Academic Course Description

BHARATH UNIVERSITY
Faculty of Engineering and Technology
Department of Civil Engineering

BCE093 Remote Sensing and GIS

Seventh Semester, 2017-18 (Odd Semester)

Course (catalog) description

The purpose of this course is to introduce the students the basic concepts and principles of various components of remote sensing and also provide an exposure to GIS and its practical applications in civil engineering.

Compulsory/Elective course : Compulsory for Civil students

Credit / Contact hours : 3 credits / 45 hours

Course Coordinator : Dr.A.Mani, Professor

Instructors :

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
Ms.A.Ambica	Third year Civil	Civil Block		ambicacivil@bharathuniv.ac.in	9.00 - 9.50 AM

Relationship to other courses:

Pre –requisites : Engineering Physics – II

Assumed knowledge : Basic knowledge in Maths and Physics

Following courses : Hydrology, Ground water Engineering, Coastal Engineering

Syllabus Contents

UNIT I REMOTE SENSING 9

Definition -Historical Components of Remote Sensing Principles & methods of remote sensing - Active and Passive remote sensing - Remote Sensing platforms -Electromagnetic radiation- Spectrum- Block body radiation – planks law – Stefan – Boltzmann law – satellites classification – based on orbit- sun synchronous and Geosynchronous based on purpose Earth Resources satellites, communication satellite Weather satellites Spy satellites Sensors Description of sensor in landscape, spot, IRS series and current satellites- Radar SLAR-and SAR.

UNIT II EMR INTERACTIONS 9

Interaction with atmosphere Scattering of EMR Raleigh, Mie, Non Selective and Raman Scattering Bach scattering Speckle EMR Interaction with water and Ozone Atmospheric windows and its significance EMR interaction with the earth surface materials Radiance, irradiance, Absorbed and Transmitting energy – reflectance- Specular- and diffuse surface- Spectral signature – and curves EMR interaction with soil Resolution Spectral, Spatial, Radiometric, and Temporal.

UNIT III RESOURCES ENGINEERING **9**

Characteristics of Digital satellite image enhancement Filtering Applications of Aerial photographs and satellite imageries – merits – Limitations – Water resources – watershed management – Urban Studies – Flood Management- Fishing Forestry etc.,

UNIT IV GEOGRAPHIC INFORMATION SYSTEM **9**

GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and NonSpatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

UNIT V MISCELLANEOUS TOPICS **9**

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems

TEXT BOOKS:

1. Anji Reddy, "Remote Sensing and Geographical Information Systems", BS Publications 2001

REFERENCE:

1. Anand P.H,"Principles of remote Sensing and Geographical Information Systems", Sri Venkateswara Publishers, 2003.
2. Lillesand T.M and Kiefer R.W. Remote sensing and Image, Interpretation, John Wiley and Sons, INC, New York, 1987.
3. Burrough P A,"Principle of GIS for land resource assessment", Oxford University, 1990

Computer usage: Image Analysis using GIS software

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area: Environmental Applications

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

Mapping of Instructional Objectives with Program Outcome

To introduce the students to the basic concepts and principles of various components of remote sensing. To provide an exposure to GIS and its practical applications in civil engineering	Correlates to program outcome		
	H	**M**	**L**
1. Apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems.	d,e,i		
2. Apply the concepts of satellite and sensor parameters and characteristics of different platforms.	d,e,i		
3. Apply the concepts of DBMS in GIS.	d,e,i		
4. Analyze raster and vector data and modeling in GIS.	d,e,i		
5. Apply GIS in land use, disaster management, ITS and resource information system.	d,e,i		

H: high correlation, M: medium correlation, L: low correlation

Draft Lecture Schedule

Session	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	**REMOTE SENSING**		
1.	Definition Historical Components of Remote Sensing	No	[T1, R1&R2]
2.	Principles & methods of remote sensing - Active and Passive remote sensing	No	
3.	Remote Sensing platforms	No	
4.	Electromagnetic radiation- Spectrum- Block body radiation – planks law – Stefan – Boltzmann law	No	
5.	Satellites classification – based on orbit- sun synchronous and Geosynchronous.	No	
6.	Based on purpose Earth Resources satellites, communication satellite Weather satellites Spy satellites	No	
7.	Sensors -Description of sensor in landscape, spot.	No	
8.	IRS series and current satellites	No	
9.	Radar SLAR-and SAR	No	
UNIT II	**EMR INTERACTIONS**		
10.	Interaction with atmosphere	No	[T1, R1&R2]
11.	Scattering of EMR Raleigh, Mie, Non Selective and Raman Scattering Back scattering Speckle	No	
12.	EMR Interaction with water	No	
13.	EMR Interaction with Ozone	No	
14.	Atmospheric windows and its significance	No	
15.	EMR interaction with the earth surface materials Radiance, irradiance, Absorbed and Transmitting energy	No	
16.	Reflectance- Specular- and diffuse surface	No	
17.	Spectral signature – and curves EMR interaction with soil	No	
18.	Resolution -Spectral, Spatial, Radiometric, and Temporal.	No	
UNIT III	**RESOURCES ENGINEERING**		
19.	Characteristics of Digital satellite	No	[T1, R2& R3]
20.	Image enhancement	No	
21.	Filtering Applications of Aerial photographs	No	
22.	Filtering Applications of satellite imageries	No	
23.	Merits &Limitations satellite imageries	No	
24.	Application of Remote Sensing and GIS – water resources & watershed management	No	
25.	Application of Remote Sensing and GIS -Urban Studies	No	

26.	Application of Remote Sensing and GIS Flood Management	No	
27.	Application of Remote Sensing and GIS Fishing Forestry etc.,	No	
UNIT IV	**GEOGRAPHIC INFORMATION SYSTEM**		
28.	GIS – Components of GIS – Hardware, Software and Organisational Context	No	[T1, R2&R3]
29.	Data – Spatial and NonSpatial	No	
30.	Maps – Types of Maps	No	
31.	Projection – Types of Projection	No	
32.	Data Input – Digitizer, Scanner – Editing	No	
33.	Raster and Vector data structures – Comparison of Raster and Vector data structure	No	
34.	Analysis using Raster and Vector data	No	
35.	Retrieval, Reclassification, Overlaying, Buffering	Yes	
36.	Data Output – Printers and Plotters	No	
UNIT V	**MISCELLANEOUS TOPICS**		
37.	Visual Interpretation of Satellite Images	No	[T1, R1 & R2]
38.	Elements of Interpretation - Interpretation Keys	No	
39.	Characteristics of Digital Satellite Image- Image enhancement	Yes	
40.	Characteristics of Digital Satellite Image – Filtering – Classification	Yes	
41.	Integration of GIS and Remote Sensing	No	
42.	Application of Remote Sensing and GIS – Urban Applications	No	
43.	Application of Remote Sensing and GIS – Water resources	No	
44.	Application of Remote Sensing and GIS – Urban Analysis	No	
45.	Watershed Management – Resources Information Systems	No	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	5%
Assignment	-	5%
Attendance	-	10%
Final exam	-	70%

Prepared by: Dr.A.Mani, Professor , Department of Civil **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / Civil / program by the time that they graduate:

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 hardware and software 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.

Program Educational Objectives

PEO1: PREPARATION

Civil Engineering graduates will have knowledge to apply the fundamental principles for a successful profession and/or for higher education in Civil Engineering based on mathematical, scientific and engineering principles, to solve realistic and field problems that arise in engineering and non engineering sectors

PEO2: CORE COMPETENCE

Civil Engineering graduates will adapt to the modern engineering tools and construction methods for planning, design, execution and maintenance of works with sustainable development in their profession.

PEO3: PROFESSIONALISM

Civil Engineering Graduates will exhibit professionalism, ethical attitude, communication and managerial skills, successful team work in various private and government organizations both at the national and international level in their profession and adapt to current trends with lifelong learning.

PEO4: SKILL

Civil Engineering graduates will be trained for developing soft skills such as proficiency in many languages, technical communication, verbal, logical, analytical, comprehension, team building, inter personal relationship, group discussion and leadership skill to become a better professional.

PEO5: ETHICS

Civil Engineering graduates will be installed with ethical feeling, encouraged to make decisions that are safe and environmentally-responsible and also innovative for societal improvement.

Course Teacher	Signature
Ms.A.Ambica	

Course Coordinator **HOD/CIVIL**