Course Specification
(Bachelor)

Course Title:	Remote Sensing Applications
Course Code:	EVS 1478
Program:	Bachelor of Science in Environmental Science
Department:	Biology
College:	Science
Institution:	Imam Mohammed Ibn Saud Islamic University
Version:	1
Last Revision Date:	-

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3 (2 Lecture + 2 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 7 / 4th Year)					
4. Course General Description:					
This course will focus on acquiring images of the Earth's surface from spacecraft, aircraft and drones to aid in the monitoring and management of the natural and built environments. Extensive computer-based analysis techniques are used to extract information from the recorded images in support of applications ranging over many earth and information science disciplines. This course covers the fundamental nature of remote sensing and the platforms and sensor types used. It also provides an in-depth treatment of the computational algorithms employed in image understanding, ranging from the earliest historically important techniques to more recent approaches based on deep learning. The course material is extensively illustrated by examples and commentary on how the technology is applied in practice.					
5. Pre-requirements for this course (if any)**:**					
EVS 1110 / EVS 1114 / EVS 1368					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The objective of these courses is to provide students with knowledge and skills to apply remote sensing in various fields, understand the complex dynamics between remote sensing, and use this knowledge in their future research work. In addition to understand the theory behind Remote Sensing analyses and complete practical Remote Sensing based applications, using a range of sensors and methodologies. Introduce a selection of					

methods and analytical skills that can be used in practical applications within Earth Observation and Spatial Analysis.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	√	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**	30
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	4
5.	**Others (specify)**	0
Total		60

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe and discuss a set of methods to analyse, interpret and assess remotely sensed imagery**	K1	Lecture, lab and take-home research assignment	Quizzes, midterm ,lab exam and final exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.2	**Define and explain the key concepts and terminologies used in remote sensing**	K2	Lecture, lab and take-home research assignment	Quizzes, midterm ,lab exam and final exam
1.3	**Explain how the electromagnetic spectrum interacts with the terrestrial environment**	K3	Lecture, lab and take-home research assignment	Quizzes, midterm, lab exam and final exam
1.4	**List key platforms and sensors and their characteristics.**	K3	Lecture, lab and take-home research assignment	Quizzes, midterm lab exam and final exam
1.5	**Identify and explain common processing pathways used in remote sensing and Describe and quantify error sources within remote sensing analyses**	K4	Lecture, lab and take-home research assignment	Quizzes, midterm lab exam and final exam
2.0	**Skills**			
2.1	**Plan, manage and complete a remote sensing-based study and acquire remote sensing data and assess the suitability for analysis**	S1	lab and take-home research assignment	Lab reports and field exam
2.2	**Interpret remote sensing and GIS products and understand their metadata, and**	S2	lab and take-home research assignment	Lab reports and field exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	results of image analysis			
2.3	**Apply the appropriate methods/algorithms and apply such methods/algorithms to analyse optical, radar, and topographic data**	S3	lab and take-home research assignment	lab reports and field exam
2.4	**Synthesize and process the data using model builder and scripting**	S4	lab and take-home research assignment	lab reports and field exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Share in the discussion of the literature on remote sensing and GIS and present data effectively**	V1	Lecture, lab and take-home research assignment	Quizzes, midterm exams, reports, project presentations, field exams and final exam
3.2	**Show the ability to perform work independently and cooperate with a team**	V2	Lecture, l and take-home research assignment	Quizzes, midterm exams, project presentations,
3.3	**Demonstrate accountability and adhere to the relevant ethical rules**	V3	Lecture, and take-home research assignment	Quizzes, midterm exams, , project presentations,

C. Course Content

No	List of Topics (lectures)	Contact Hours
1.	Remote Sensing Concepts and Systems	4
2.	Applications in Environmental Sciences :Precipitation	4
3.	Meteorology and Climate	4
4.	Applications in Environmental Sciences :Hydrology and Water Resources	2
5.	Applications in Environmental Sciences :Marine and Coastal Ecosystems	2
6.	Applications in Environmental Sciences: Environmental Hazards	2
7.	Applications in Earth System Sciences: Agriculture	2
8.	Applications in Earth System Sciences: Forestry	2
9.	Applications in Earth System Sciences: Geology	2
10.	Applications in Earth System Sciences: Renewable Energy Sources	2
11.	Applications in Earth System Sciences: Land Use and Land Cover (LULC)	2
12.	1.Radar scattering from the Earth's surface 2. Sub-surface imaging and volume scattering 3. Scattering from hard targets 4. The cardinal effect, Bragg scattering and scattering from the se 5. Geometric distortions in radar imagery 6. Geometric distortions in radar imagery, cont. 7. Radar interferometry 8. Radar interferometry for detecting change 9. Considerations in radar remote sensing	2
Total		30

No	List of Topics (Field)	Contact Hours
1.	Remote sensing technologies that use sunlight, infrared radiation,	4
2.	Range of datasets and web portals,	4
3.	Radar, and lasers	4
4.	Analysis tools, water resource management	4
5.	Application to air quality	4
6.	Application to agriculture	2
7.	Application to Water	2
8.	Application to desert and land	2
9.	Tutorial Video	2
10.	Tutorial Video	2
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm 1	Around 5th - 6th week	15%
2.	Midterm 2	Around 7th - 8th week	15%
3.	Quizzes, Participation, and Attendance	During the semester	10%
4.	Lab reports	During the semester	5%
5.	Lab Exam	15th week	15%
6.	Final Exam	16th week	40%
Total			**100%**

*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	Nicolas R. Dalezios(2021). Remote Sensing Applications in Environmental and Earth System Sciences, 1st Edition, CRC Press, USA. https://doi.org/10.1201/9781315166667 James B. Campbell, Randolph H. Wynne, and Valerie A. Thomas (2022). Introduction to Remote Sensing Sixth Edition, Guilford press, USA
Supportive References	Netzband, M. A1 - Stefanov, W.L. A1 - Redman, C. (2007. Applied Remote Sensing for Urban Planning, Governance and Sustainability, Springer Berlin Heidelberg, https://books.google.com.sa/books?id=0fTse9UL6_IC
Electronic Materials	NONE
Other Learning Materials	Blackboard

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms and field
Technology equipment (projector, smart board, software)	Projector and Smartboard
Other equipment (depending on the nature of the speciality)	-

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Direct
Effectiveness of Students assessment	Program Leader	Direct
Quality of learning resources	Peer Reviewer	Indirect
The extent to which CLOs have been achieved	Program Leader	Direct
Other	-	-

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**Head of Biology Department**
REFERENCE NO.	
DATE	