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**Department of Earth Sciences and Petroleum**

**College of Science**

**University of Salahaddin-Erbil**

**Subject: Practical Remote Sensing**

**Course Book 2nd stage Earth Sciences and Petroleum**

**Lecturer's name MSc. Kaiwan K. Fatah**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Practical Remote Sensing** |
| **2. Lecturer in charge** | **Kaiwan Kareemkhan Fatah** |
| **3. Department/ College** | **Geology/ Science** |
| **4. Contact** | **e-mail:** **k1geors@gmail.com** **,** **kaiwan.fatah@su.edu.krd****Tel: 07504096074** |
| **5. Time (in hours) per week**  | **For example Theory: 2** **Practical: 8**  |
| **6. Office hours** | **9am-2pm**  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  |  **B.Sc. Salahaddin university-Erbil college of Science Dep. Of Geology 2011 Erbil -Iraq** **M. Sc. Southampton University faculty of Sciences 2015 Southampton- UK** **PhD student** **General specialization Geology****Specific specialization Applied GIS and Remote Sensing** |
| **9. Keywords** | **Remote Sensing, Geology, Environmental Science and ENVI**  |
| **10. Course overview:** The course will cover the basic of the remote sensing and its application in various areas, for example, using remote sensing in geology, environmental Sciences and hydrology. The course will apply ENVI software and Stereoscopes with regarding aerial photos and satellite images for studying geological and environmental sciences. It also to teach students to be familiar and how to use the software especially ENVI and deal with some basic tools, and how to deal with different type of digital spatial data. |
| **11. Course objective:**This course is for students who have no previous experience in remote sensing, aiming to initiate students to the fundamentals of remote sensing by providing the theory and hands-on experience with real data and using software. To determine the fundamental geology and environmental geology by using software and digital data. |
| **12. Student's obligation** The student should attend all labs, prepare each lab report and submitting assignments in **the time.**  |
| **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 and typical data, and the main teaching object: using some basic tools of software to analysis satellite images and Appling in different aspect  |
| **14. Assessment scheme**The students are required to do two closed book practical exam at the mid and end of the semester. The exams have 5.0 marks and the average of these exams is obtained, the attendance, classroom activities and weekly report 2.5 marks. There will be a final practical exam on 7.5 marks. So that the final grade will be based upon the following criteria:Mid-semester Practical exam: 6.5%Average of them 13%+ End-semester Practical exam: 6.5%  Laboratory participation and weekly report 5% Assignments 10%Attendance 3%Homework 4 %  total: 35% |
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| **15. Course Reading List and References‌:**1. Sabins, F.F. (1997). Remote Sensing: Principles and Interpretation, 3rd ed. New York: W. H. Freeman & Co. (G70.4.S15 1997)
2. Application of aerial photo interpretation in Geology, Shiv. N. Pandey
3. Lilles and Kiefer. 1976. Remote Sensing and Image Interpretation. John Wiley and Sons, New York.
4. Campbell, J. and Wynne, R. (2011). *Introduction to Remote Sensing*. 5th ed. United States: Guilford Publications.
5. Different internet websites which is given during labs because there are changeable.
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| **16. The Topics:** | **Lecturer's name** |
| *Week1:* ***3DVisualization by using Pocket Stereoscope*.***Weeks 2:* **Studying Aerial Photos and Image Interpretation by Using Pocket and Mirror Stereoscopes with regards to recognitionElements**. **(Assignment 1)***Week 3:* **An introduction to ENVI software.** *Week4:* **Types of spatial data.****(Assignment 2)***Week 5:* **Radiometric calibration.***Week 6:* **ENVI for Extracting spectral reflectance for land classes**. **(Assignment 3)***Week 7:* **An introduction to GPS.** *Week 8:* **Band Combinations from ENVI.** **(Assignment 4)** *Week 9:* **Band Ratio from ENVI** *Week 10:* **Remote Sensing Indexes.** *Week 11:* **ENVI for calculating Temperature from satellite image.** *Week 12:* **ENVI for Extracting slope and aspect from DEM data (raster) and deal with properties of data.** **(Assignment 5)***Week 13:* **ENVI for land cover classification unsupervised classification.***Week 14:* **ENVI for land cover classification supervised classification.** *Week 15:* **Change detection**   **(Assignment 6)**   **Examination.** | 2 hrs per each labKaiwan Kareemkhan Fatah |
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| **17. Examinations:A** **Q1/ Q1/Choose the correct answer for the following statements? (30 marks)** 1. 1- A band combination which is good for agricultural studies. Healthy vegetation shows in bright green colour.

**A.**  A.(4,5,3) **B.** (7,5,4) **C.** (5,4,1)1. 2. The band ratio which is useful for observing differences in water turbidity.

**A. A.(**3/7) **B. (**3/1) **C.** (5/7)1. 3. Which band of Landsat ETM+ is used for computing temperature?

**A.**  A. band3 **B.** band6 **C.** band41. 4. At least how much side overlapping requires for seeing stereo-pairs in 3D.

**A.**  A. 25 **B.** 60 **C.** 401. 5. It is the band combinationwhich is used for Separation of urban and rural land uses.

**A.**  A. (7,4,2) **B.** (7,3,1) **C.** (5,4,3)1. 6. Satellites are arranged into how many orbital planes in GPS system.

**A.** A. 5 **B.** 4  **C.** 61. 7. The band ratio which is used for enhancing the vegetation and water bodies.

**A. A. (**4/2) **B. (**2/1) **C.** (4/3)1. 8. Water has high absorption and virtually no reflectance in which wavelengths range and beyond.

**A.** A.Blue **B.** NearInfrared **C.** Red 1. 9. Average focal length of modern camera of aerial photo equal

AA. 172mm **B.** 162mm **C.** 152 mm1. 10. It is ''false colour'' combination. Vegetation shows in Red.

**A.**  A. (4,5,7) **B.** (4,3,2) **C.** (7,4,2)**(N Note**: all band ratios and combinations have been done on landsat7 (ETM+)**)** **Q2/ Q2/A/ What are the main accuracy problems in GPS? (15 marks)**1. **2.**
2. **4.**

**Q2/ Q2/B/ Draw the spectral reflectance curve of Vegetation OR Soil and Fill blanks by name of the curve, Y and X axes? (15 marks)****C:\Users\BAWAR CENTER\Desktop\Picture12.gif****Q3/**  Q3/ Calculate the NDVI and NDWI for both types of land covers respectively, If it is known that **type A** reflects 6 % in in red band, and reflects 60 % in near-infrared band, while **type B** reflects 10 % in near-infrared band, and ct reflects 70 % in greenband? And give your comment on the results? **(20 marks)** **Q4/ Q4/ Answer the following questions? (20 marks)**E:\Remote Sensing geo 2017-2018\q\images (2).jpg C:\Users\BAWAR CENTER\Desktop\gg.jpg F:\remote practical LABAKANIMN HAMOI\aeril photogrspyh\11_tech_aerial_1_pop.jpg**E****C****A****B**21**D**111. 1. Name the feature which is circled in the aerial photograph **A**, and which element has been used for identifying the feature?
2. 2. Name the features which are pointed in the aerial photograph **B**, and which element has been used for distinguishing the features?
3. 3. Mention the name of feature which is circled in aerial photograph **C**, and which element has been used for identifying the feature?

4. Name the feature which is seen in the aerial photograph **D,** and which element has been used for identifying the feature? **Kaiwan Kareemkhan** **MSc. In Applied GIS & RS**1. 5. Mention the type of aerial photograph **E**.
2. **17. Examinations:B**
3. **Do the following tasks and save them in the given folder on desktop by using ENVI software.**
4. **Combine band 7, band 4 and band 2, and save it as BC.**
5. **Find the ratio of band 3 over band 1 and save it as BR.**
6. **Calculate NDVI and save it as NDVI.**
7. **Collect spectral reflectance for ONE land cove and save it in pdf file format as a SR.**
8. **Create 2D scater plot.**
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