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**Department of … Field Crops**

**College of ……Agriculture**

**University of …Salahaddin University-Erbil**

**Subject: …Remote Sensing and GIS**

 **Course Book for 3rd year**

**Lecturer's name: Mr Fuad Mohammad Ahmad**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | First semester\ Autumn Semester |
| **2. Lecturer in charge** | **Fuad Mohammad Ahmad** |
| **3. Department/ College** | **Forestry / Agriculture** |
| **4. Contact** | **e-mail: fuad.ahmad@su.edu.krd****Tel: 07503273848** |
| **5. Time (in hours) per week**  | **Theory: 1 (2hr)****Practical: 2 (3hr)**  |
| **6. Office hours** | **Availability of the lecturer to the student during the week** 2hr\day |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **B.Sc in Plant Production, college of agriculture, Tikrit university, 1999.****MSc. In Remote Sensing and GIS, Soil and Water department, Salahaddin University-Erbil, 2009**  |
| **9. Keywords** |  |
| **10. Course overview:** The aim of the course is to introduce students to the ways in which remote sensing systems are used to acquire data, how these data may be analyzed and how the information is used in studies of the natural and human environments. At the end of the course, students should have a good knowledge of the different types of remote sensing imagery that are available and the analysis procedures used for studying specific environmental problems. Students should also be capable of undertaking basic computer-assisted image analysis and producing thematic images |
| **11. Course objective:**1. Provide students with an understanding of the importance of Geo-information2. Introduce students to some practical applications of Remote Sensing to problems in agriculture and environmental quality.Students should acquire a good understanding of the concepts above. They should be able to show their mastery of them in oral and written form, in lecture, in the remote sensing laboratory and in exams. |
| **12. Student's obligation**When they have finished the course, students will have been introduced to a working knowledge of remote sensing techniques  |
| **13. Forms of teaching**Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and definitions. Computer Remote Sensing software will be used to learning how they can use the tools of remotely sensed data. |
| **14. Assessment scheme**I will give two examinations before the final one. The grade is distributed among the theoretical examination,(70%), three quizzes (15%) and class activity(10%). ‌Finally we take the mean of two or three examination and group project: 25%Practical Examination 15%Final examination: 60% |
| **15. Student learning outcome:**Remote Sensing is relatively modern science. Students need to be able to understand both the concepts presented as well as have a basic understanding of the factual nature of the course. In order to achieve that goal, feedback will be given on questions asked in lecture and laboratory, exams and on the final laboratory report in as prompt fashion as possible so that the students will always understand how they stand. These will consist of lectures, laboratory demonstrations, laboratory work , reading assigned scientific papers, writing a final laboratory report and answering those questions that are asked in lecture and Remote Sensing laboratory. Initiative on the part of each individual student in asking pertinent questions and inviting conversation on related outside topics will be noted in the final grade. Selected articles; resource texts and reserve library materials may be assigned as required |
| **16. Course Reading List and References‌:**▪ Key references: J. R. Jensen, 2012. Remote Sensing of the Environment: An Earth Resource Perspective. Upper Saddle River, NJ, Prentice Hall. 544 pp.▪ Useful references:1. Remote Sensing: Principles and Interpretation by Floyd F. Sabin (Freeman, 2010, 494p.)
2. Introductory Digital Image Processing: A Remote Sensing Perspective by John R. Jensen (Prentice Hall, 1996; 318 p.)

▪ Magazines and review (internet):1. International Journal of Remote Sensing
2. GIS Sciences and Remote Sensing
3. http://www.fs.fed.us/eng/rsac/
4. <http://landsat.usgs.gov/index.php>
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| **17. The Topics:** | **Lecturer's name** |
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| Weeks | Subjects | Notes |
| 1st. | Remote Sensing-An Introduction | * Characteristics and Components of a Remote Sensing System
* Types of Remote Sensing
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| 2nd. | Electromagnetic Radiation (EMR) Principles | * Remote Sensing and Electromagnetic Radiation “EMR”
* The Electromagnetic Spectrum (EMS)
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| 3nd. | Energy-Matter Interaction | * Proportion of energythat is transmitted, reflected or absorbed depends
* EMR-Atmosphere Interactions
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| 4rd. | Photographs and Images | The detection of electromagnetic energy can be performed either photographically or electronically. Photographic systems are relatively simple and inexpensive. |
| 5th. | Image Resolution Types  | *Image resolution* describes the details in an [image](http://en.wikipedia.org/wiki/Image) holds. The term applies equally to [digital images](http://en.wikipedia.org/wiki/Digital_image), film images, and other types of images |
| 6th. | Satellite Orbits &Electro-optical Sensors | *Satellite* is an artificial object which has been intentionally placed into orbit. Such objects are sometimes called artificial satellites to distinguish them from natural satellites such as Earth's Moon |
| 7th | Electro-optical Sensors | *Electro-optical sensors* use non-film detectors. In contrast, photographic cameras record radiation reflected from a ground scene directly onto film. |
| 8th | Image Interpretation and Analysis | Interpretation and analysis of remote sensing imagery is the *identification* and/or *measurement* of various *targets* in an image in order to extract useful information about them. |
| 9th | Color Composite Images | In displaying a color composite image, three primary colours (Red, Green and Blue) are used. When these three colors are combined in various proportions, they produce different colors in the visible spectrum |
| 10th | Digital Image Processing *“DIP”* | After data is collected and transmitted to the ground station, it must be *processed* and *converted* into a format that is usable by the researcher who will interpret the data. |
| 11th | **Spatial Filtering** | Spatial filters are used to suppress 'noise' in an image, or to highlight specific image characteristics. |
| 12th. | Techniques for Multispectral Image Analysis | We can perform mathematical operation on multi-spectral bands. In general, addition and multiplication operators tend to enhance *correlated* information between bands, while subtraction and division operators tend to enhance *uncorrelated* information between bands. |
| 13th | Tasseled Cap Transformation on Landsat TM(ETM) | Four separate images can be created based on the application of Tasseled Cap transformation on sixnon-thermal bands of Landsat TM data: scene brightness, vegetation greenness, surface wetness, and atmospheric haze. |
| 14th | Field Data | Field data consist of observations collected at or near ground level in support of remote sensing analysis |
| **15th** | **Remote Sensing-Systems-Applications-Examples** |  |

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| **18. Practical Topics (If there is any)** |
| **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 answersExamples 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. |