Course Specification
(Bachelor)

Course Title:	Remote Sensing
Course Code:	CE4805
Program:	Bachelor of Science in Civil Engineering
Department:	: Civil Engineering Department
College:	College of Engineering and Architecture
Institution:	Umm Al Qura University
Version:	1
Last Revision Date:	31 January 2025

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A. General information about the course:

1. Course Identification

1. Credit hours: (3 hours)					
2. Course type					
A.	☐University	☐College	X Department	☐Track	Others
B.	☐Required		**X** Elective		
3. Level/year at which this course is offered: Level 5 / 3rd Year					
4. Course General Description:					
The course covers the fundamentals and physics of Remote Sensing such as concept and Scope of Remote Sensing, Concept of Electromagnetic Radiation (EMR), Fundamental laws governing the science, Energy Interaction in the atmosphere, and Energy Interactions with Earth Surface Features. It presents the platforms and Sensors which may include the types and characteristics of Sensor, Remote Sensor Platforms and Satellite Orbits, Satellite Basics and Space Imaging Satellites. This course also provides an overview of the main applications of remote sensing in various important areas, such as environmental issues, agriculture, forestry, urban issues and water management, the usage of satellite data at various resolutions, the usage of models in remote sensing, the analysis of data from various climate zones and applications in research and society.					
5. Pre-requirements for this course (if any)**:**					
6. Co-requisites for this course (if any)**:**					
7. Course Main Objective(s):					

On completion of the course, the students will be able to acquire the following:

- **The basic physical principles of remote sensing,**
- **The basic technical principles of satellites, sensors and ground segments in data collection and the properties of the available data from these systems,**
- **The principles of digital image processing and manipulation in remote sensing,**
- **Important applications for satellite remote sensing in research and the public and private sectors.**
- **The ability to give examples of and suggest uses for remote sensing in different climate zones and for various types of ecosystems and land-usages and to understand and describe the limitations of the technology currently in use.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	**45**
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		**45**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	To explain the main aspects of Remote Sensing and its applications.	K1	• Lectures	• Written Exams • Fieldwork reports
1.2	To discuss the different systems for Space Imaging Satellites, softwares and applications.	K2	• Lectures	• Written Exams • Reports
2.0	**Skills**			

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.1	To apply appropriate fundamental laws governing the science such as Sources of Energy, Stefan-Boltzman law, Wien's law, Kirchhoff's law etc., Black body and Real body, Radiant temperature & Kinetic temperature.	S1	• Lectures	• Written Exams • Reports
2.4	To perform remote sensing surveying using both basic principles and modern instruments and tools.	S3	• Lectures and training tutorials • Through group project work • Through detailed research and analysis of a particular topic for surveying applications.	• Class works. • Written and oral examinations. • Projects. • Reports.
3.0	**Values, autonomy, and responsibility**			
3.1	To use life-long learning and continuing education for remote sensing techniques and instrumentation.	V3	• Group assignments. • Small group work. • Lab. work.	• Lab. Exam • Oral exams.
3.2	To use professional remote sensing techniques for safety of pilgrims during Hajj and Umrah.	V1	• Lectures • Lab. work	• Written Exams • laboratory and fieldwork reports • Lab Exams

C. Course Content

No	List of Topics	Contact Hours
1	**Fundamentals & Physics of Remote Sensing**	3
2	Concept of Electromagnetic Radiation (EMR)	3
3	Fundamental laws governing the science	3
4	Energy Interactions with Earth Surface Features	3
5	Platforms and Sensors, Sensor materials, Sensor System.	3
6	Framing and Scanning System, Whiskbroom scanners, Push-broom scanners, Side Looking scanner.	3
7	Types and Characteristics of Sensor, Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites (1)	3
8	Types and Characteristics of Sensor, Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites (2)	3
9	Remote Sensor Platforms and Satellite Orbits (1)	3
10	Remote Sensor Platforms and Satellite Orbits (2)	3
11	Satellite Basics, Kepler's laws, Major-Semimajor axis & Eccentricity, Velocity, Period, Historical development, Launch Vehicle, Escape Velocity Payload (1)	3
12	Satellite Basics, Kepler's laws, Major-Semimajor axis & Eccentricity, Velocity, Period, Historical development, Launch Vehicle, Escape Velocity Payload (2)	3
13	Space Imaging Satellites, Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar.	3
14	Specification of some popular satellites – IRS, Landsat and SPOT series; High resolution satellites – IKONOS, Cartosat.	3
15	Specification of some popular satellites - Quickbird, OrbView, GeoEye, Pléiades, WorldView; Other latest earth resource satellites.	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Tutorials	2-15	10%
2.	Reports and Practical Examination	3-15	15 %
3.	Mid Term Exam	7	25 %
4.	Final Exam	16	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	• Jensen, John R., 2018. Introductory Digital Image Processing: A Remote Sensing Perspective, 5th edition. Prentice Hall: Upper Saddle River, NJ 07458.
Supportive References	• James B. Campbell and Randolph H. Wynne, 2017. Introduction to Remote Sensing. 7th Edition. The GuilfordPress, 662 pages.
Electronic Materials	• Websites of softwares companies.
Other Learning Materials	• Latest Softwares and Techniques

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classrooms for lectures and exams for 35 students during the scheduled class hours. • Surveying lab. with sufficient surveying instruments for 20 students during the scheduled lab. or field work hours.
Technology equipment (projector, smart board, software)	• Data show for some work presentation. •
Other equipment (depending on the nature of the specialty)	• Printers and laptops for staff members with required computer software programs are required.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Faculty members who teach this course and the lab staff associated with the course.	• Both written and verbal, through presentations. • Analysis of students` marks • Regular feedback of the students about the course and the teaching methods
Effectiveness of Students assessment	Faculty members who teach this course and those teaching other courses relevant to this course.	• Regular revising and improving of the course contents and consulting the faculty members • Teaching faculty and lab staff associated with the course are also available for personal consultation.
Quality of learning resources	Faculty members who teach this course	• Frequent improvement for teaching and learning techniques. • Frequent survey for latest references. • Encouraging the students in team work cooperation and writing reports.
The extent to which CLOs have been achieved	Independent member(s) teaching staff	A sample of students answer sheets is revised by a specified committee of the department.
Other	--	--

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	CIVIL ENGINEERING COUNCIL
REFERENCE NO.	THE FIFTEENTH SESSION OF THE ACADEMIC YEAR 1446
DATE	30 APRIL 2025

