Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019-2020

Course Handout Part II

Date: 06-01-2020

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : **CE F431**
Course Title : **PRINCIPLES OF GEOGRAPHICAL INFORMATION SYSTEMS**
Instructor – in – Charge : RAJITHA K

Scope & Objective: The course introduces the fundamentals of Geographic Information Systems. The main objective of the course is to promote a good foundation in GIS and working knowledge of fields strongly related to GIS in the computing perspective. Different algorithms for spatial analysis are discussed in the course illustrated with case studies. The course will also guide the students through projects and to apply concepts and ideas in various application areas and to establish a motivation towards research in thrust areas related to GIS.

Course Outcomes: At the end of the course, student will be able to

- Develop framework for analyzing the spatial data obtained from satellite platform and UAV platform
- Generate spatial datasets utilizing the primary data obtained from GPS , satellite images and ancillary datasets
- Solve spatial related problems related to Civil Engineering discipline utilizing satellite images and GIS software

Student Learning Outcomes (SLOs) assessed in this course: **(a), (b), (c), (d), (e), (h), (i), (j) and (k).**

Text Book:

T1: Kang-tsung Chang; “Introduction to Geographic Information Systems” , Tata

McGraw-Hill , 4 th ed. 2015.

Reference Books:

R1: Thomas M Lillesand, and Ralph W Kiefer; "Remote sensing and Image Interpretation", John Wiley & Sons,7th ed. 2015
R2: Basudeb Bhatta, Remote sensing and GIS, Oxford University Press, 2011.

Lecture No.	Topics to be covered	Learning objectives	Reference	SLO*
1-2	Introduction to GIS	**S**tudy the basic concepts of GIS, **L**ist the advantages and scope of applications in different field of Engineering and science	T1 , R1 ,Lecture notes	(a),(k)
3-5	GIS Functionality: Interface, Spatial data, Raster data model and vector data model	**S**tudy the different types of spatial datasets **A**nalyze the spatial datasets to solve real life problems	T1, R1	(a), (b)
6-12	Co-ordinate system and Geo- Referencing and map Projection	**D**iscuss the different types of coordinate system **E**valuate the performances for various cases	T1, R1,R2, Lecture notes	(a), (b)
13	Digitization, Encoding, and Structuring of data	**D**iscuss the different types of spatial data generation techniques **A**nalyze the spatial data for different applications	T1 , R1, Lecture notes	(a), (b)

R3: Michael F. Worboys, "GIS: A Computing Perspective", Taylor & Francis Ltd; 1995, 1 st ed.

Course Plan:

14-18	Remote sensing Fundamentals	**S**tudy the basics of remote sensing techniques, **D**iscuss the laws governing remote sensing process **E**xamine the utility of data for solving real world problems	T1 , R1, Lecture notes	(a), (j)		
19-20	Basics of Global Navigation Satellite System (GNSS)	**S**tudy the Global Navigation Satellite System **D**iscuss trilateration, errors and advances in GNSS	Lecture notes	(a),(j), (k)		
21-22	RADAR, TM and Multispectral sensing Radar: basics and application	**S**tudy on advanced remote sensing sensors **D**iscuss the real life applications focusing GIS utility	T1 ,R2, Lecture notes	(a),(j)		
23-26	Basics of spatial database	**S**tudy the basics of spatial database **D**esign spatial database	T1 &R1	(a), (c)		
27-30	Deterministic and Statistical spatial interpolation	**S**tudy the different Spatial Interpolation techniques **E**xamine the performances of different techniques	T1, R1, Lecture notes	(a), (b)		
31-33	Triangulation, DEM, TIN, terrain mapping and analysis	**D**iscuss the different computational algorithms for triangulation and spatial analysis **A**nalyze the performance of triangulation	T1, Lecture notes	(a), (b)		

		methods				
34-36	Network analysis, Geocoding, Path analysis and network applications	**D**iscuss the computational algorithms for network analysis and location – allocation problems **S**olve problems related to network analysis	R1, Lecture notes	(a), (e)		
37-39	Different aspects of Spatial model creation, monitoring and managing at various levels of project	**D**esign of spatial problem related project **F**ormulation of objectives **S**tudies on implementation strategies	Lecture notes	(a), (b), (e)		
40-43	transportation, Environment, water resources and allied fields	**Di**scuss various current applications of GIS through case studies for multi-disciplinary engineering related applications	Lecture notes	(h),(i),(j),(k)		

List of exercises for the practical classes:

1. Introduction to ARCGIS – ARCMAP Data view, Table of contents, toolbars Adding data, Creation of feature classes, importing data from CAD
2. Rectification of satellite images/scanned map
3. Database creation and digitization of spatial datasets and projections.
4. Attribute data integration to the vector data – Creation of tables, fields. Map layout generation with legend, scale, north arrow and grids.
5. Use of spatial analysis tools, querying, joining data. Use of editing tools, buffer and overlay analysis and creation of thematic maps
6. Spatial data modelling, DEM , TIN generation from point datasets and its applications
7. Contour generation, cut and fill analysis, viewshed analysis
8. Network analysis and Location –allocation problems
9. Introduction to QGIS
10. Practice exercises through case studies.

***Student Learning Outcomes (SLOs):**

SLOs are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.

(a) an ability to apply knowledge of mathematics, science and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid test	90 min	25	6/3 9.00 - 10.30AM	CB
Surprise test	-	5		OB
Project	-	15		OB
*Assignment		5		OB
Lab	-	15		OB
Lab test	60 min	5		CB
Comp. Exam.	180 min	30	12/05 FN	CB

*Total number of assignments will be Two

Chamber Consultation Hour: To be announced

Notices: All notices will be displayed at Civil Engineering Notice Board and LTC

Make-up Policy: Take prior permission

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-In-Charge-CE F431