Plains and Desert : - formation, characteristics, divisions human adaptation	
	3	Plateaus : - formation, characteristic's, divisions human adaptation	
	4	Coasts and islands:- formation, characteristics, divisions, human adaptation	

	Drainage and climate		
3	1	Drainage system of India :- Himalayan Drainage – Evolution, River systems- Indus ,Ganga, and Brahmaputra	15
	2	Peninsular Drainage :Major River Systems, comparison between Himalayan and peninsular drainages.	
	3	Climate: - Factors affecting climate of India Indian Monsoon : - Concepts (thermal and dynamic) mechanism.	
	4	Rainfall distribution, Climatic regions	
4	**Vegetation and Soil**		10
	1	Natural vegetation: - classification, distribution, and characteristic's,	
	2	Wild life : Wild life sanctuaries, National parks, Biosphere reserves.	
	3	**Biogeographical zones of India.**	
	4	Soils:- classification of Indian soils. Soil erosion, soil conservation.	
5	**Teacher Specific Module**		
	Directions		
	15. Prepare an Atlas map of India based on the theme: Physiography, Drainage, Climate, Soil and Natural Vegetation and Biogeographical zones.		30

Essential Readings:

1. Deshpande C D : India – A Regional Interpretation, Northern Book Centre, New Delhi, 1992.
2. Farmer B H:– An Introduction to South Asia, Metheun, London 1983.
3. Learmonth ATA et.al (ed) : Man and Land of South Asia, Concept Publishers, New Delhi.
4. Shafi M : Geography of South Asia, McMillan & Co, Calcutta, 2000.
5. Twri R C – Geography of India, Prayag pustak bhavan , Allahabad 2011
6. Singh R L (ed) : India – A Regional Geography, National Geographical Society, India, Varanasi, 1971.

7. Spate OHK and Learmonth ATA : India and Pakistan – Land, People and Economy, Methuen & Co. London 1967.
9. Valdiya K S : Dynamic Himalaya, University Press, Hyderabad, 1998

8. Wadia D N : Geology of India, McMillan & Co. London 1967.

11. Khullar D R – India - A Comprehensive Geography, Kalyani Publishers, New Delhi, 2006
.

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Geography of Kerala

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	DSC	200-299	KU3DSCGRS207	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1.5

Course Description

The Geography of Kerala course offers a comprehensive exploration of Kerala's diverse physical and human landscapes. Students delve into the state's unique geography, including its lush forests, backwaters, and coastal regions. Through studies of landforms, climate, and socioeconomic factors, learners gain insights into Kerala's environmental challenges and cultural dynamics, enriching their understanding of this captivating region.

Course Pre requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the geographical features of Kerala, including its diverse landscapes, climate patterns, and natural resources.	U
2	Evaluate the environmental challenges facing Kerala and propose sustainable solutions based on geographical principles.	A
3	Analyze the socio- economic and cultural aspects influenced by Kerala's geography, such as settlement patterns and agricultural practices.	A

Remember I, understand(U), Apply(A), Analyse (An), Evaluate I, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2				✓			
CO 3				✓			

Module	Unit	Content	Hrs
I		**Physical Settings of Kerala**	10
	1	Location - Physiography	
	2	Climate – Seasons -Annual rainfall- Seasonal Rainfall - Variability of rainfall – Features and effects of monsoon.	
	3	Soil: types	
	4	Drainage: East and West flowing rivers- Backwaters and lakes	
	5	Natural Vegetation - Wildlife Sanctuaries and National Parks.	
II		**Agriculture and Irrigation**	10
	6	Agriculture – Spatial distribution: Rice, Coconut, Rubber, Tea, Coffee, Pepper and Cardamom	
	7	Agro - Climatic Zones of Kerala	
	8	Irrigation: Characteristics, Major Irrigation Projects in Kerala	
	9	Problems and Prospects of Agriculture.	
III		**Resources and Industries**	15
	10	Mineral Resources – Occurrence and distribution of rare earths	
	11	Power Resources – Capacity and production of major Hydroelectric, Thermal, Solar and Wind energy projects	
	12	Marine Resources – Fisheries: Significance and Production	

	13	Industries in Kerala: - Major Industries - Cottage and Small-Scale Industries	
	14	Technology Parks in Kerala	
	15	Tourism Industry – Potentialities – Major Eco-tourism centers	
	16	Problems and Prospects of Tourism Industry	
	Population		10
IV	17	Distribution and Growth of Population, Density, Sex-ratio	
	18	Patterns of Migration in Kerala: Current trends of migration in Kerala	
	19	Trend of Urbanization – Major Urbanization Problems	
	20	Kerala Model of Development	
	21	Roads, Railways, Waterways, Airways and Ports Pattern and Current flows of Trade	
V	**Teacher Specific Module**		30
	22	Prepare an Atlas map of kerala based on the theme: Physiography, Drainage, Climate, Soil and Natural Vegetation and Mineral Resources.	

References

- ➢ Geography of Kerala - Dr. SrikumarChattopadhyay ➢ Geography of Kerala – Dr. George Kurian.
- ➢ Economy of Kerala - Karunakaran and Sankaranarayanan
- ➢ Geomorphology of Kerala - V. Prasannakumar
- ➢ Striving for Sustainability: Environmental Stress and Democratic Initiatives in Kerala , Dr. SrikumarChattopadhyay, Richard W Franke
- ➢ Gazetteer of Kerala - Kerala Gazetteer, Govt. of Kerala
- ➢ Water Atlas of Kerala - CWRDM, Kozhikode
- ➢ Resource Atlas of Kerala - Centre for Earth Science Studies
- ➢ District Census Handbooks - Directorate of Census Operations – Kerala

Web References

- ➢ https://www.envis.ker.nic.in
- ➢ https://www.keralaagriculture.gov.in
- ➢ https://www.dmg.kerala.gov.in/mineral-resources
- ➢ https://www.spb.kerala.gov.in/economic-review

➢ https://www.census2011.co.in/census/state/kerala.html

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	**a)**	**ESE**		**15**	
b)	**CCA**		**25**	**b)**	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article review	10		ii	Skill	4	
	iii	Seminar/Viva-Voce	5		iii	Record	3	

MULTI DISCIPLINARY COURSES

Western Ghats– Culture and Ecology

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
I	MDC	100-199	KU1MDCGRS101	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:
The "Western Ghats: Ecology and Culture" course offers a unique exploration of one of India's most biodiverse and culturally rich regions. Situated along the western coast of India, the Western Ghats are renowned for their stunning landscapes, rich biodiversity, and vibrant cultural heritage. This course delves into the intricate connections between the ecology and culture of the Western Ghats, offering students a holistic understanding of this remarkable biodiversity hotspot.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understanding the Biodiversity of the Western Ghats.	U
2	Analyzing Ecological Systems and Conservation Efforts.	An
3	Exploring Cultural and Historical Significance.	An
4	Investigating Human Impact and Sustainable Practices	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2		✓				✓	
CO 3		✓					✓
CO 4			✓			✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Physical Settings**	15
	1	Western Ghats – location, physiography and origin	
	2	Natural vegetation and biodiversity, National parks and wildlife sanctuaries.	
	3	Western Ghats as a water tower - drainage system, lakes, waterfalls	
	4	Significance of Western Ghats in regional climate	
2		**People and Economy**	10
	1	Demography – distribution, density and growth of population, migration streams.	
	2	Indigenous communities, life style and culture, displacement and marginalization	
	3	Economy – Pattern and prospects of agriculture, tourism, mining and power projects	
	4	Urbanization and transportation – development and related issues	
3		**Development and Sustainability**	

	1	Development and sustainability – Debates on human nature interaction, human and wildlife conflicts	15
	2	Resource management and utilization	
	3	Conservation strategies- Expert Committees on Western Ghats.	
	4	Community based conservation – Laws and legislation	
4	**Teacher Specific Module**		
	Directions		
	Conduct a field survey in one of the vulnerable localities in the Western Ghat to map the biological diversity and human environment interaction in the locality.		5

Essential Readings:

1. The Ministry of Environment and Forest, (MoEF) Government of India (2010) The report of Western Ghats ecology expert panel. http://www.moef.nic.in/downloads/public- information/wg-23052012.pdf.
2. Pascal, J. P. (1940). Bioclimate maps of the Western Ghats (Vol. 829). French Institute of Pondichery: Pondichery. Tropical Conservation Science| ISSN.
3. Kadur, S., & Bawa, K. S. (2005). Sahyadris, India's Western Ghats, a Vanishing Heritage. Atree.
4. Johnsingh, A. J. T. (2015). Walking the Western Ghats. Bombay Natural History Society and Oxford University Press.
5. Kapadia, H. (2004). Trek the Sahyadris. Indus Publishing.
6. Sundararaju, V. (2020). Ecological Harmony. Notion Press.
7. Kasthurirangan K (2013): "Report of the High-Level Working Group on Western Ghats", Ministry of Environment and Forest, Government of India.
8. Preetha N, Oommen V Ommen (2016): "Public Participation in Land-Use Planning of Western Ghats", Kerala land use board, Thiruananthapuram.

Suggested Readings:

1. Viju, B. (2019). Flood and fury: ecological devastation in the Western Ghats. Penguin Random House India Private Limited.
2. D'Souza, R. V. (2020). India's Emerging Ecological Public and the Western Ghats: The Gadgil Committee Report and the Responses of Contiguous States. In Universities and Sustainable Communities: Meeting the Goals of the Agenda 2030 (pp. 417-430). Springer International Publishing.
3. Chattopadhyay, S. 2017. Geomorphological Field Guide Book on Laterites and Backwaters of Kerala (Edited by AmalKar). Indian Institute of Geomorphologists, Allahabad.
4. Chandran, M. S. (1997). On the ecological history of the Western Ghats. Current science, 146- 155.
5. Gadgil, M. (1996). Western Ghats: a lifescape. Journal of the Indian Institute of Science,

76(3), 495-504.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	10
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	15
Total		**75**

Introduction to Climate Change

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
II	MDC	100-199	KU2MDCGRS102	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

This course offers an in-depth examination of climate change from both scientific and societal perspectives. Students will explore the fundamental scientific principles underlying climate change, including the greenhouse effect, carbon cycling, and the impacts of human activities on the climate system. The course will delve into the complexities of climate change science, addressing topics such as climate modeling, paleo climate evidence, and the role of feedback mechanisms. From a societal standpoint, the course will analyze the social, economic, and political dimensions of climate change. The course will also explore the intersection of climate change with issues of environmental justice, equity, and human rights and students will be encouraged to think critically and creatively about potential solutions to the climate crisis.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the scientific basis of modern climate change.	U

2	To analyze the social, economic, and political dimensions of climate change.	An
3	Evaluate mitigation and adaptation strategies for addressing climate change at various scales.	E

Remember(R), Understand (U), Apply(A), Analyse(An), Evaluate(E), Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2		✓					
CO 3	✓		✓				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
		Climate Change	
	1	Earth's Climate System; Understanding Climate Change- past and present	

1	2	Green House Gases and Global Warming; Feedback mechanism	15
	3	Causes of Climate Change	
	4	Global Climatic Assessment- IPCC	
2	**Vulnerability and Impact**		15
	1	Climate Change Vulnerability- Theoretical Basis	
	2	Physical, Social and Economic Vulnerability- with case studies	
	3	Climate Change Impact on Natural System (sea level rise, melting glacier, extreme weather events, biodiversity)	
	4	Climate Change Impact on Human System (Agriculture, Water Resources and Human Health)	
3	**Adaptation and Mitigation**		10
	1	Adaptation- Concepts, Need and Strategies (Incremental and Transformational); Risks of maladaptation	
	2	Mitigation- Concepts, Strategies and Pathways	
	3	Global Initiatives for adaptation and mitigation	
	4	South Asia- Climate vulnerability and adaptation and mitigation measures	
4	**Teacher Specific Module**		
	Directions		
	Discussion/Seminar on Climate Change Policy Framework with specialreference to: Global Initiatives: UNFCCC and COPs Kyoto Protocol Paris Agreement and Nationally Determined Contributions (NDCs) India: National Action Plan on Climatic Change		**5**

Essential Readings:

1. Dessler,A.E.,and Parson,E.A.(2009):The Science and Politics of Global Climate Change – A Guide to the Debate, Cambridge University Press, Cambridge, 190pp.
2. IPCC 5th Assessment report on Climate Change :http://www.ipcc.ch/report/ar5/11.
3. IPCC 6th Assessment report on Climate Change :https://www.ipcc.ch/assessment- report/ar6/
4. Khan,M.Z.A.,and Gangawala,S.(2011): Global Climate Change– Causes and Consequences, Rawat Publications, Jaipur, 298pp

5. Ruddiman,W.F.(2008):Earth's Climate–Pasta nd Future,W.H.Freeman,NewYork, 388pp.
6. Adger,W.N.2006.Vulnerability,Global Environmental Change, 16(3),268-281
7. Barros, Vicente R. (eds.), 2014. Climate Change 2014. Impacts, Adaptation and Vulnerability: Global and Sectoral Aspects. Fifth Assessment Report of the Intergovernmental Panel on Climate Change (PartB;Regional Aspect),Cambridge University Press, New York.
8. Barry,R.G.and Chorley, R.J.2003.Atmosphere,Weather and Climate,Routledge, London
9. Brewster,E.N.2010. Climate Change Adaptation: Steps for a Vulnerable Planet, New York, Nova Science
10. Critchfield,H.J. 1983.General Climatology. Prentice Hall India Ltd(2010 Reprint)
11. IPCC, 2013. Climate Change 2013: The Physical Science Basis, the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)].Cambridge University Press, Cambridge,United Kingdom and New York, NY, USA,

Suggested Readings:

1. OECD. (2008). Climate Change Mitigation: What do we do? (Organization and Economic Co-operation and Development).
2. UNEP. (2007). Global Environment Outlook: GEO4: Environment for Development. Nairobi, Kenya: United Nations Environment Programme.
3. Reddy M.A, Vijay Lakshmi T "Climate Change:Vulnerability and Adaptation"
4. Trevor. M. Letcher(edited) 2009: Climate Change: Observed impacts on Planet Earth
5. Narain.S 2021: Climate Change Science and Politics. Centre for Science and Environment
6. Sarah L. Burch and Sara E. Harris: Understanding Climate Change: Science, Policy and Practice
7. Sen, Roy, S., and Singh, R.B., (2002). Climate Variability, Extreme Events and Agricultural Productivity in Mountain Regions. Delhi, India: Oxford & IBH Pub.
8. Pachori RK 2015:Dealing with Climate Change: Setting a Global agenda for Mitigation and Adaptation

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	10
b)	Test Paper-2	

c)	Assignment	
d)	Seminar	15
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

VALUE ADDED COURESES

Environment and Sustainability

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
III	VAC	200-299	KU3VACGRS201	3	3

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

As we step into an era marked by unprecedented environmental challenges, the need for sustainable practices and responsible stewardship of our planet has never been more critical. This course is designed to equip students with the knowledge and skills necessary to understand and address these pressing issues, fostering a deep appreciation for the intricate balance between human activities and the natural world.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
CO 1	Gain in-depth knowledge on natural processes and resources that sustain life and govern economy.	U
CO 2	Critically examine the relationship between the environment and society	An
CO 3	Develop critical thinking for shaping strategies for environmental protection, conservation of biodiversity, environmental equity, and sustainable development.	E
CO 4	Adopt and propagate sustainability as a practice in life, society, and industry.	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2	✓	✓					
CO 3			✓			✓	
CO 4						✓	

COURSE CONTENTS

Contents for Class room Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Ecosystems**	10
	1	Definition, structure and function of ecosystem	
	2	Energy flow in an ecosystem (food chains, food webs and ecological succession)	
	3	Case studies of the following ecosystems (Forest ecosystem, Aquatic ecosystems)	
2		**Natural Resources**	10
	1	Land and Soil	
	2	Natural Vegetation	
	3	Energy resources (renewable and non-renewable resources)	
3		**Sustainability**	
	1	Biological diversity and threats to biodiversity (Habitat loss, poaching of wildlife, human-wildlife conflicts, biological invasions)	10
	2	Environmental pollution: types, causes, effects and controls	
	3	Sustainable Development: Concept and Components; Measures of Sustainability: SDG	

4	**Field Work**		10
	1	Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.	
	2	Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.	
	3	Study of simple ecosystems-pond, river, coastal regions etc.	
5	**Teacher Specific Module**		
	Directions		
	Writing field report based on the activity conducted as part of Module 4.		5

Essential Readings:

1. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
2. World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press.
3. Cunningham W. P. and Cunningham M. A., 2004: Principles of EnvironmentalScience: Inquiry and Applications, Tata Mcgraw Hill, New Delhi.
4. Goudie A., 2001: The Nature of the Environment, Blackwell, Oxford.
5. Miller G. T., 2004: Environmental Science: Working with the Earth, Thomson BrooksCole, Singapore.

Suggested Readings:

1. Ioris, A.A.R. ed., 2021. Environment and Development: Challenges, Policies and Practices. Springer Nature.
2. Gadgil, M. and Guha, R. (1993). This Fissured Land: An Ecological History of India. University of California Press, Berkeley, USA.
3. Raven, P.H, Hassenzahl, D.M., Hager, M.C, Gift, N.Y. and Berg, L.R. (2015). Environment, 9th Edition. Wiley Publishing, USA.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	

b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Ecosystem Services

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	VAC	100-199	KU4VACGRS202	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 .5

Course Description: In this course, the ecological and conceptual frameworks of ecosystem services are evaluated. The aggregate of all products and services that natural and managed ecosystems provide to humanity is encompassed by these services. Occasionally, ecology services are referred to as Earth's natural capital or nature's benefits to humanity. These services include the direct provision of goods such as food, wood, and water, as well as indirect services such as climate regulation and pest control. Additionally, ecology services include cultural services such as recreation, ecotourism, and cultural heritage. This course aims to give students a fundamental understanding of the categories of ecosystem services, conceptual frameworks, and the structure and functions of ecosystems. In addition, this course offers the chance to comprehend the application of GIS and Remote Sensing in the spatial analysis of ecosystem services.

Course Pre requisite : NIL

Course Outcomes:

CO No.	**Expected Outcome**	Learning Domains
1	Understand the concept and types of ecosystem services.	U
2	Application of frameworks for determining ecosystem services	A
3	Analysis of different types of ecosystem services and its link with human wellbeing	A
4	Design the spatial analysis of ecosystem services with the use of GIS / Remote sensing.	C

RememberI, Understand(U), Apply(A), Analyse(An), EvaluateI, Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	✓		✓		✓		
CO 2				✓			
CO 3					✓		

MODULE	UNIT	DESCRIPTION	HOURS
1		**Basic Concepts**	10
	1	Concept of Natural capital The services of Nature	
	2	Definitions of Ecosystem Types of Ecosystems	
	3	Birth of a concept: ecosystem services	
	4	Key ecosystem services	
	5	The notion of ecosystem services (ES) and how they contribute to people's well-being in a broad sense, also known as "natural capital."	
2		**Ecosystem – Structure and Function**	10
	1	Components of Ecosystem	
	2	Productivity	
	3	Decomposition	
	4	Energy Flow & Nutrient cycling	
	5	Conceptual Frameworks for ecosystem services	

3		**Millennium Ecosystem Assessment**	10
	1	Reporting Categories Used in the Millennium Ecosystem Assessment	
	2	Marine, Coastal and Inland water	
	3	Forest, Dryland and Island	
	4	Mountain, Polar and Cultivated	
	5	Urban Ecosystem	

4	**CATEGORIES OF ECOSYSTEM SERVICES**		**10**
	1	Provisioning Services – Products obtained from ecosystems	
	2	Regulating Services – Benefits obtained from regulation of ecosystem processes	
	3	Cultural Services – Non material benefits obtained from ecosystems	
	4	Supporting Services – Services necessary for all other ecosystem services	
	5	Substitution of services -	

5	**Teacher Specific Module**	
	Ecosystem Services & Spatial Analysis – Common tools and methods	
	Practicals 1. Use of GIS to layer, query, and visualize spatial data 2. Use of Satellite imagery to track vegetation health, land cover changes, and biomass over time	5

Essential Readings:

1. Costanza, R., R. d'Arge, R. de Groot, et al. (1997). "The value of the world's ecosystem services and natural capital." Nature 387(15 May 1997): 253-260. http://www.nature.com/nature/journal/v387/n6630/abs/387253a0.html

2. Daily, G. C. (1997). Introduction: What are ecosystem services? Nature's Services: Societal Dependence on Natural Ecosystems. G. C. Daily. Washington, DC, Island Press: 1-10.

3. Millenium Assessment Report 2005 (https://www.millenniumassessment.org/en/index.html)

Suggested Readings:

1. Cardinale, B.J., R. B. Primack, and J.D. Murdoch, Chapter 5 - The many values of biodiversity, in Conservation Biology, 1st ed. 2019, Oxford University Press: New York, NY. p. 117-139. 2.

2. Cardinale, B.J., R. B. Primack, and J.D. Murdoch, Chapter 6 - Biodiversity and ecosystem services, in Conservation Biology, 1st ed. 2019, Oxford University Press: New York, NY. p. 141-180. 3.

3. Daily, G. et al. (2009). Ecosystem services in decision making: time to deliver. Frontiers in Ecology and the Environment, Vol. 7 No. 1, pp. 21–28.

4. Hungate, B.A., et al., The economic value of grassland species for carbon storage. Science Advances, 2017. 3(4): p. 1-8.

5. Lindenmayer, D.B., et al., Avoiding bio-perversity from carbon sequestration solutions. Conservation Letters, 2012. 5(1): p. 28-36. 4.

6. Tilman, D., et al., Diversity and productivity in a long-term grassland experiment. Science, 2001. 294(5543): p. 843-845. 5.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Water Resource Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	VAC	200-299	KU4VACGRS203	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

The course on Water Resources Management typically covers a broad range of topics related to the importance of water resource, principles of hydrological cycle, integrated water resource management, sustainable and efficient use of water and analysis of water laws, regulations and governance structure.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
CO 1	Understand various water quality issues and able to identify sources of pollution and assess the impact of water pollution on ecosystem	U
CO 2	Comprehend the principles of water governance and understand international water law and policy framework. They will analyse the role of water management and decision-making process	An
CO 3	Evaluate the sustainable water management strategies, including water conservation and integrated water resource management	E
CO 4	Able to remember various components of hydrological cycles and will understand the concept water resource management.	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2	✓	✓					
CO 3			✓			✓	
CO 4						✓	

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction Of Water Resource**	9
	1	Meaning and scope of water resource management	
	2	Historical profile on world Water Resources Development	
	3	Hydrological cycle- Evapotranspiration, Precipitation, Interception, Infiltration, Run off, Storage	
II		**Surface water Resource**	9
	4	Distribution of surface water-Types and Significance,	
	5	Watershed as Geohydrological unit, Drainage Basin, Catchment area	
	6	Surface water pollution and environment	
III		**Ground Water Resource**	9
	7	Ground water-rock properties affecting ground water-porosity, permeability	
	8	Zone of aeration and ground water	
	9	Water Table-saturated and unsaturated zone	
	10	Aquifers-Characteristics-Classification	
	11	Ground water depletion and environment	
IV		**Water Conservation and Management**	9
	12	Water conservation	
	13	Traditional water harvesting methods, Rainwater harvesting and management	

	14	Forest management and water conservation	
	15	Wetland and micro watershed management	
	16	Integrated watershed management	
V	**Water Governance And Policies**		**9**
	17	Concept of sustainable use of water resource	
	18	Water and climatic change	
	19	water policy of India	

References

➢ Todd,D.K. and Mays.L.W.(205) Groundwater Hydrology, John Wiley & Sons.

➢ Tim, Davie. (2009), Fundamentals of Hydrology (3rd Edition), Routledge.

➢ Hydrology & Water Resources R.K. Sharma DhanpatRai& Sons, Delhi

➢ Karanth, K.R., 1988: Ground Water: Exploration, Assessment and Development, Tata-

➢ McGraw Hill, New Delhi.

➢ Ramaswamy, C. (1985): Review of floods in India during the past 75 years: A Perspective.

➢ Indian National Science Academy, New Delhi.

➢ Rao, K.L., 1982: India's Water Wealth 2nd edition, Orient Longman, Del

➢ Bansil, P.C. 2004. Water Management in India. Concept Publishing Company, India.

➢ Brebbia, C.A. 2013. Water Resources Management VII. WIT Press.

➢ Mays, L.W. 2006. Water Resources Sustainability. The McGraw-Hill Publications.

➢ Mandal R.B, 2006: Water Resource Management, Concept publishing company

Web references

➢ https://www.iaea.org/topics/groundwater

➢ https://www.un-igrac.org/what-groundwater

➢ https://www.watercache.com/education/rainwater-harvesting-101

➢ https://jsactr.mowr.gov.in/Public_Dash/download/Rain_Water_Harvesting_Conservat ion_Manual_2019-CPWD

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SKILL ENHANCEMENT COURSES

Introduction to Survey Techniques

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	SEC	200-299	KU4SECGRS201	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

The course outcome of Fundamentals of Surveying aims to provide students with a foundational understanding of surveying principles and techniques. Students will learn basic concepts such as measurement, data collection, and mapping. They will develop skills in using surveying instruments and applying mathematical computations to analyze survey data. By the end of the course, students should be equipped with the knowledge and abilities necessary for entry-level surveying tasks and further study in the field.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
CO 1	Understanding of Basic Surveying Principles	U
CO 2	Ability to Conduct Basic Surveying Measurements	An
CO 3	Proficiency in Surveying Instrument Usage	E
CO 4	Skill in Data Collection and Documentation	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2	✓	✓					
CO 3			✓			✓	
CO 4						✓	

Module	**Unit**	**Content**	**Hrs 45**
I	**Concept of drawing & sheet layout following safety precautions.**		**8**
	1	Demonstrate of tools &equipment used in the Surveying.	
	2	Introduction of safety equipments and their uses.	
	3	Use of drawing instruments and equipments with care.	
	4	Method of fixing of drawing sheet on drawing board.	
	5	Layout of different size of drawing sheet and folding of sheets	
	6	Instruments & equipments used by Surveyor, their types and uses.	
II	**Scales and Projection**		**8**
	7	Scales	
	8	Geometrical construction-lines, angles, triangles, quadrilaterals, and circles.	

	9	Map Projection -Perspective projection- Non perspective projection	
III	**Classification of Survey, Signs & symbols**		**8**
	10	Draw conventional signs & symbols used in surveying.	
	11	Classification of survey. Accuracy and speed in field & office work. Common terms used and definitions.	
	12	Conventional signs and symbols. Use of legends.	
IV	**Chain and Tape survey**		**11**
	13	Linear measuring instruments	
	14	Tape Survey Chain survey – different types of chains	
	15	Equipment and instrument used to perform surveying& testing of chain.	
	16	Field book-types, methods of entry of check lines-its importance.	
V			10
	1	Perform site survey Conduct a tape/chain survey of a small area with all details and plotting the map. Calculating the area of site. Prepare a site plan by the help of chain / tape.	

Books and References:.

1. Moffitt, F. H., & Bossler, J. D. (2016). Elementary Surveying: An Introduction to Geomatics (15th ed.). Pearson.

2. Wolf, P. R., & Ghilani, C. D. (2017). Elementary Surveying: An Introduction to Geomatics (14th ed.). Pearson.

3. Kavanagh, B. F., & McGrath, T. R. (2017). Surveying Principles for Civil Engineers (2nd ed.). Wiley.

4. Davis, R. E., & Foote, F. (2014). Surveying: Theory and Practice. McGraw-Hill Education.

5. Brinker, R. C., & Minnick, R. W. (2017). Surveying Fundamentals and Practices (7th ed.). Pearson.

6. Govindasamy, G. K. (2016). Fundamentals of Surveying (2nd ed.). CRC Press.

7. Punmia, B. C., & Jain, A. K. (2017). Surveying (Vol. 1). Firewall Media.

8. Uren, J., & Price, W. F. (2014). Surveying for Engineers (5th ed.). Palgrave Macmillan.

9. Raymond, W. L., & Mittal, P. (2016). Fundamentals of Surveying and Levelling. S. K. Kataria & Sons.

10. McCormac, J. C., & Nelson, A. P. (2016). Surveying: Principles and Applications. Wiley.

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Introduction to Geo-Spatial Technology

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	SEC	300-399	KU5SECGRS301	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

The course highlights on a vast array of functionalities from spatial data analysis, Global Positioning System and application of Geo-spatial Technology

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
CO 1	To understand general concepts of geo-spatial technology and remote sensing	U
CO 2	To analyse geo-spatial technology for environmental data analysis	An
CO 3	To analyse the concept of GPS and its applications	E
CO 4	To understand general ideas of GIS	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2	✓	✓					
CO 3			✓			✓	
CO 4						✓	

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Geo-spatial Technology**	8
	1	Geo-spatial Technology: Meaning and Concept	
	2	Evolution of Geo-spatial technology	
	3	Remote Sensing: Meaning and types, Advantages, Applications	
II		**Geographic Information System**	8
	4	GIS: Meaning and concept	
	5	Components of GIS – Hardware, Software, Methods, Data, Users.	
	6	Proprietary v/s Open Source Software	
		Applications	
III		**Global Positioning System**	10
	7	Earth Positioning Systems : NAVSTAR, GLONASS, BEIDOU, NAVIC, GALILEO	
	8	GPS Design & Objectives	
	9	Components of GPS- Space Segment-Control Segment-User Segment	
	10	Applications of GPS: GPS in Natural Resource Management, GPS in Surveying and Mapping, GPS in Navigation	
IV		**Geo-spatial Technology for Environmental Data Analysis**	9
	11	Geo-spatial Technology for Geology: Mineral exploration, Geologic mapping, Hydrological analysis	
	12	Geo-spatial Technology for mapping and Analysis of Bio-diversity/Forestry -Ecological sensitive zones and species diversity and species richness	

	13	Geo-spatial Technology for planetary sciences	
V	**Geo-spatial Technology for Historical and Socio-economic data analysis**		10
	14	Geo-spatial technology for archaeological studies	
	15	GIS in Business : Market and Demographic Analysis, Transportation and Logistics, Facilities Management and Banking	

Desirable Skill Enhanacement Techniques

1. Field mapping using hand held GPS
2. Downloading geo-spatial data from online sources
3. Analysis of Disease spread, population trends, vegetation indices using FOSS
4. Preparing the layout of the campus using Mobile Mapping

References

➢ Efraim.T, Rainer;R.K, Introduction to Information Technology, John Wiley & Sons.

➢ Haywood, Ian, Cornelius, Sarah & Carver, Steve (any edition),'An Introduction to Geographical Information Systems', Prentice Hall, Pearson Education, U.K

➢ ch03_s01 Canada Center for Remote Sensing, 'Fundamentals of Remote Sensing, Canada

➢ Konecny Gottified, 'Geoinformation: Remote Sensing, Photogrammetry and Geographic

➢ Information Systems', Taylor and Francis, London, 2003

➢ The GIS Glossary, Environmental System Research Institute, Canada, 1996 ➢ Longley, Paul A et al. 'Geographic Information Systems and Science, John Wiley,

➢ Francis Harvey,'A Primer of GIS: Fundamentals of Geographic and Cartographic Concepts',The Guildford Press New York, 2008

➢ De By, Rolf A 'Principles of Geographic Information Systems 'ITC Educational Textbook Series, ITC, Netherlands, 2001

Web References

➢ https://www.ibm.com/topics/geospatial-data

➢ https://www.ibm.com/topics/geographic-information-system

➢ https://www.space.com/gps-what-is-it

➢ https://www.educba.com/applications-of-gis/

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Advanced Geospatial Techniques

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	SEC	300-399	KU6SECGRS302	3	45

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	0	25	50	75	1 Hr 30 mnts

Course Description:

This course is designed to provide students with hands-on experience in applying advanced geospatial techniques to address complex spatial challenges. Through a combination of theoretical understanding and practical exercises, students will explore cutting-edge tools in spatial analysis, remote sensing, and Geographic Information Systems (GIS). Emphasis will be placed on real-world applications, enabling students to develop practical skills that are essential for careers in fields such as environmental science, urban planning, and geospatial technology.

Course Pre requisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Apply advanced spatial analysis techniques to analyze and interpret complex spatial patterns and relationships.	A
2	Process and interpret various types of remote sensing data for accurate land cover classification and change detection.	An
3	Create and analyze spatial models using GIS tools to simulate and understand complex spatial processes.	C
4	Develop and present interactive maps using web GIS technologies to effectively communicate geospatial information.	C

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓			✓			
CO 2				✓	✓		
CO 3				✓	✓		✓
CO 4				✓	✓	✓	
CO 5							

MODULE	UNIT	DESCRIPTION	HOURS

1	1	Introduction to Advanced Geospatial Techniques	8
	2	Spatial Data Management	
	3	GIS Modeling	
	4	Integrating Geospatial Techniques	
2	1	Raster surface preparation using various interpolation methods	8
	2	Density analysis	
	3	Hydrological analysis	
	4	Image Classification Techniques	
3			9
	1	Web GIS	
	2	3D data preparation	
	3	Build 3D earth model	
	4	Terrain analysis	
4			10
	1	Suitable site analysis	
	2	Weighted overlay analysis techniques	
	3	Network analysis	
	4	Change detection	
5	**Teacher Specific Module**		10
	Directions		
	A project file consisting of 5 exercises on using any GIS Software on above mentioned themes.		

Essential Readings:

1. M. Anji Reddy (2008) Textbook of Remote sensing and Geographical information systems, BS Publications, Hyderabad
2. Basudeb Bhatta (2021) Remote sensing and GIS, Oxford University Press, New Delhi Ian
3. Heywood et.al (2002) An Introduction to Geographical Information System, Pearson Education Private Limited, Delhi.
4. Kang Tsung Chang (2008) Introduction to Geographic Information Systems, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.
5. Loo C P and Albert K W Y (2004) Concepts and Techniques of Geographic Information Systems, Prentice Hall of India, New Delhi.

Suggested Readings:

1. Verbyla D. L. (2003) Practical GIS analysis. Taylor & Francis, London, 305
2. Mitchell, Andy (2001). ESRI Guide to GIS Analysis, Volume 1. Geographic Patterns & Relationships. ESRI Press
3. Lillisand, T.M. And P.W.Kiefer, 1986: Remote Sensing And Image Interpretation,John Wiley & Sons, New York.
4. Michael F. Goodchild (2009) Geographic information systems and science: today and tomorrow, Annals of GIS, 15:1, 3-9, DOI: 10.1080/19475680903250715.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper-1	
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Major Elective

Biogeography

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
V	DSE	300-399	KU5DSEGRS301		4	60
Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

Environmental and Biogeography provides a comprehensive foundation to navigate the dynamic interface between living organisms and their environment. This course integrates principles from ecology, climatology, and biogeography to elucidate the dynamic interactions shaping ecosystems and biodiversity patterns. Students will delve into the fundamental principles of ecology, examining the flow of energy and matter through ecosystems and the intricate web of interactions between organisms and their environment. In the realm of biogeography, students will explore the spatial patterns of biodiversity and the processes that shape them. The course will enable students to understand how factors such as climate, topography, and human activities influence biodiversity patterns and ecosystem dynamics across different spatial scales. This course delves into the pressing environmental challenges facing our planet, including habitat destruction, climate change, and species extinction. Students will critically evaluate strategies for conservation, sustainable resource management, and the restoration of degraded ecosystems, fostering an understanding of the complexities of environmental stewardship.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Detailed exposure of ecosystem and its geographical dimensions.	R
2	Appreciate the functionality of the bio geographical processes and biogeochemical cycles.	U
3	In-depth knowledge of human adaptation in various biomes.	A

4	Understand the factors affecting its distribution of flora and fauna and major environmental issues.	An
5	Critically evaluate the global and national level efforts to conserve biodiversity.	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1		✓					
CO 2	✓						
CO 3	✓						
CO 4			✓				
CO 5						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Ecosystem**	14
	1	Human-Environment Relationships: Historical Progression, Environment, Ecology and Ecosystem	
	2	Ecosystem: Concept, Structure and Functions	
	3	Introduction to Environmental Geography	
2		**Biogeographical Processes and Biogeochemical Cycles**	14
	1	Dispersal and Speciation; Ecological Succession and Extinction	
	2	Biogeochemical cycles	
	3	Factors influencing global distribution: Phyto-geographical realms and Zoogeographical realms	

3		**Human Environment Relationship and Contemporary Environmental Problems**	14
	1	Human life in different environmental regions: Mountain, desert, coastal	
	2	Major environmental issues in the world and India: Climate change, biodiversity loss, Pollution	
	3	Environmental movements in India: Western Ghat Conservation, Chipko Movement, Narmada Bachao Andolan	
4		**Biogeography**	14
	1	Definition, scope and significance of Biogeography; Basic Ecological Principles and Darwin's theory of Evolution	
	2	Ecotone and ecological niche, Concepts of Biome, distribution of flora and fauna	
	3	Bio-diversity- concept, Types, problems, Conservation measures; Biodiversity Hotspots in India	
5		**Teacher Specific Module**	
	Group wise documentary making on the theme 'Documenting Local Biodiversity and its Conservation'		4

Essential Readings:

1. Chandna R. C., 2002: Environmental Geography, Kalyani, Ludhiana.
2. Cunninghum W. P. and Cunninghum M. A., 2004: Principals of EnvironmentalScience: Inquiry andApplications, Tata Macgraw Hill, New Delhi.
3. Goudie A., 2001: The Nature of the Environment, Blackwell, Oxford.
4. Odum, E. P. et al, 2005: Fundamentals of Ecology, Ceneage Learning India.
5. Huggett, R.J. (1998). Fundamentals of Biogeography, USA: Routeldge
6. Lomolino, Mark. V., 2020, Biogeography: A Very Short Introduction,Oxford Publication, ISBN: 9780198850069
7. Cox, C.B, et.al, 2016, Biogeography: An Ecological and Evolutionary Approach, 9th Edition, Wiley-Blackwell.
8. Taylor, J.A., 2021, Themes in Biogeography, Routledge, Taylor andFrancis publications, ISBN 9780367351106

Suggested Readings:

1. MoEF, 2006: National Environmental Policy-2006, Ministry of Environment and Forests, Government of India.
2. Pielou, E.C., 1979, Biogeography, John Wiley & Sons, USA.10: 0471058459ISBN 13: 9780471058458
3. L.C Aggarwal, 2018, Biogeography, Rawat publication Jaipur

4. Mathur, H.S. (1998). Essentials of Biogeography. Jaipur, India: Anuj Printers.
5. Singh S., 1997: Environmental Geography, Prayag Pustak Bhawan. Allahabad.
6. UNEP, 2007: Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme

Assessment Rubrics:

	Evaluation Type	Marks
	End Semester Evaluation	**70**
	Continuous Evaluation	**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report- Documentary	10
	Total	**100**

Water Resource Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSE	300-399	KU5DSEGRS302	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

Water resource management is a crucial discipline that addresses the sustainable utilization, allocation, and conservation of water resources to meet the needs of both present and future generations. This signature course provides students with a comprehensive understanding of the principles, theories, and practices involved in the management of water systems at local, regional, and global scales. Through a blend of theoretical study, case analyses, and practical applications, students will explore the complexities of water governance, policy development, and integrated water resource management.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To appraise the significance of hydrology and to understand the complex water systems of the earth and to find solutions for water problems.	U
2	To know the water cycle and its relevance in the sustenance of water resources and to apply the water balance equation to various hydrological problems.	A
3	To analyse the nature of processes involved in surface and ground water systems.	An
4	To examine the impact of human activities on water resources and contributing to the water resource management of the area based on the analysis of hydrological data.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✔						
CO 2		✔			✔		
CO 3		✔	✔				
CO 4			✔			✔	✔

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Water resource management -Conceptual basis**	14
	1	Water – The environmental, technological of societal complexities system concepts in Hydrology	
	2	Scope of WRM, Sustainable water management and sustainable water development goals (SDG6).	
	3	Hydrological Cycle; systems concepts, lumped and distributed systems, deterministic and stochastic Systems,	
	4	Global Water Balance, Human impact on the hydrological cycle,	
2		**Surface and ground water resource**	14
	1	Surface Water Systems, Drainage Basin as Geohydrological unit	
	2	Springs Darcy's Law and elementary groundwater flow equation, ground water monitoring, groundwater resource estimation	
	3	Ground water - factors affecting groundwater- aquifers and their characteristics/classification, groundwater basins,	

3	**WRM- issues and challenges**		14
	1	Water use conflicts, water quality and major water pollutants (points and non-point source),	
	2	Water quality criteria analysis	
	3	Flood causes and types – flood frequency analysis, flood plain zoning, estimation of flood for different frequencies, flood forecasting,	
	4	Drought- causes and types, drought assessment and monitoring	
4	**Spatial Planning in India**		14
	1	Concept and Practice of Water Management- Approaches of Surface Water Management -	
	2	Traditional Water Harvesting, Storing and Management practices of water- world and in India.	
	3	Micro and Decentralized Planning in india, Rainwater Harvesting – Significance. Artificial groundwater recharge, Wetlands Management,	
	4	Disaster management , Watershed Based Planning, Government of India and State Government Initiatives for Water Management	
5	**Teacher Specific Module**		
	Directions		
	Prepare a field report on rain water harvesting system Calculate water balance of the locality Practice methods of Ground water estimation		4

Essential Readings:

1. Abbas, B.M. 1982. The Ganges Water Dispute, Vikas Publishing House Pvt. Ltd., New Delhi.
2. Aggarwal, A. 1991. Floods, Floodplains and Environmental Myths, Centre for Science and Environment, New Delhi.
3. Andrew, D. W. and Trimble, S. 2004. Environmental Hydrology, 2nd Edition, Lewis Publishers, CRC Press.
4. Beek, E., Loucks, P.D. 2005. Water Resource Systems Planning and Management: An Introduction to Methods, Models and Applications, UNESCO, Paris.
5. Bhattacharya, S.K. 1988. Urban Domestic Water Supply in Developing Countries, CBS Publishers, CR Distributors, Delhi.
6. Chow, V.T., Maidment, D.R. and Mays, W.L. (1988) Applied Hydrology, McGraw-Hill International Editions, McGraw-Hill Book Company, New York.
7. Chow V.T (2017) - Handbook of Applied Hydrology, Tata McGraw Hill, New Delhi
8. Jain, S.K., Aggarwal, P.K. and Singh, V.P. 2007. Hydrology and Water Resources of India,

   Springer, The Netherlands.
9. Jaya Rami Reddy (2011) A Textbook of Hydrology, University Science Press
10. Joseph Holden (2013) Water Resources-An Integrated Approach, Routledge
11. Karanth, K.R. 1988. Groundwater: Exploration, Assessment and Development, Tata-McGraw Hill, New Delhi.
12. Mahajan G. 1989. Evaluation and Development of Groundwater, Ashish Publishing House, New Delhi.

Suggested Readings:

1. Micklin, Philip, P. 1996. Man and the water cycle: Challenges for the 21st century, Geojournal, 39 (3): 285-298.
2. Mysooru R Yadupathu Putty (2013) Principles of Hydrology I.K. International, New Delhi, 2013
3. Pietro Laureano (2001) Water Conservation Techniques in Traditional Human Settlements, Copal Publishing House
4. Raghunath, H.M (1987) Groundwater, Wiley Eastern Ltd., New Delhi.
5. Raghunath H M, (2006) Hydrology Principles, Analysis and Design, New Age International

Assessment Rubrics:

Evaluation Type	Marks
End Semester Evaluation	**70**
Continuous Evaluation	**30**

a)	Test Paper- 1	10
b)	Test Paper-2	
c)	Assignment	
d)	Seminar	
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	20
Total		**100**

Regional Planning and Development

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSE	300-399	KU5DSEGRS303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description

This course provides theoretical and practical knowledge to students with a comprehensive understanding of regional planning, it encompassing its historical development of the concept of regional planning, diverse methodologies, and practical applications. Students engaging with regional development perspectives and evaluate the blockages such as ecological, economical and social. Analysis UrbanIndustrial Growth Pole Strategies and the Diffusion of Modernization. the Polarization and the Development of Underdevelopment. These provide an opportunity to the students understand and examine the various regional development theories. Neo-Populist Regional Development Strategies. Space and Explanation in Regional Development Theory. Provision for handling a real-world problems related to regional development and assess students' ability to apply their knowledge to solve the regional issues through proper planning principles.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	To appraise the significance of hydrology and to understand the complex water systems of the earth and to find solutions for water problems.	U
2	To know the water cycle and its relevance in the sustenance of water resources and to apply the water balance equation to various hydrological problems.	A
3	To analyse the nature of processes involved in surface and ground water systems.	An

4	To examine the impact of human activities on water resources and contributing to the water resource management of the area based on the analysis of hydrological data.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✔						
CO 2		✔			✔		
CO 3		✔	✔				
CO 4			✔			✔	✔

Module	**Unit**	**Content**	**Hrs** 60
I	**Foundations and Dimensions Regions and Regional Planning**		**10**
	1	Concept of region: Origin and development of regional studies, region in a Place, region as a place.	
	2	Foundations of Regional Studies: ecological foundations, economic foundations, social and cultural dimensions.	
	3	Functional and Formal Regions, Techniques of Regional Delimitation.	
	4	Regional Planning: Principles and Typology.	
II	**Theories in Regional Development**		**15**
	5	Regional Organization of Space: regional consciousness and identity, region and political life Economic Systems: Types and Nature	
	6	Theories: Classical theory of Economic Development.	
	7	Marxian Theory of Economic Development, Schumpeterian Theory of Economic Development, Rostow‘s Stages of Economic Growth,	
	8	Myrdal Theories of Circular Causation, Leontief-Input Output Model, Francis Perroux – Growth Pole Theory,	
	9	Theory of Balanced and Unbalanced Growth, J. Friedmann - Core Peripheral model and R.P. Mishra‘s Growth Foci Theory.	
III	**Strategies and adaptation for Sustainable Regional Development**		10
	10	Modern Regional Developmental thoughts: Hardin's model, ―the tragedy of the commons‖,	

	11	Theory of limits to Growth and Beyond the Limits.	
	12	The Environment and Development: Sustainable development, historical development, Policies, ,	
	13	Environmental Impact Assessment (EIA), Green Economy, Ecosystem valuation methods	
	14	Environmental committees, Millennium Development Goals and Global treatise	
IV	**Regional Imbalance and human development inequalities**		**15**
	15	Concept of Regional inequalities; Obstacles of Regional Imbalance, Factors of Regional Imbalance,	

	16	Characteristics of Underdeveloped Regions, Vicious Cycle of Poverty,.	
	17	The dependency theory of under Development	
	18	Measures and indexes for regional development: GDP, HDI,	
	19	Measures and indexes for regional development GDI, MPI, EPI and GHI.	
	20	History of Planning Programs in India:	
	21	Five-year plans in India,	
	22	NITI Aayog, and Studies in Regional Imbalances and methods of regionalization in India.	
V	**Practicum of Regional Planning:**		10
	1	Preparation of location specific master plan for Regional Development, Micro watershed plan preparation for any nearby local bodies, Drafting Regional Imbalances assessment report of any developmental issues.	
	2	evaluation of EIA and ESV in the particular issues at Local level, Students organizes seminar and workshop at college level in the topics regional development.	
	3	Project:	

Assessment Rubrics:

	Evaluation Type	Marks
	End Semester Evaluation	**70**
	Continuous Evaluation	**30**
a)	Test Paper- 1	
b)	Test Paper-2	
c)	Assignment- Project Report	20
d)	Seminar	
e)	Book/ Article Review	
f)	Viva-Voce	10
g)	Field Report	
	Total	**100**

Soil Geography

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
V	DSE	300-399	KU5DSEGRS304	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

This course provides an in-depth exploration of soil geography, emphasizing its formation, classification, properties, and management. It covers fundamental soil processes, the role of environmental factors in soil development, and regional soil characteristics. The course also examines soil resource utilization, degradation, and conservation strategies, equipping students with the theoretical and applied knowledge required for sustainable soil management.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand fundamental concepts of soil geography	U
2	Apply soil classification and analysis techniques	A
3	Analyze soil properties and their spatial patterns	An
4	Evaluate soil resource management strategies	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create(C)*

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✔						
CO 2		✔			✔		
CO 3		✔	✔				
CO 4			✔			✔	✔

Mapping of Course Outcomes to PSOs

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Basics of Soil Geography**	12
	1	Definition, Nature and Scope of Soil Geography	
	2	History of Soil Geography and Pedology	
	3	Significance of Soil Geography	
2		**Soils: Formation and Properties**	14
	1	Jenny's Factorial Model of Soil Formation: Parent Material, Biotic, Climatic, Relief and Time factor.	
	2	Process of Soil Formation: Physical, Biotic and Chemical.	
	3	Physical Properties of Soils: Morphology, Texture, Structure, Water, Air and Temperature.	
	4	Chemical Properties of Soils: PH , Organic Matter, NPK (Nitrogen, Phosphorous and Potassium).	
3		**Characteristics, Classifications, Distribution**	14
	1	Soil water balance and Soil Profile	
	2	Soil Analysis: Saline and Alkaline, Vermicomposting Process	
	3	Genetic Classification of Soils- USDA Soil Taxonomy	
	4	ICAR Classification and Distribution of Major Soils in India	
4		**Soil Resource Management**	12
	1	Utilization of soil resource	
	2	Soil Degradation: Concept, Causes, consequences	
	3	Soil erosion, estimation of soil losses	
	4	Treatment and management of soil resource	

	Teacher Specific Module	
	Directions	
5	Practical Exercise: • Draw Soil Profile of local area • Calculate soil properties with soil meter: pH, light, moisture • Calculate NPK soil properties of local area.	8

Essential Readings:

1. Backman, H.O and Brady, N.C.(1960.)The Nature and Properties of Soils, Mc Millan NewYork.
2. Bennet, Hugh H.: Soil Conservation, McGraw Hill, New York.
3. Bunting, B.T.(1973) The Geography of Soils, Hutchinson, London.
4. Clarke G.R.(1957) Study of the Soil in the Field, Oxford University Press, Oxford.
5. Daji, J. A., (1970): A Text Book of Soil Science, Asia Publishing House, Londaon.
6. Foth H.D. and Turk, L.M.(9172) Fundamentals of Soil science, John Wiley, New York. 8.
7. Govinda Rajan, S.V. and Gopala Rao, H.G.(9178) Studies on Soils of India Vikas, New Delhi.
8. Morgan, R. P. C., (1995): Soil Erosion and Conservation, 2nd edition, Longman, London.
9. Plaster, E. J., (2009): Soil Science and Management, Cengage Learning, Boston.
10. Raychoudhuri, S.P., (1958): Soils of India, ICAR, New Delhi.
11. Russell, Sir Edward J.:(1961) Soil Conditions and Plant Growth, Wiley, New York.
12. Sarkar, D., (2003): Fundamentals and Applications of Pedology, Kalyani Publishers, New Delhi.

Suggested Readings:

1. Chairas, D. D., Reganold, J. P., and Owen, O. S., (2002): National Resource Conservation and Management for a Sustainable Feture, 8th edition, Prentice Hall, Englewood Cliffs.
2. Mathur, Neeru, (2012): Soils, Rajat Publications, New Delhi-02 (India).
3. Mc. Bride, M.B.(1999) Environmental Chemistry of Soils, Oxford University Press, New York.
4. Nye, P.H. and Greene, D.J.(1960)The Soil under Shifting Cultivation Commonwealth Bureau of Soil Science, Technical Communication, No. 51; Harpender, England.
5. Sehgal, J., (1996): Pedology: Concepts and Applications, Kalyani Publishers, New Delhi.

Assessment Rubrics:

	Evaluation Type	Marks
	End Semester Evaluation	**70**
	Continuous Evaluation	**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	
e)	Book/Article Review	10
f)	Viva-Voce	
g)	Field Report	
	Total	**100**

Geoinformatics for Urban Planning

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSE	300-399	KU6DSEGRS305	4	75

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	35	65	100	1,5

Course Description	This course introduces the fundamental concepts, tools, and applications of Geoinformatics (GIS and Remote Sensing) in urban planning. It focuses on spatial data handling, mapping, analysis, and interpretation for urban environments. Students will learn how geospatial technologies support urban land use planning, infrastructure development, environmental management, and smart city initiatives using simple and practical approaches.

Course Outcomes

CO No.	Course Outcome	Learning Domains
CO1	Understand the basic concepts of GIS and Remote Sensing in urban planning	
CO2	Identify and use spatial data for urban analysis	
CO3	Perform basic mapping and visualization using GIS tools	

CO4	Analyze urban growth, land use, and infrastructure using geospatial techniques	
CO5	Apply GIS and Remote Sensing for real-world urban planning problems	

Course Pre-requisite

Sl. No.	Pre-requisite
1	Basic knowledge of Geography
2	Fundamentals of Maps and Cartography
3	Introductory knowledge of GIS (desirable but not mandatory)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1							
CO 2							
CO 3							

Contents for Classroom Transaction

Module	Sl.No.	Unit	Hours
1: Introduction to Geoinformatics and Urban Planning	1	Basics of Geoinformatics: GIS, Remote Sensing, GPS	9
	2	Role of GIS in Urban Planning	
	3	Types of Spatial Data: Raster and Vector	
	4	Urban systems, structure, and planning concepts	
2: GIS Data and Mapping Techniques	1	Data sources: Satellite data, Census data, Open data (OSM)	12
	2	Map projections and coordinate systems	
	3	Data input, editing, and attribute management	
	4	Thematic mapping: Land use, population, infrastructure	

3: Remote Sensing in Urban Analysis	1	Basics of satellite imagery and sensors	12
	2	Image interpretation: visual and digital techniques	
	3	Urban land use/land cover classification	
	4	Change detection and urban growth analysis	
4: Applications in Urban Planning	1	Urban sprawl and land use analysis	12
	2	Site suitability analysis	
	3	Transportation and infrastructure planning	
	4	Smart cities and geospatial technologies	
5: Practical	1	Introduction to GIS software such as QGIS / ArcGIS	30
	2	Georeferencing and digitization	
	3	Preparation of urban land use map	
	4	Basic spatial analysis (buffer, overlay, query)	

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			75	Practical			25	100
a)	ESE		50	a)	ESE		15	
b)	CCA		25	b)	CCA		10	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/Book Article	10		ii	Skill	4	
		review						
	iii	Seminar/Viva-Voce	5		iii	Record	3	

Essential References

1. Burrough, P. A., McDonnell, R. A., & Lloyd, C. D. (2015). Principles of geographical information systems (3rd ed.). Oxford University Press.
https://global.oup.com/academic/product/principles-of-geographical-information-systems9780198742845
2. Longley, P. A., Goodchild, M. F., Maguire, D. J., & Rhind, D. W. (2015). Geographic information science and systems (4th ed.). Wiley.
https://www.wiley.com/en-us/Geographic+Information+Science+and+Systems%2C+4th+Edition-p9781118676950
3. Lillesand, T., Kiefer, R. W., & Chipman, J. (2015). Remote sensing and image interpretation (7th ed.). Wiley.

https://www.wiley.com/en-us/Remote+Sensing+and+Image+Interpretation%2C+7th+Edition-p9781118343289
4. QGIS Development Team. (2024). QGIS Geographic Information System. Open Source Geospatial Foundation. https://qgis.org
5. United Nations Human Settlements Programme (UN-Habitat). (2020). Urban planning and design for sustainable development. https://unhabitat.org
6. Chang, K. T. (2019). Introduction to geographic information systems (9th ed.). McGraw-Hill Education. https://www.mheducation.com/highered/product/introduction-geographic-information-systemschang/M9781259916830.html
7. De Smith, M. J., Goodchild, M. F., & Longley, P. A. (2020). Geospatial analysis: A comprehensive guide to principles, techniques and software tools (6th ed.). The Winchelsea Press. https://www.spatialanalysisonline.com
8. Campbell, J. B., & Wynne, R. H. (2011). Introduction to remote sensing (5th ed.). Guilford Press. https://www.guilford.com/books/Introduction-to-Remote-Sensing/Campbell-Wynne/9781609181765
9. European Commission, Joint Research Centre. (2023). Global Human Settlement Layer (GHSL) user guide. https://ghsl.jrc.ec.europa.eu
10. ed Nations. (2019). World urbanization prospects: The 2018 revision. https://population.un.org/wup/
11. Natural Earth. (2024). Free vector and raster map data. https://www.naturalearthdata.com

Suggested References

1. Jensen, J. R. (2016). Introductory digital image processing: A remote sensing perspective (4th ed.). Pearson. https://www.pearson.com
2. Heywood, I., Cornelius, S., & Carver, S. (2011). An introduction to geographical information systems (4th ed.). Pearson. https://www.pearson.com
3. ESRI. (2024). GIS for urban and regional planning. https://www.esri.com/en-us/industries/planning/overview
4. OpenStreetMap Contributors. (2024). OpenStreetMap. https://www.openstreetmap.org
5. European Space Agency (ESA). (2023). Remote sensing for urban applications. https://www.esa.int
6. Foody, G. M. (2020). Explaining the unsuitability of the kappa coefficient in the assessment and comparison of the accuracy of thematic maps. Remote Sensing of Environment, 239, 111630. https://doi.org/10.1016/j.rse.2019.111630
7. Weng, Q. (2014). Global urban monitoring and assessment through Earth observation. CRC Press. https://www.routledge.com
8. Batty, M. (2013). The new science of cities. MIT Press. https://mitpress.mit.edu/9780262533874/the-new-science-of-cities/
9. Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. GeoJournal, 69(4), 211–221. https://doi.org/10.1007/s10708-007-9111-y
10. Google Earth Engine Team. (2024). Google Earth Engine documentation. https://developers.google.com/earth-engine
11. NASA. (2023). Earth observation data for urban studies. https://earthdata.nasa.gov
12. World Bank. (2020). Urban development and geospatial analysis. https://www.worldbank.org/en/topic/urbandevelopment

Geographical Thought

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSE	300-399	KU6DSEGRS306	4	60

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

The course enables students to explore how geographical thought has developed over time, from ancient civilizations to the present day. It introduces key concepts, methodologies, and debates that have influenced geographical thinking, such as environmental determinism, possibilism, positivism, radicalism etc. Moreover, students will critically analyze the contributions of prominent geographers and philosophers to the field, considering their impacts on societal perceptions of space, place, and landscape. By tracing the historical and philosophical roots of geographical thought, students will gain a deeper understanding of the complexities inherent in the study of geography and its relevance to contemporary global challenges.

Course Prerequisite : NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	In depth understanding about the evolution of geographical thought	U
2	Detailed knowledge about the paradigms and debates in the geographical studies.	A
3	Understanding of emerging traditions and practices in geography	An
4	Critically appreciate how the past shaped the present of geography	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1		✓					
CO 2	✓						
CO 3			✓				
CO 4						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1		**Paradigms in Geography**	14
	1	Definition, Nature and Traditions in Geography	
	2	Place of Geography in Classification of the Sciences	
	3	Paradigmatic Shifts (as per Kuhn's Model)	

	4	Major Paradigms in Geography (Spatial, Regional & Environmentalism)	
2	**Geography during the Pre-Modern Period**		14
	1	Classical Philosophies: Greek and Roman School	
	2	Medieval Period: Arab and Chinese School	
	3	Indian Geographical Traditions	
	4	Age of Discovery and its Impact	
3	**Modern Geographical Thought**		14
	1	Disciplinary Trends in Germany	
	2	French Geographical School	
	3	Geography in Britain	
	4	Development of Geography in USA	
4	**Contemporary Trends in Geography**		14
	1	Quantitative Revolution & System's Approach	
	2	Behaviouralism and Humanism	
	3	Radicalism and Feminism	
	4	Post-modernism and post-colonialism	
5	**Teacher Specific Module**		4
	Reading and reviewing academic book		
	Stage any dramatic movement in the history of geographical thought (eg. Schaefer-Hartshorne Debate and the Quantitative revolution; Age of discovery and voyages; environmental determinism versus possibilism)		

Essential Readings:

1. Cresswell, T. (2024). Geographic thought: a critical introduction. John Wiley & Sons.
2. Holt-Jenson, A. (2011), Geography: History and Concepts: A Students Guide, Sage.
3. Dikshit, R.D. (1997), Geographical Thought: A Contextual History of Ideas, Prentice Hall of India.
4. Nayak, A., & Jeffrey, A. (2013). Geographical thought: An introduction to ideas in human geography. Routledge.
5. Martin, G. J. (2005). All possible worlds: A history of geographical ideas. OUP Catalogue.
6. Sudeepta, A. (2015). Fundamentals of Geographical Thought. Delhi, India: Orient Black Swan private limited.
7. Thakur, B. (1994) Indian Geography: Development, Trends and Prospects, Trans. Inst. Indian Geographers, 16(1): 67-85.

8. Singh, R.S. (2009). Indian Geography: Perspectives, Concerns & Issues, Rawat Publications.

Suggested Readings:

1. Pauline Couper (2015) A Student's Introduction to Geographical Thought; SAGE Publications.
2. Arentsen M., Stam R. and Thuijis R., 2000: Post-modern Approaches to Space, ebook.
3. Bhat, L.S. (2009) Geography in India (Selected Themes). Pearson
4. Hartshone R., 1959: Perspectives of Nature of Geography, Rand MacNally and Co.
5. Johnston R. J., (Ed.): Dictionary of Human Geography, Routledge.
6. Soja, Edward 1989. Post-modern Geographies, Verso, London. Reprinted 1997: Rawat Publ., Jaipur and New Delhi.
7. Dikshit, K.R. (2006). "The Changing Western Perspective on geography and the Indian Context", Transactions, Institute of Indian Geographers, 28 (2): 123-155.
8. Dikshit, R.D. (2001). "Indian geography: An encounter with reality", Transactions, Institute of Indian Geographers, 23 (1 & 2).
9. Kumar, B. (2022) Geography: Paradigm and Contemporary Development, Ghaziabad: Globe Publishing House

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	
e)	Book/Article Review	10
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Geography of Tourism

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSE	300-399	KU6DSEGRS307	4	60

Learning Approach (Hours/Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

The course "Geography of Tourism" explores the relationship between tourism and geography, focusing on the spatial aspects of tourism development, destinations, and impacts. It examines how geographical factors shape and influence tourism activities, patterns, and experiences around the world.

Course Pre-requisite : NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the significance of tourism as a human expression in spatial context.	U

2	Evaluate the significance of tourism in the cultural, social, economic and environmental milieu of geographic spaces.	A
3	Analyse various types of tourism and their geo-backup	An
4	Examine the spatial dimensions of tourism attractions at national and international level	E
5	Evaluation of emerging tourist research paradigms and tourism planning	E

Remember(R), Understand(U), Apply(A), Analyse(An), Evaluate(E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓	✓					
CO 2		✓					
CO 3		✓	✓				
CO 4		✓					
CO 5							✓

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction**	14
	1	Tourism – Concept, nature, scope, and importance	
	2	Components of tourism – approaches to the study of tourism	
	3	Significance of tourism in social, cultural and economic realms	
	4	Tourism and resources: water, climate, natural and cultural landscape and Wildlife resources	
2		**Factors affecting Tourism**	14
	1	Factors influencing the growth of tourism – Infrastructure and support systems	
	2	Concepts of mobility and spatialities in tourism, tourism fluxes	
	3	Cultural geography of tourism and leisure, Gender differences in Leisure	
	4	Place marketing and place formation- Spatial tradition of mobility, Time space Geography, Tourism Area Life Cycle	
3		**Types of Tourism**	14
	1	Types of Tourism -Eco-tourism, green tourism, Heritage tourism, Adventure tourism, Monsoon tourism, Niche tourism and medical tourism	
	2	Participation and community-based tourism, Responsible tourism, rural tourism and Urban tourism	
	3	Social, cultural and Economic significance of tourism, Multiplier effect on the economy - Impact of tourism on environment, carrying capacity and tourism development.	
	4	Climate change and tourism	

4	**Tourism Dynamisms**		14
	1	Global tourism flows – Distance decay and power curves, spatial dimensions of tourism attractions at national and international level	
	2	Major natural and cultural attractions in India with special reference to Kerala	
	3	Growth and development of tourism in spatio-temporal context Problems and prospects of Tourism in India, National Tourism Policy	
	4	Tourist Research Paradigms, Tourism-energy model, Tourism planning –Application of Geospatial Technology in tourism planning and modelling – Case studies	
5	**Teacher Specific Module**		4
	Data sources for tourism- local, district, state and national		
	Field work- identify tourism potential of a locality		

Essential Readings:

1. Krishan K Kamra Mohinder Chand, (2006), Basics of Tourism Theory, Operation and Practice, Kanishka Publishers
2. Naveen Kumar, (2018), Global Tourism Policies, Laws and Action Plans, Paradise Press, New Delhi
3. Arpita Mathur,2019, Fundamentals of Travel and Tourism, Ane Books Pvt.Ltd
4. Sampad Kumar Swain, Jitendra Mohan Mishra, (2012), Tourism Principles and Practices, Oxford University Press, New Delhi
5. Guptajit Pathak, (2015), Tourism in India Continuity, Development, Challenges and Issues, Avon Publications, New Delhi.

Suggested Readings:

1. R.K. Goswami, (2007), Tourism and Environment, Cybertech Publications,New Delhi
2. Julie Wilson, (2012), The Routledge Handbook of Tourism Geographies, Routledge Publishers
3. Bhatia A K (1996), Tourism Development, Principles and Practices, SterlingPublishers
4. Kennell, J., 2016. Carrying capacity. In Encyclopedia of Tourism (pp. 133-135) Springer International Publishing

- Assessment Rubrics:

	Evaluation Type	Marks
	End Semester Evaluation	**70**
	Continuous Evaluation	**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	10
Total		**100**

Population Dynamics and Application of GIS

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
VI	DSE	300-399	KU6DSEGRS308		4	60
Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE(Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

This course introduces students to the scope, concepts, and methods of Population Geography. It examines population distribution, structure, dynamics, and theories while situating them in both historical and contemporary contexts. Special attention is given to India's demographic data sources and to the use of GIS in population studies.

Course Pre-requisite: Nil

Course Outcomes:

CO No	Expected Outcome	Learning Domains
1	The students would get an understanding of the distribution and trends of population growth in the developed and less developed countries, along with population theories.	U
2	The students would get an understanding of the dynamics of the population.	An
3	An Understanding of the implications of population composition in different regions of the world.	E

4	Learn the basic mapping techniques to deal with Distribution, Density and Concentration of Population data.	An

Remember(R), Understand (U), Apply(A), Analyse(An), Evaluate(E), Create(C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓						
CO 2		✓					
CO 3			✓				
CO 4						✓	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction**	10
	1	Nature and Scope of Population Geography	
	2	History of Population Geography	
	3	Recent Trends in Population Geography	
	4	Sources of Population Data with special References to India: Census, Vital Statistics and Sample Survey	
2		**Population Dynamics**	15
	1	World population: growth and spatial pattern	
	2	Attributes of population- age-sex composition	
	3	Determinants of fertility and mortality	
	4	Migration – Types and Determinants	
		Population Theories	
3	1	Malthusian Theory	15
	2	Concept of Optimal Population	
	3	Demographic Transition Theory	

	4	Neo-Malthusianism	
4	**Contemporary Population Issues and Applications of GIS in Population Geography**		15
	1	Demographic Dividends- Opportunities and Challenges	
	2	Ageing of Population	
	3	Global Refugee Crisis	
	4	Applications of GIS in Population Studies	
5	**Teacher Specific Module**		
	Directions		
	Discussion on Spatial Analysis of Population Attributes. Demonstrate thematic layering for population data using GIS Software. Students create thematic maps from India Census data.		5

Essential Readings:

1. Bhende A. and Kanitkar T. (2019). Principles of Population Studies. Himalaya Publishing House, New Delhi, India.
2. Chandna, R.C. (2017). Geography of Population. Kalyani Publishers, Ludhiana, India.
3. Clarks, John, I. (1972). Population Geography. Pergamon Press, New York.
4. Hassan M.I. (2020). Population Geography, A Systematic Exposition. Routledge Taylor and Francis Group, New York.
5. Lutz, W., Warren, C. S. and Scherbov, S. (2004). The End of the World Population Growth in the 21st Century. UK: Earthscan.

Suggested Readings:

1. Majumdar, P.K. (2010). Fundamentals of Demography. Rawat publications, Jaipur.
2. Newbold, K. B. (2017). Population Geography: Tools and Issues. Rowman and Littlefield Publishers,NY, USA.
3. Week, John R. (2020) Population: An Introduction to Concepts and Issues. Cengage Learning, Boston.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper - 1	10
b)	Test Paper - 2	
c)	Assignment	10
d)	Seminar	10
e)	Book/Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Geo-Statistics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VII	DSC	400-499	KU7DSCGRS405	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	0	30	70	100	2

Course Description:

In a time where every decision is data driven, immense opportunities rest with academia to explore, assess the real ground situations its trajectories and predictions and way forward. The course just meant to do the same, and in process equip the students with the latest in the segment of data analysis in a geographical perspective.

Course Prerequisite: Basic statistics knowledge at plus two level.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Introduce basic idea of Geo-statistics	U
2	Demonstrate how Data analytical skills are used in domain of Geography.	An

3	Awareness about latest and tested statistical methods and its application.	A
4	Equipping the students with quantitative skills for advanced research in geography	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Introduction to Geo-Statistics**	14
	1	Scope and significance of Geo-Statistics in research	
	2	Application of Univariate Statistics:. Measures tools of Location and Spread. Univariate Plots: Histogram, Probability Density Function (PDF), Cumulative Density Function (CDF). Types of Distribution: Parametric: Normal (Gaussian), Log-Normal, Non-Parametric.	
	3	Application of Bivariate Statistics: Bivariate Data Display: Scatterplot or Cross plot, Bivariate Measures (Covariance, Correlation Coefficient). Bi-variate & Multiple correlation and regression,	
	4	Correlation analysis Scatter Diagram & Residual mapping, T-test, Z-Score, Root Mean Square Error, Principal Component analysis.	
2		**Characterization of Spatial process**	14
	1	**Surface Modelling:1** Spatial autocorrelation, Role of Interpolation, Methods of Interpolation – Global and Local Deterministic Methods.	
	2	**Surface Modelling:2** Moving Averages, Inverse Distance Weighted Interpolation, Thiessen polygons, Optimal Interpolation using Geo-statistics	
	3	**Variogram and covariance.** Understanding of semi variogram: Components, types and functions. **Variogram and its use for Interpolation**, Interpolation by Kriging – Ordinary Kriging, Block Kriging, Non-Linear Kriging, Stratified Kriging, Co-Kriging, Universal Kriging, Probabilistic Kriging	
3		**Introducing Statistical Software**	14
	1	SPSS Package or R	
	2	Comparison between Excel and SPSS Package/ R	
	3	Comparison between SPSS and R software	
	4	Geo-statistics into GIS	
		Use of Factor and cluster analysis in geographical research	
	1	**Factor analysis.1** Introduction and conceptual framework Factor Analysis using SPSS and Arc-	

4		Gis/ Q-GIS	14
	2	**Factor analysis.2** Assumptions and axioms Factor Analysis using SPSS and Arc-Gis/ Q-GIS	
	3	**Cluster analysis. 1** Introduction and conceptual framework Cluster anlysis using Arc Gis/Q-GIS	
	4	**Cluster analysis. 2** Assumptions and axioms Cluster anlysis using Arc Gis/Q-GIS	
5		**Geostatistics for Disaster Management:**	
		Landslide Susceptibility Modeling - Bi-Variate Statistical Methods: Probabilistic Likelihood Analysis (Frequency Ratio, Information Value Method, Weights of Evidence Method. Multivariant Methods: Multiple logical Regression, Discriminant analysis.	4
		Field Visit to nearby landslide prone/Affected area, report drafting.	

Essential Readings:

1. SALKIND N J and FREY B B. *Statistics for Those Who Think They Hate Statistics*. 7th ed. Sage Publishers, 2019 ISBN: 978-1-5443-9339-1.
2. WEBSTER, R. and M. A. OLIVER. *Geostatistics for environmental scientists*. 2nd ed. Chichester: John Wiley & Sons, 2007, xii, 315. ISBN 9780470028582.
3. DE SMITH, Michael John, Michael F. GOODCHILD and Paul LONGLEY. *Geospatial analysis : a comprehensive guide to principles, techniques and software tools*. 2nd ed. Leicester: Metador, 2007, xxii, 491. ISBN 9781906221980.
4. BORROUGH, P.A., McDONNELL, R.,A (1988): Principles of Geographical Information Systems. Oxford University Press, Oxford, 333s.
5. MCKILLUP, Steve and M. Darby DYAR. *Geostatistics explained : an introductory guide for earth scientists*. 1st pub. Cambridge: Cambridge University Press, 2010, xvi, 396. ISBN 9780521746564.

Assessment Rubrics:

	Evaluation Type	**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	10
b)	Test Paper-2	
c)	Assignment	20
d)	Seminar	
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**
