Contents of Remote Sensing Course
Fall Semester / 2022-2023
Grade 4

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References recommended for this course :

1- Campbell, J. B. 2002 “Introduction to Remote Sensing”; 3rd edition, New York, USA.

2- Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. 2008 “Remote sensing and Image Interpretation”; 6th edition, London, UK.

Course Structure

- **Lecture**

Two-hours period lecture per week, students are encouraged to take careful notes based on lectures. These should include noting remote sensing referenced in class, key concepts and definitions, core concepts related to data gathering, image interpretation and image analysis.

- **Lab**

The lab exercises are aimed at reinforcing core concepts, themes, and skills introduced through the lectures and readings.

Students will engage in hands on experiences that involve:

1- analysis of remotely sensed images,

2- use of web-tools to learn concepts related to remote sensing applications,

3- organizing and visualizing spatial information.

Students will also complete:

1- computer based assessments,

2- lab reports, and

3- web search during their lab sections.

- Labs will be implemented by the graduate research assistants involved in the instruction of this course.

- Each lab will begin with a brief explanation of the lab assignment by the TA, including an overview of the learning objectives and materials, The remaining portion of the lab will devoted to completing the lab assignment.

Part I: Foundations

1- History and scope of remote sensing

- definitions
- overview of remote sensing process
- key concepts of remote sensing

2- Electromagnetic radiation

- the electromagnetic spectrum
- radiation laws
- Interactions with the atmosphere
- three models for remote sensing

Part II: Image Acquisition

1- Photographic sensors

- the aerial camera
- Geometry of the vertical aerial photograph
- Coverage by multiple photographs
- Digital photogrammetry
- sources of aerial photography
- review questions

2- Digital data

- electronic imagery
- Spectral sensitivity
- data formats
- equipments for digital analysis
- image processing analysis
- review questions

3- Image interpretation

- the context of image interpretation
- Elements of image interpretation
- Image interpretation strategies
- Image interpretation keys
- image interpretation equipment
- interpretation of digital imagery
- review questions

4- Active Microwave and LIDAR

- active microwave
- geometry of the radar image
- Wavelength and Polarisation
- interpreting brightness values
- Satellite imaging radars
- LIDAR
- review questions

5- Thermal radiation

- thermal detectors
- thermal radiometery
- microwave radiometers
- thermal scanners
- thermal properties of objects
- geometry of thermal images
- heat capacity mapping

6- Image resolution

- definitions
- target variables
- system variables
- measurement of resolution
- spatial and radiometric resolution
- Interactions with the landscape

History and Scope of Remote Sensing

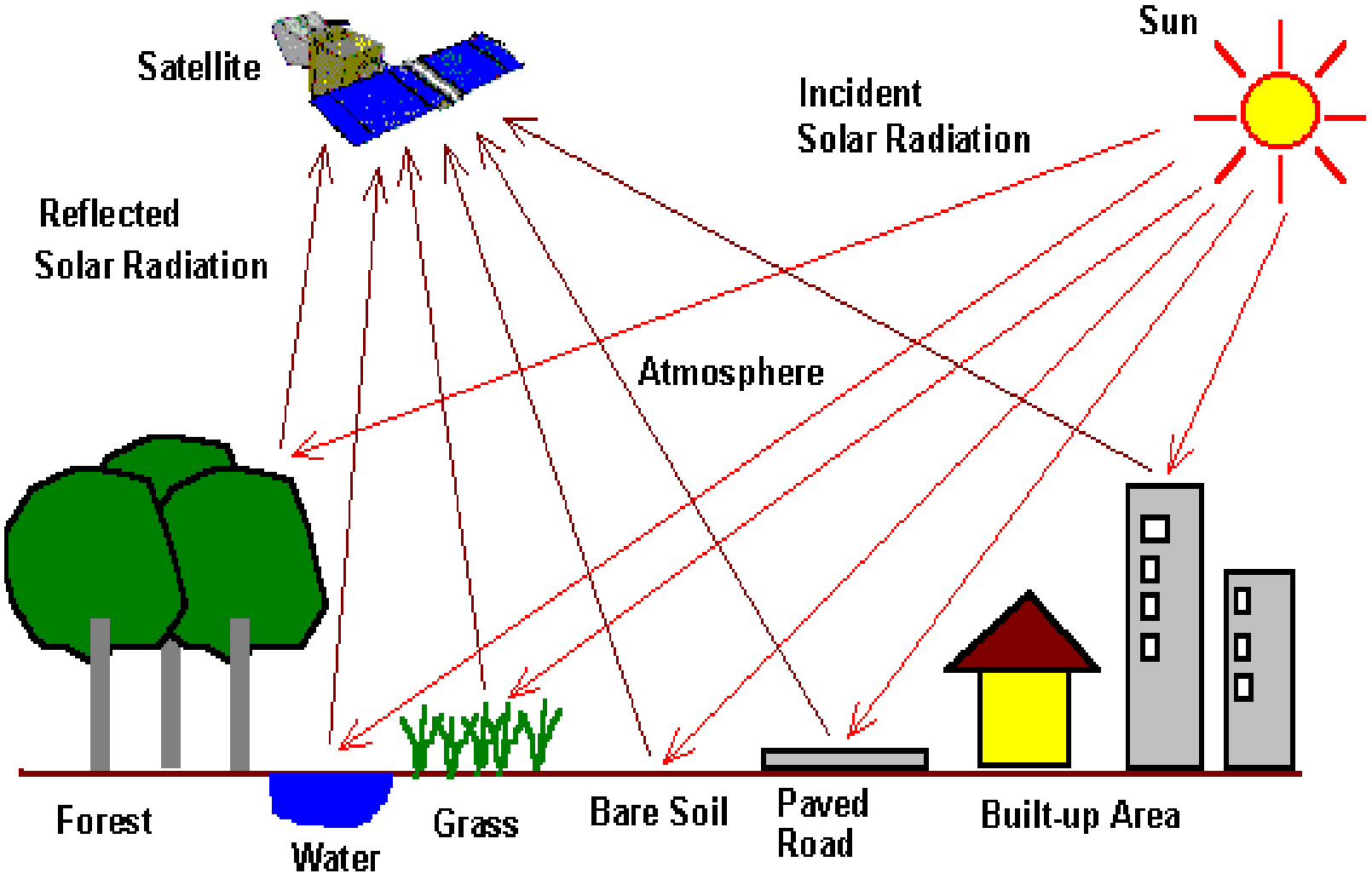
- A picture is worth a thousand words.
- It convey information about (positions, sizes, and interrelationships between objects).
- e.g. Your personal pictures, what is the concept of taking a photo for you ?
- easily can identify the main concept as “gathering of information at a distance”
- however, this is a broad definition ! Need to refine it.

Remote Sensing discussed here is related to observations of:

- Earth's land and water surfaces
- By means of reflected or emitted electromagnetic energy.
- using an instruments that present information in an image format.

- In 1960-1970, first use of term “remote sensing”
- Many definitions of remote sensing have been published since that time.
- For our purposes, Remote Sensing is

“the practice of deriving information about the earth’s land and water surfaces using images acquired from an overhead perspective, using electromagnetic radiation, reflected or emitted from the earth’s surface”.


Satellite
Sun
Incident
Solar Radiation
Reflected
Solar Radiation
Atmosphere
Forest
Water
Grass
Bare Soil
Paved
Road
Built-up Area