Example Syllabus: Introduction to Remote Sensing – GST 105

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COURSE DESCRIPTION:

This course is an introduction to remote sensing of the Earth. Topics include the physical principles on which remote sensing is based, history and future trends, sensors and their characteristics, image data sources, and image classification, interpretation and analysis techniques.

PREREQUISITES: Introduction to Geospatial Technology or consent of instructor; college algebra highly recommended.

COMPUTER LAB REQUIREMENT: Multicore processor with 8GB RAM and >100GB Hard Drive or external data storage; Broadband Internet connection and professional grade remote sensing software.

STUDENT LEARNING OUTCOMES (SLOs):

1. Describe basic physics concepts on which remote sensing is based (i.e. Electromagnetic Spectrum, etc.)
2. Describe the fundamentals of Photogrammetry
3. Select appropriate data set for remote sensing application based on spectral, temporal, radiometric and spatial resolution.
4. Describe characteristics of passive and active remote sensing systems (such as multispectral, LiDAR and Radar).
5. Perform basic remote sensing workflows to solve problems (such as acquiring data, feature extraction, change detection, pre- and post-processing, create composite images and image classification).
6. Describe future trends in remote sensing.
7. Apply basic concepts, methods and uses of accuracy assessment and ground truthing to the results of remote sensing workflows.
8. Interpret, analyze and summarize results of a remote sensing workflow.

COURSE OUTLINE AND RESOURCES:

Specific material/exercises/data/exams are at the discretion of the developer and are offered as samples; not mandatory components in the course. Our objective is to provide as complete a model course outline as possible without being too prescriptive on the precise course content. It is expected faculty that adopt these outlines will modify the material to meet their own local industry needs.

*Refer to the GST101: Introduction to Geospatial Technology Model Course Outline for unit alignment with the Geospatial Technology Competency Model

Units	Unit Objectives
1. What is Remote Sensing?	Students will understand the concept of remote sensing and its applications. Students will list different types of remotely sensed data and sensor systems and describe the history and future directions of remote sensing. (SLO 1,4,6)
2. Physical Foundations	Students will investigate and understand the physics principles on which remote sensing is based such as the electromagnetic spectrum, reflection and absorption. Students will understand the physical differences between active and passive remote sensing systems and will open and view data in a remote sensing application. (SLO 1, 4)
3. Elements of Photogrammetry	Students will use photogrammetric concepts such as scaling, resolution to interpret aerial photography. Students will understand calibration, rectification and orthorectification. (SLO 2)
4. Satellites and Sensor Platforms	Students will understand how remote sensing systems work and how their characteristics impact remotely sensed data. For example students will be able to quantify how orbital characteristics, such as polar orbit compared to a Geostationary Earth Orbit (GEO), of a satellite based sensor system such impact the spatial, temporal and other resolution characteristics of remotely sensed data. (SLO 4, 6)
5. Remote Sensing and Image Classification	Students will perform image classification techniques such as supervised and unsupervised classification on remotely sensed data. (SLO 3, 5,7, 8)
6. Remote Sensing Workflows	Students will complete remote sensing workflows to create products. Students will acquire and preprocess data from specified sources for use in the creation of data products such as composite images or image classifications. Students will interpret, analyze and summarize their results. (SLO 3,5,8)
7. Accuracy Assessment	Students will perform accuracy assessment on the products of remote sensing workflows. Students will incorporate accuracy assessment results into their interpretation and analysis of workflow outputs. (SLO 3,5,7, 8)
8. Final Project (OPTIONAL)	Solve a problem using remote sensing focused geospatial technology from goals and data acquisition to analysis and processing to cartographic presentation and publishing. (SLO 1, 2, 3, 4, 5, 6, 7, 8)

METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

I. Quizzes
II. Lab Exercises
III. Tests
IV. Final Project

METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Lecture Discussion
* Learning Modules
* Audio-Visual
* Collaborative Learning
* Lecture-Lab Combination
* Computer Assisted Instruction

REQUIRED TEXTS AND SUPPLIES:

1. Reading materials may include, but are not limited to:
    a. TEXTBOOKS:
        i. Introduction to Remote Sensing, 5th Edition Campbell and Wynne, ISBN: 978-1609181765
        ii. Remote Sensing of the Environment: An Earth Resource Perspective, 2nd Edition, Jensen, ISBN: 978-0131889507

    b. MANUALS:
        i. GeoTech Teaching Resources, http://www.geotechcenter.org

    c. PERIODICALS:
        i. ESRI ArcNews, http://www.esri.com/news/arcnews/index.html
        ii. ESRI ArcUser, http://www.esri.com/news/arcuser/index.html

    d. OTHER:

2. SOFTWARE: Access to professional grade remote sensing software.

3. SUPPLIES: Computer with an internet connection. Access to GPS receiver.

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