***Draft Document***

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| **Module title** | **Remote Sensing and Image Analysis** |
| **Responsible teacher** | **Dr. Artak Piloyan** |

This course provides an introduction to the use of remotely sensed data within the concept of Digital Earth. Remote sensing is the science of acquiring data using techniques that do not require actual contact with the object or area being observed. The different sensors used to collect this information, and the interpretation techniques vary quite widely, and are being developed at an astounding rate. In this course, we will focus on the interpretation and applications of data from spaceborne imaging systems (eg: Landsat MSS, Landsat TM, Landsat OLI/TIRS, Sentinel 2, MODIS, AVHRR, SPOT and etc.).

The number of disciplines that utilize remotely sensed data continues to increase. Geologists, geographers, climatologists, and ecologists have all adapted remote sensing techniques to their respective research. We will briefly discuss many different uses of remotely sensed data, **but focus on natural resources management and environmental applications**.

In this course you will learn about the fundamentals of Remote Sensing theory and technologies through the use of problem solving and spatial thinking skills. The approach used in this course is **problem-based learning** applied to spatially explicit problems. These concepts are essential to the use of RS. It is supposed that students will develop your own analytical skills by addressing real-world problems within the spatial framework of RS. The specific objectives of this course are to:

1. **process remotely sensed data to make it useful in geographic information systems;**
2. **perform image enhancement on remotely sensed imagery;**
3. **extract information from remotely sensed data using a variety of manual and automated techniques;**
4. **critically assess the strengths and weaknesses of remote sensing instruments and platforms for a variety of application scenarios;**
5. **develop multi-step remote sensing workflows to solve problems in a variety of application areas;**
6. **apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate remote sensing data and processing methods.**
7. **clearly and concisely communicate findings from the analysis of remotely sensed data through the written word and graphical products**.

This course in Remote Sensing and Image Analysis, often called Remote Sensing, will prepare students for jobs within this explicit field. Remote Sensing is used by image analysts for environmental consulting and in a wide variety of government jobs (e.g. Ministry of Environment, Cadastre Committee, Ministry of Emergency Situation, etc.). Students will also gain skills applicable in an array of fields, such as environmental science, ecology, urban and regional planning, business, public health, and climatology.

The format of this course will involve weekly lectures, readings and practical associated assignments, focused on fundamental topics and theory. Weekly activities will also be assigned based on interactive assignments, feedback and other learning activities. Laboratory sessions will be designed to provide hands-on experience in the processing and interpretation of remotely sensed information. This is where students will apply the fundamentals of what they have leant about remote sensing to the practicalities of undertaking these analyses. The hands-on labs are the critical piece of this course and this is what allows students to market themselves as an image analyst, with hand-on experience, and a sample project/portfolio of work.

The course will be composed of 8 modules:

1. **Electromagnetic radiation (EMR) and Sensors**
2. **Remote Sensing system Platforms and sensors**
3. **Geometric aspects of imagery**
4. **Image visualization and enhancement**
5. **Radiometric and atmospheric corrections**
6. **Vegetation indexes**
7. **Digital image classification**
8. **Accuracy assessment**

The course assumes 3 topics for laboratory and practical assignments:

1. **Change detection in Urban areas**
2. **Tracking forest biomass**
3. **Assessment of the quality and quantity of inland water bodies**