GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING
SUBJECT NAME: APPLICATION OF GEOINFORMATICS IN CIVIL ENGINEERING
SUBJECT CODE: 2170606
B.E. 7th SEMESTER

Type of course: Remote Sensing and Geographical Information System

Prerequisite: Basic knowledge of surveying, computer and its peripherals, Fundamentals of Photogrammetry, Remote Sensing, GPS and GIS.

Rationale: (1) To develop understanding about Photogrammetry, remote sensing system, Global Navigation Satellite System (GNSS) and GIS.
(2) To enable students to make measurements using photogrammetric technique, to carryout analysis of remotely sensed data and extract information from it.
(3) To enable students conversant with data collection using GNSS systems and Differential GPS.
(4) To enable students prepare thematic maps and carryout analysis using GIS technique.
(5) To enable students learn different applications of Photogrammetry, remote sensing system, Global Navigation Satellite System (GNSS) and GIS.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightag
1	**INTRODUCTION:** Introduction to geo-informatics. Conventional methods of mapping. Advanced methods of mapping. Comparison of methods.	6	10
2	**AERIAL PHHOTOGRAMMETRY:** Development and classification of Photogrammetry, Aerial Photogrammetric processes: acquisition of data, classification of photographs, photographic scale, relief displacement, flight planning, stereo Photogrammetry, Stereo model compilation, principal and use of stereoscopic 3D view and parallax bar, Ortho-rectification, Orientation and triangulation, DEM Generation.	8	15

3	**REMOTE SENSING:** Introduction to Electromagnetic Spectrum (EMR), interaction of EMR with atmosphere and target, Resolutions: Spatial, temporal, spectral and radiometric, sensor characteristics, satellite data products, digital imaging, digital image processing, visual image interpretation, digital image interpretation. microwave remote sensing.	11	20
4	**GNSS and SCANNERS:** Global Navigation Satellite System (GNSS) basic concepts, GPS (NAVSTAR), Galileo, GLONASS and Indian Regional Navigation Satellite System (IRNSS). Functional segments of GPS and components. Working principle, factors affecting, GPS setup and accessories, satellites & receivers, Differential GPS (DGPS), Applications of GNSS. Scanners: Introduction, Classification, Principle and Application.	9	20
5	**GIS:** Structure of GIS: Cartography, Geographic mapping process, GIS data models, database management systems, Raster data representation, Vector data representation, transformations, map projections, Geographic Data Representation, Storage, Quality and Standards, Assessment of data quality, Managing data errors, Geographic data standards. GIS Data Processing, Analysis and Modeling: Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation–Quadrant counts, and nearest neighbor analysis – Network analysis – Surface modeling – DEM.	11	20
6	**APPLICATION of GEOINFORMATICS:** Case studies of applications of geo-informatics to following areas: a. Environment. b. Water Resources. c. Transportation. d. Town Planning. e. Geology. f. Disaster Management. g. Mapping.	8	15
	TOTAL	53	100

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**20**	**20**	**15**	**15**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. B. Bhatta, Remote Sensing and GIS, 2nd Edition, Oxford University Press, New Delhi
2. J.R. Jensen, Introductory Digital Image Processing, Prentice-Hall, New Jersey
3. J.R. Jensen, Remote Sensing of Environment: An Earth Perspective, Pearson Education, Delhi, 2004
4. P.A. Burrough and R.A. McDonnell, Principles of Geographical Information Systems, 2nd ed. Oxford, England, Oxford University Press.
5. T.M. Lillesand, R.W. Kiefer and J.W. Chipman, Remote Sensing and Image Interpretation, 5th edition, John Wiley and Sons, India
6. George Joseph, Fundamentals of Remote Sensing, Universities Press, India, 2005

Course Outcome:

After learning the course the students should be able to:

1. Ability to develop Orthographic and Contour maps using aerial photographs and Remote sensing Images
2. Ability to develop maps using Total Station, GIS, GPS and Scanners
3. Ability to create GIS application referencing Spatial features with Attribute data

List of Experiments/Tutorials:

1. Photo interpretation and Photogrammetry
2. Image Registration and Georeferencing
3. Image Interpretation
4. Image classification
5. Application of GIS and GPS
6. Creation of thematic maps
7. Overlay analysis
8. Digital Elevation Modeling
9. Geospatial analysis and Map based Queries

Design based Problems (DP)/Open Ended Problem:

Faculty may give any open ended problem related to image interpretation and analysis, GPS use, digitization, overlay analysis, map based query and spatial analysis.

List of Open Source Software/learning website:

https://www.itc.nl;
http://52north.org/ilwis
http://nptel.ac.in/courses/105108077/24
http://nptel.ac.in/courses/105102015/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.