

Ministry of Higher Education and Scientific research



**Department of: GEOMATICS**

**College of: Engineering**

**University of: Salahaddin**

**Subject: REMOTE SENSING COURSE – Fall Semester**

**Course Book – GRADE 4 – Semester 7**

**Lecturer's name: Asst. Prof. Dr. Dleen Al-Shrafany**

**Academic Year: 2023/2024**

# Course Book

<b>1. Course name</b>	<b>Remote Sensing</b>
<b>2. Lecturer in charge</b>	<b>Dr. Dleen M. S. Al-Shrafany</b>
<b>3. Department/ College</b>	<b>Geomatics Engineering Department</b>
<b>4. Contact</b>	<b>e-mail: Dleen.alshrafany@su.edu.krd</b>
<b>5. Time (in hours) per week</b>	<b>For example Theory: 2 Practical: 3</b>
<b>6. Office hours</b>	<b>Sun:8:30-1:30, Mon: 8:30-4:00, Tue:8:30-4:00, Wed 8:30-1:00, Thu: 8:30-12:30</b>
<b>7. Course code</b>	<b>SE 403</b>
<b>8. Teacher's academic profile</b>	<b><a href="https://sites.google.com/a/su.edu.krd/dleen-alshrafany/home">https://sites.google.com/a/su.edu.krd/dleen-alshrafany/home</a></b>
<b>9. Keywords</b>	<b>EM energy, radiation and reflection, Satellite system, passive and active remote sensing, RADAR, LIDAR</b>
<b>10. Course overview:</b>	
<p>The course introduces the principles of remote sensing for earth observation, in particular:</p> <ul style="list-style-type: none"> <li>• physical principles of the visible, infrared and microwave section of the electromagnetic spectrum</li> <li>• remote sensing platforms and sensors</li> <li>• data acquisition, storage and processing</li> <li>• image processing and analysis</li> <li>• remote sensing applications in geosciences</li> </ul>	
<b>11. Course objective:</b>	
<p><b>The course provides students:</b> an insight into remote sensing, both in theory (mathematical and physical background) and in practice (applications and training). After the course they will be able to understand the information content of remotely sensed data and how to retrieve the information. Students will be able to decide which remote sensing techniques suite your specific needs.</p>	
<b>12. Student's obligation</b>	
<p>The students has to attend the lectures and labs, also they have to prepare all</p>	

necessary homework that is assigned to them, in addition to that, the students are necessary to work for the quizzes which is held along the study course.

At the end of each term the student has to attend exams. Each student has to attend at least two exams and final exam in order to evaluate his knowledge. In addition to the oral exam the student has to test for a practical exam too.

### **13. Forms of teaching**

The means that are used in the teaching, to deliver the subjects to the students, are Mainly lectures and along with parallel labs. Theory and practical samples will be covered in the lecture. In addition to that homeworks are given to the students in order to motivate them to evolve thinking about the subject. Lecture notes will be available on the personal web site in order to download the required lessons.

### **14. Assessment scheme**

Lab reports **10%**

Assignments **10%**

Short Quiz + Class Exam **20%**

Final Practical Exam **10%**

Final Exam **50%**

### **15. Student learning outcome:**

**Upon completion of the course, students will be able to....**

1. Define and describe remote sensing and explain its applications and history.
2. Define and describe basics of electromagnetic spectrum and interactions with various types of media.
3. Describe sensors and image acquisition methods.
4. Analyze and explain remote sensing purposes, advantages, and limitations.
5. Describe basic characteristics of remote sensing imagery.
6. Describe industry-specific image sources.

### **16. Course Reading List and References:**

#### **▪ Key references:**

Campbell, J. B. (2002) Introduction to Remote Sensing. 3<sup>rd</sup> edition. NewYork.USA.

#### **▪ Useful references:**

- Lillesand, Kiefer and Chipman (2008) Remote Sensing and Image Interpretation. 6<sup>th</sup> edition. John Wiley and Sons. USA
- Schowengerdt, R, A. (2007) Remote Sensing: Models and Methods for Image Processing. 3<sup>rd</sup> edition. Academic Press. London. UK.

<b>17. The Topics:</b>			<b>Lecturer's name</b>
Week-1	04/10/2016	History and scope of remote sensing	<b>Dr. Dleen M. S. Al-shrafany (2 hrs)</b>
Week-2	11/10/2016	Electromagnetic radiation	
Week-3	18/10/2016	Radiation Law	
Week-4	25/10/2016	Blackbody and whit body concept	
Week-5	01/11/2016	Interaction with the atmosphere	
Week-6	08/11/2016	Atmospheric windows	
Week-7	15/11/2016	Interactions with surfaces	
Week-8	22/11/2016	Models for remote sensing	
Week-9	29/11/2016	Satellite Orbits	
Week-10	06/12/2016	Digital Data	
Week-11	13/12/2016	Image analysis	
Week-12	20/12/2016	Image Interpretation Task	
Week-13	03/01/2017	Image Pre processing	
Week-14	10/01/2017	Active Microwave	
Week-15	17/01/2017	RADAR Principles	
Week-16	07/02/2017	Geometry of the RADAR image	
Week-17	14/02/2017	Geometric errors of RADAR image	
Week-18	21/02/2017	Penetration of the RADAR signal	
Week-19	28/02/2017	Corner reflectors	
Week-20	04/04/2017	LIDAR System Components	
Week-21	11/04/2017	Thermal radiation	
Week-22	18/04/2017	Thermal detectors	
Week-23	25/04/2017	Thermal scanners	
Week-24	02/05/2017	Thermal radiometers	
Week-25	09/05/2016	Microwave radiometers	
<b>18. Practical Topics (if there is any)</b>			
Week-1	02/10/2016	Introduction to ENVI software	<b>Dr.Dleen M. S. AL-shrafany (3 hrs)</b>
Week-2	09/10/2016	Visual Interpretation of sat image	
Week-3	16/10/2016	Introduction to measure image resolution	
Week-4	23/10/2016	Learn Basic functions of ENVI	
Week-5	30/10/2016	Continue basic function of ENVI	
Week-6	06/11/2016	Selecting ROI and linking sat images	
Week-7	13/11/2016	Image/ Band stacking	
Week-8	20/11/2016	Image mosiacking	
Week-9	27/11/2016	Image masking / 1- build mask	
Week-10	04/12/2016	Image masking / 2- apply mask	
Week-11	11/12/2016	Building and applying mask using vector file	

Week-12	18/12/2016	Apply band math ratio
Week-13	08/01/2017	Converting coordinate system
Week-14	15/01/2017	Topographic application
Week-15	05/02/2017	Overly application
Week-16	12/02/2017	Create and apply contour lines
Week-17	19/02/2017	Image rectification and restoration
Week-18	26/02/2017	Geometric correction
Week-19	02/04/2017	Image enhancement
Week-20	09/04/2017	Image convolution / filtering
Week-21	16/04/2017	Edge enhancement
Week-22	23/04/2017	High spatial filtering
Week-23	30/04/2017	Image classification
Week-24	07/05/2017	Supervised classification
Week-25	14/05/2017	Unsupervised classification

### 19. Examinations:

**1. Compositional:** In this type of exam the questions usually starts with Explain how, What are the reasons for...?, Why...?, How....?

With their typical answers

Examples should be provided

### 2. True or false type of exams:

In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided

### 3. Multiple choices:

In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.

### 20. Extra notes:

Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.

### 21. Peer review

### پیداچونہوہی ھاوہل

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم كۆرسىبووكە دەئىتت لەلایەن ھاوئىكى ئەكادىمىيە سەير بكرىت و ناوئوكى بابەتەكانى كۆرسەكە پەسەند بكات و جەند ووشەيك بنووسىت لەسەر شىاوى ناوئوكى كۆرسەكە و واژووى لەسەر بكات. ھاوئەل ئەو كەسەكە كە زانىارى ھەبىت لەسەر كۆرسەكە و دەبىت پلەى زانستى لە مامۇستا كەمتر نەبىت.