GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil Engineering

Course / Subject Code: ME01065021

Course / Subject Name : Geoinformatics in Civil Engineering

w. e. f. Academic Year:	2024-2025
Semester:	1st Semester
Category of the Course:	PCC

Prerequisite:	Elementary knowledge of Remote sensing & GIS concepts and its application.
Rationale:	The students will get equipped with understanding of various topics viz; image processing, layer creation. Students are introduced with application of GIS in Civil engineering field.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Observe, Identify and define simple/ complex problems of day to day lives present in Industry/ Society where GIS and Remote Sensing applications can be useful.	R,U
02	Apply knowledge of basic image interpretation and data image processing.	U
03	Integrate the existing data through various observations from various angles and layer creation.	A,N,C
04	Apply problem-solving methodologies to generate, evaluate and justify innovative solutions by designing and conducting/ analyzing and interpreting the data.	A,N
05	Demonstrate the ability to give solutions with an ability which can help communicate effectively for giving better interpretation and solutions	N,E

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Remote Sensing and its application – Energy sources and Radiation principles, Energy equation, EMR and Spectrum, EMR interaction with Atmosphere scattering, Absorption, EMR interaction with earth surface features reflection, absorption, emission and transmission, Spectral response pattern , vegetation, soil, water bodies- Spectral reflectance	8	20
2.	GIS and its application – Geographical Concepts and Terminology, Difference between Image Processing System and Geographic Information System (GIS), utility of GIS, various GIS packages and their salient features, Essential components of a GIS.	10	25
3.	GPS and its application - Introduction to Global Navigation Satellite System, Introduction to GPS, GPS Segments: Space, Control and User segments. GPS principles, receiver types and positioning techniques GPS applications in Transportation Engineering: Intelligent Transport System, Mass transport system and location based services. GPS applications in Construction Management: Location based material and equipment management	8	20
4.	Data Acquisition - Digital Image interpretation, Pattern recognition, shape analysis, Textural analysis, Decision concepts, fuzzy sets and Evidential reasoning, Change detection, multi temporal data merging, multi sensor image merging merging image data with ancillary data, Expert system, Artificial Neural Network; Integration with GIS. Scanners and Digitizers, Method of Digitization, Raster and Vector Data, Data Storage, Verification and Edition. Data Preprocessing; Format Conversion, Data Compression, Data Reduction and Generalization, Run Length Coding, Merging, Edge Matching, Rectification and Registration, Interpolation.	10	20
5.	Data Analysis in Geo-informatics - Hierarchical Data, Network Systems, Relation Database, Data Management – Conventional Database Management System, Spatial Database Management, Reclassification and Aggregation, geometric and Spatial Operations on Data Measurement and Statistical Modeling. Data Output – Types of Output. Application of GIS in various Natural Resources Mapping & Monitoring, Engineering Application	12	15

	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**20**	**20**	**20**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
(a) Books:

1. A. M. Chandra and S. K. Gosh. Remote Sensing and GIS, Narosa Publishing Home, NewDelhi 2009.
2. B. Bhatta, "Remote Sensing and GIS", Oxford University Press, New Delhi.
3. Dr. Chandra A. M.," Remote Sensing and GIS",Narosa Publishers, New Delhi.
4. George Joseph, Fundamentals of Remote Sensing, Universities Press, Hyderabad 2005.
5. M. Anji Reddy, Text book of Remote Sensing and Geographical Information systems, BS Publications, Hyderabad. 2011.ISBN: 81-7800-112-8
6. Manual of Remote Sensing Vol. 2, American Society of Photo Grammetry and Remote Sensing.
7. P.A.Borough,"*PrinciplesofGeographicinformationSystemsforLandResourcesAssessment* ",Oxford University Press, 1986.
8. Stan Aronoff, "Geographic Information Systems: A Management Perspective", WDL Publicat ions,1991.
9. Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W.Chipman, Remote Sensing and image interpretation, John Wiley & Sons, 2008.

(b) Open source software and website:
QGIS

Suggested Course Practical List: If any

1. Projection and Re-projection Of Image
2. Geo referencing and Image Registration
3. Digitization of Map , Map preparation
4. Working with tables, Attribute Querying , Spatial Querying
5. Basic Raster Analysis and Styling
6. Raster Mosaicking and Clipping

7. Working with terrain Data
8. Watershed Delineation

List of Laboratory/Learning Resources Required:

1. GIS software
2. Image processing Software

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