INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

CIVIL ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**REMOTE SENSING AND GIS**			
Course Code	**A70140**			
Regulation	**R15- JNTUH**			
Course structure	**Lectures**	**Tutorials**	**Particles**	**Credits**
	4	**1**	**-**	**3**
Course coordinators	**Mr. Y. Ravi Kumar, Assistant Professor, Department of Civil Engineering.**			
Team of instructors	**Mr. Y. Ravi Kumar, Assistant Professor, Department of Civil engineering.**			

I. COURSE OVERVIEW:

Remote Sensing and GIS is a relatively recent discipline and is an area of emerging technology with a phenomenal growth over last four decades. The Remote Sensing technology is now beyond the art of Map making from satellite or Aerial images. It has interleaved with information technology where raw digital data is converted to information which in turn aid to the knowledge base for quick and correct decision making. The digital data handling led to the development of GIS (Geographical Information System). Remote Sensing coupled with GIS and GPS techniques has dramatically enhanced human capability for natural and manmade resources exploration, mapping and monitoring on local and global scale. The demand for Remote Sensing and GIS is increasing day by day in Government and Private sector. The course is not only going to enhance job opportunity for the civil students but shall also open an avenue of effective and viable interaction with national establishments related to various aspects of remote sensing.

II. PREREQUISITE(S):

Level	Credits	Periods/week	Prerequisites
UG	3	5	Knowledge of surveying, map reading and basic mathematics

III. MARKS DISTRIBUTION:

Session Marks	University Exam Marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of a subjective test and an objective test. The subjective test is for a duration of 1 hr and the objective test is for a duration of 30m. The subjective test is for 10 marks, and the objective test will be for 10 marks. Subjective test in midterm examinations shall contain 4 questions, with each question having part a) and part b). Each question will carry 5 marks and the student need to answer any 2 questions. First midterm examination shall be conducted for the first four units of syllabus and second midterm examination shall be	75	100

conducted for the remaining four units. The objective question paper and the key will be from university. Five marks are earmarked for assignments. There shall be two assignments and the Marks shall be awarded considering the average of two assignments in each course.		

IV. EVALUATION SCHEME:

Component	Duration hrs.	Marks
I Mid Examination - Descriptive	1	10
I Mid Examination - Quiz	1/2	10
I Assignment	-	5
II Mid Examination - Descriptive	1	10
II Mid Examination - Quiz	1/2	10
II Assignment	-	5
External Examination	3	75

V. COURSE OBJECTIVES:

I. Remember the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain.
II. Understand the basic concept of Remote Sensing and know about different types of satellite and sensors.
III. Illustrate Energy interactions with atmosphere and with earth surface features, Interpretation of satellite and top sheet maps
IV. Understand different components of GIS and Learning about map projection and coordinate system
V. Develop knowledge on conversion of data from analogue to digital and working with GIS software.

VI. COURSE OUTCOMES:

After completing this course the student will have acquired the ability on the following.

1. Understand the concepts of Photogrammetry and compute the heights of the objects.
2. Understand the height measurement based on relief displacement, fudicial points and using parallax.
3. Understand the principles of aerial photogrammetry and remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
4. Understand the basic concept of GIS and its applications; know different types of data representation in GIS.
5. Understand and Develop models for GIS spatial Analysis and will be able to know what the questions that GIS can answer.
6. Apply knowledge of GIS software and able to work with GIS software in various application fields.
7. Understand the spatial and attribute data management, display and exploration.
8. Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems.
9. Apply knowledge of GIS and understand the integration of Remote Sensing and GIS.
10. Understand the application of vector and raster data structure to the real world.
11. Demonstrate the importance of topology, and learn different types of representation of features in GIS.
12 Understand the Integration of Raster data and Vector data and its importance in the Geographical Information System.
13. Understand the importance of source map and learning the on screen digitization.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency Assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	S	Assignments, Tutorials.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences	H	Assignments, Tutorials, Exams.
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	H	Assignments, Tutorials, Exams
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	-	--
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	H	Assignments, Exams
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	-	--
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	-	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	S	Assignments, Exams.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	H	Assignments and Exams
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	H	Assignments and Exams
PO11	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	H	Assignments and Exams
PO12	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	-	--

None **S – Supportive** **H - Highly Related**

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program specific Outcomes		Level	Proficiency Assessed by
PSO 1	**ENGINEERING KNOWLEDGE:** Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.	H	Assignment, Tutorials Exams
PSO 2	**BROADNESS AND DIVERSITY:** Graduates will have a broad understanding of economic, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.	H	Projects
PSO 3	**SELF-LEARNING AND SERVICE:** Graduates will be motivated for continuous self-learning in engineering practice and/ or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.	S	Guest Lectures

IX. SYLLABUS:

UNIT – I

Introduction to Photogrammetry: Principle and types of aerial photograph, Geometry of vertical aerial photograph, Scale and Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fudicial points, parallax measurements using fudicial points.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and information, Remote Sensing data collection, Remote sensing advantages and Limitations, Remote sensing Process. Electromagnetic spectrum, Energy interactions with atmosphere and with earth surface features(soil, water, vegetation), Indian satellites and sensors characteristics, Resolution, Map and image and false color composite, Introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information System: Introduction to GIS, Components of a GIS, Geospatial data: Spatial Data-Attribute data- Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- attribute data management-Data display-Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; map projections: types of Map Projections- map projection parameters-Commonly Used map Projections- projected coordinate Systems.

UNIT – III

Geographic Information System: Introduction to GIS, Components of a GIS, Geospatial data: Spatial Data-Attribute data- Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- attribute data management-Data display-Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; map projections: types of Map Projections- map projection parameters-Commonly Used map Projections- projected coordinate Systems.

UNIT – IV

Vector Data Model :representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data model; Classes and their Relationship; The geobase data model; geometric representation of spatial feature and data structure , Topology rules.

UNIT – V

Raster data Model: Elements of the Raster Data model, Types of Raster data, Raster Data structure, data conversion, Integration of Raster and Vector data

Data Input: Metadata , Conversion of existing data, Creating new data ; Remote Sensing data, fields data, Text data, digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

TEXT BOOKS:

1. Remote Sensing of the environment- An earth resource perspective- 2nd edition- by John R. Jensen, Pearson Education.
2. Introduction to geographic information system- kang – Tsung Chang, Tata McGraw- Hill Education Private Limited.

REFERENCES:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications.
3. Principals of Geo physical Information System- Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004
4. Basics of Remote Sensing and GIS by S. Kumar, laxmi Publications.

X. COURSE PLAN:

The course plan is tentative and intended as a guideline. There may probably be slight changes.

Lecture No.	Course Learning Outcomes	Topics to be Covered	Reference
1	Understand the concept of Photogrammetry	Introduction to Photogrammetry	T :2, R2
2	Understand the Principle of aerial photograph	Principle of aerial photograph	T: 2, R2
3	Understand the types of aerial photograph	Types of aerial photograph	T: 2, R2
4	Understand Geometry of vertical aerial photograph	Geometry of vertical aerial photograph	T: 2, R2
5	Understand Geometry of vertical aerial photograph	Geometry of vertical aerial photograph	T: 2, R2
6	Understand Geometry of vertical aerial photograph	Geometry of vertical aerial photograph	T: 2, R2
7	Calculate the Scale and Height measurement	Scale measurement	T: 2, R2
8	Calculate the Scale and Height measurement	Height measurement	T: 2, R2
9	Calculate Scale and Height measurement on single vertical aerial photograph,	Scale and Height measurement on single vertical aerial photograph.	T: 2, R2
10	Calculate Scale and Height measurement on single vertical aerial photograph,	Scale and Height measurement on single vertical aerial photograph.	T: 2, R2
11	Calculate Scale and Height measurement on single vertical aerial photograph,	Scale and Height measurement on single vertical aerial photograph.	T: 2, R2
12	Calculate Height measurement based on relief displacement	Height measurement based on relief displacement.	T: 2, R2
13	Understand Fundamentals of stereoscopy	Fundamentals of stereoscopy.	T: 2, R2
14	Understand Fundamentals of stereoscopy	Fundamentals of stereoscopy.	T: 2, R2
15	Understand fudicial points related Aerial photographs	Fudicial points.	T: 2, R2

16	Understand fudicial points related Aerial photographs	Fudicial points.	T: 2, R2
17	Understand the parallax measurements using fudicial points.	Parallax measurements using fudicial points.	T: 2 , R2
18	Understand the parallax measurements using fudicial points.	Parallax measurements using fudicial points.	T: 2 , R2
19	Apply the knowledge Remote Sensing	Remote Sensing	T: 2, R2
20	Apply the knowledge Remote Sensing	Remote Sensing	T: 2, R2
21	Understand Basic concept of Remote sensing	Basic concept of Remote sensing	T: 2, R2
22	Understand Basic concept of Remote sensing	Basic concept of Remote sensing	T: 2, R2
23	Analyze the Data and information	Data and information	T: 2, R2
24	Analyze Remote Sensing data collection	Remote Sensing data collection	T: 2, R2
25	Understand Remote sensing advantages and Limitations	Remote sensing advantages and Limitations	T: 2, R2
26	Understand Remote sensing Process	Remote sensing Process	T: 2, R2
27	Understand Remote sensing Process	Remote sensing Process	T: 2, R2
28	Understand the physics of Electromagnetic spectrum	Electromagnetic spectrum	T: 2, R2
29	Understand the Energy interactions with atmosphere and with earth surface features(soil, water, vegetation)	Energy interactions with atmosphere and with earth surface features(soil, water, vegetation)	T:1, R2
30	Understand the importance of Indian satellites and sensors characteristics	Indian satellites and sensors characteristics	T:1, R2
31	Differentiate the Resolution	Resolution	T:1, R2
32	Differentiate Map and image and false color composite,	Map and image and false color composite,	T:1, R2
33	Understand Introduction to digital data	Introduction to digital data	T:1, R2
34	Understand the importance of Elements of visual interpretation techniques.	Elements of visual interpretation techniques.	T:1, R2
35	Importance Geographic Information System	Geographic Information System	T:1, R2
36	Importance Geographic Information System	Geographic Information System	T:1, R2
37	Understand Introduction to GIS, Components of a GIS	Introduction to GIS, Components of a GIS	T:1, R2
38	Understand Introduction to GIS, Components of a GIS	Introduction to GIS, Components of a GIS	T:1, R2
39	Understand Geospatial data: Spatial Data Attribute data Joining Spatial and Attribute data;	Geospatial data: Spatial Data Attribute data Joining Spatial and Attribute data;	T:1, R2
40	Understand Geospatial data: Spatial Data Attribute data Joining Spatial and Attribute data;	Geospatial data: Spatial Data Attribute data Joining Spatial and Attribute data;	T:1, R2
41	Understand GIS Operations: Spatial Data Input- attribute data management	GIS Operations: Spatial Data Input-attribute data management	T:1, R2
42	Understand GIS Operations: Spatial Data Input- attribute data management	GIS Operations: Spatial Data Input-attribute data management	T:1, R2
43	Analyze Data display-Data Exploration, Data Analysis. COORDINATE SYSTEMS	Data display-Data Exploration, Data Analysis. Coordinate Systems	T:1, R2
44	Analyze Data display-Data Exploration,	Data display-Data Exploration, Data	T:1, R2

	Data Analysis. COORDINATE SYSTEMS	Analysis. Coordinate Systems	
45	Analyze Geographic Coordinate System,	Geographic Coordinate System,	T:1, R2
46	Analyze Geographic Coordinate System,	Geographic Coordinate System,	T:1, R2
47	Approximation of the Earth	Approximation of the Earth	T:1, R2
48	Approximation of the Earth	Approximation of the Earth	T:1, R2
49	Analyze Datum; map projections,	Datum; map projections,	T:1, R2
50	Understand Types of Map Projections- map projection parameters	Types of Map Projections- map projection parameters	T:1, R2
51	Understand Types of Map Projections- map projection parameters	Types of Map Projections- map projection parameters	T:1, R2
52	Understand Commonly Used map Projections- projected coordinate Systems	Commonly Used map Projections- projected coordinate Systems	T:1, R2
53	Understand Commonly Used map Projections- projected coordinate Systems	Commonly Used map Projections- projected coordinate Systems	T:1, R2
54	Analyze Vector Data Model : representation of simple features	Vector Data Model : representation of simple features,	T:1, R2
55	Analyze Vector Data Model : representation of simple features	Vector Data Model : representation of simple features,	T:1, R2
56	Topology and its importance	Topology and its importance	T:1, R2
57	Topology and its importance	Topology and its importance	T:1, R2
58	Topology and its importance	Topology and its importance	T:1, R2
59	Create coverage and its data structure, Shape file	coverage and its data structure, Shape file	T:1, R2
60-	Analyze Data models for composite features Object Based Vector Data model;	Data models for composite features Object Based Vector Data model;	T:1, R2
61	Analyze Data models for composite features Object Based Vector Data model;	Data models for composite features Object Based Vector Data model;	T:1, R2
62	Analyze Data models for composite features Object Based Vector Data model;	Data models for composite features Object Based Vector Data model;	T:1, R2
63	Discuss Classes and their Relationship;	Classes and their Relationship;	T:1, R2
64	Analyze The geodatabase data model;	The geodatabase data model;	T:1, R2
65	Geometric representation of spatial feature and data structure, Topology rules.	Geometric representation of spatial feature and data structure, Topology rules.	T:1, R2
66	Discuss Raster data Model: Elements of the Raster Data model, Types of Raster data	Raster data Model: Elements of the Raster Data model, Types of Raster data	T:1, R2
67	Analyze the Raster Data structure, data conversion ,	Raster Data structure, data conversion ,	T:1, R2
68	Integration of Raster and Vector data	Integration of Raster and Vector data	T:1, R2
69	Analyze Data Input: Metadata , Conversion of existing data	Data Input: Metadata , Conversion of existing data	T:1, R2
70	Creating new data ; Remote Sensing data, Data, field's data, Text data,	Creating new data ; Remote Sensing data, data, fields data, Text data ,	T:1, R2
71	Digitizing, Scanning, on screen digitizing,	digitizing, Scanning, on screen digitizing,	T:1, R2
72	Importance of source map, Data Editing.	Importance of source map, Data Editing.	T:1, R2

XI: MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	S	H			S				S	S			H		S
II	H	S						S		S		S	H	S	
III	S				S			H	H	H			H	S	
IV	S	S										S	S	H	
V		S	H							S			S	H	S

S – Supportive **H - Highly Related**

XII: MAPPING COURSE OUTCOMES LEADING TO ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	S	H							S	S		S	H	S	S
2	H	S	S							S			H	S	S
3								S				S	H		
4	S		S						S	S				H	S
5	H	H	H					S		S				H	S
6		H			S			S	S			S		S	S
7	H							S					H	H	
8			H		S								S	S	H
9	S	H	S					H	H	S					S
10					H				H	S		H	S		
11	H		H		H				S				H		S
12		H							H	H		H	S	S	H
13			S		H			H	S	S		S	S	H	H

S – Supportive **H - Highly Related**

Prepared by: Mr. Y Ravi Kumar, Assistant Professor.

HOD, CIVIL ENGINEERING