**Remote Sensing for Agriculture, Rangelands, and Forestry 1-2-4028**
**3 credits**

**Syllabus:**

Throughout the course the students will be exposed to remote sensing principles, techniques, and applications with emphasis on vegetation. The course is specially designed for students from the all earth- and environment-related disciplines.

Student evaluation: exercises (50%), exam (50%).

Main topics:

1. **Introduction and fundamental terms** – remote sensing definition, analog and digital data, the multi-concept, unique applications, historic landmarks.
2. **Physical background** – unites, electromagnetic spectrum, wave theory, quantum theory, Stephan-Boltzmann's Law, Wien's Displacement Law, Plank law.
3. **Radiation interaction with the atmosphere and with the Earth** – absorptance, transmittance, reflectance, radiation balance equation, the atmosphere, scattering.
4. **Analog remote sensing** – films and colors.
5. **Spectral signature of ground features** – vegetation, soils, rocks, water, snow, clouds.
6. **Pixel and image characteristics** – the pixel, radiance to DN, the image structure, resolutions (spatial, radiometric, spectral, temporal), conversion of DN to radiance, radiance to reflectance.
7. **Vegetation indices** – simple ratio, NDVI, SAVI, ARVI, EVI, red-edge.
8. **Mixed pixels**.
9. **Bidirectional reflectance**.
10. **Principles of spectroscopy**.
11. **Satellites** – classification, Meteosat, NOAA-AVHRR, Landsat, Spot, VENµS.
12. **Radar** – principles, spatial resolution, synthetic aperture, factors affecting back scattering (topography, roughness, dielectric constant, soil moisture, volume scattering), polarization.
13. **Radar interferometry** – simple and differential.
14. **LiDAR**
15. **Image processing basics** – image enhancement, digital filters, geometric corrections, atmospheric corrections, edge detection, classification, colors.

Reading material:

1. Lillesand, T.M., Kiefer, R.W. and Chipman, J.W. 2008. Remote Sensing and Image Interpretation (6nd edition). John Wiley and Sons.

2. Campbell J.B. 2008. Introduction to Remote Sensing (4th edition). London: Taylor & Francis.