**Salahaddin University**

**College of Science**

**Earth science and Petroleum department**

**2nd grade**

**Remote Sensing Course Book**

**By:**

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Bachelor Degree in Geology, Salahaddin University, Erbil - 2005

High Diploma in Remote Sensing and GIS, ITC Institute, the Netherlands - 2009

Master degree in Remote Sensing, Salahaddin University, Erbil – 2014

PhD in Remote sensing and GIS - 2022

Syllabus: 2022 - 2023

**Instructor:**

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**Objectives:**

* The objective of this course is to familiarize about the principles of remote sensing and the data acquisition and analysis of satellite data.
* This course introduces students to find out how pictures of the earth's surface are recorded from aircraft and satellites.
* Students gain an understanding of "common" Remote Sensing products such as earth resources, satellite images, aerial photographs as well as more sophisticated research tools such as RADAR and multispectral scanner systems.
* Survey the various types of remote sensing data that are available on web sites, and gain an understanding of the uses and applications as well as the limitations of each type.

**Mobile and social media:**

Cellular telephones and pagers must be turned off during class and labs. You shouldn’t be texting, chatting, snapping, facebooking, or doing basically any form of procrastination. Failure to comply can result in a respectful request for you to leave the class so as to not bother others and/or extra assigned projects on modern communication technology. Cell phones should be turned off during any meeting. Please learn this professional behavior early and save yourself a great deal of embarrassment in the working world.

**Attendance:**

You are expected to attend every class session and every lab. Your grade will depend on your attendance and participation. This is very much a hands-on class. Many of the activities and assignments depend on your participation and group work. Your classmates are counting on you! Activities, demonstrations, lectures, quizzes, and labs will not be repeated and there will be no “make ups” accepted without a very good reason.

**Reference lists:**

1. [Principles of remote sensing: an introductory textbook](http://www.itc.nl/library/papers_2009/general/PrinciplesRemoteSensing.pdf), By K. Tempfli (editor), G.C. Huurneman (editor), W.H. Bakker (editor), L.L.F. Janssen (editor), W.H. Bakker, W.F. Feringa, A.S.M. Gieske, K.A. Grabmaier, C.A. Hecker, J.A. Horn, G.C. Huurneman, N. Kerle, F.D. van der Meer, G.N. Parodi, C. Pohl, C.V. Reeves, F.J.A. van Ruitenbeek, E.M. Schetselaar, M.J.C. Weir, E. Westinga, T. Woldai.Fourth edition, Enschede, ITC, 2009. 284 pages, ITC Educational Textbook Series; 2ISBN 978-90-6164-270-1
2. Lillesand, T. M. and Kiefer, R. W. (2004). Remote Sensing and ImageInterpretation, 5th edition. (John Wiley and Sons), ISBN 0-471-15227-
3. Gibson, P.J (2000). Introductory Remote Sensing: Principles andConcepts (Routledge), ISBN 0-415-19646-9
4. Jensen, J. (2000) Remote Sensing of the Environment: An EarthResources Perspective, Amazon Publishers, ISBN #
5. Sabins, F.F (1996). Remote Sensing: Principles and Interpretation, 3rded, (W H Freeman & Co), ISBN # 0-7167-2442-1
6. Different sources from internet.

**Journals / Periodicals:**

1. International Journal of Remote Sensing.

2. Remote Sensing of Environment Journal.

3. Photogrammetric Engineering & Remote Sensing Journal

4. Geo Carto International Journal.

5. Asian Pacific Remote Sensing Journal.

**Course Content:**

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| **Lecture #** | **Briefing** |
| **1** | Definition and overview of Remote sensing history and evolution of Remote Sensing and Remote Sensing applications. |
| **2** | Electromagnetic Radiation, Terms and Definitions, Laws of Radiation, EM spectrum, Sources of EMR. Interaction between EM radiation and matter, Reflection, Absorption, Scattering and Transmission. |
| **3** | Remote Sensing Systems – Active and Passive Systems, imaging and non-imaging systems, concept of Resolutions in Remote Sensing – Spatial, Spectral, Temporal and Radiometric. |
| **4** | Spectral Reflectance Curve |
| **5** | Aerial photographs from Aircraft – definitions, principles and characteristics of Aerial photo. |
| **6** | Orbits and Platforms for Earth Observation. Temporary and Stationary platform, Geostationary, sun-synchronous satellite, Landsat satellite, 1st and 2nd generation, main characteristic for each generation, |
| **7** | Earth Observation Satellites (Landsat, ASTER, SPOT, rapidEye, sentinel, GeoEye, Quickbird and IRS) and their properties. |
| **8** | Exam |
| **9** | Principles of Thermal Remote Sensing including its uses. |
| **10** | Principles of Microwave Remote Sensing |
| **11** | Digital Image Classification |
| **12** | Image Enhancement and Visualization |
| **13** | Review |

**Learning Outcomes:**

When you have completed this course, you will be able to:

* Explain the principles of remote sensing and the technical characteristics and constraints of Earth Observation missions
* Design, implement and critically evaluate methods of digital image processing ranging from preprocessing to image classification, field data collection and accuracy assessment
* Generate geographical information by processing digital remotely sensed data.