PRINCIPLES AND APPLICATIONS OF REMOTE SENSING

- Basic principles of remote sensing
  Active and passive sensors, remote sensing from ground and aerial, satellite remote sensing, categories of satellites, technical characteristics of operation, orbits, resolutions.

1. Remote sensing of the atmosphere by Radar (Mechanisms of propagation in the radio frequency spectrum. Principles of Radar)
2. Propagation of electromagnetic waves (Meteorological factors determining the index of refraction. Simple refraction. Curvature of ray paths relative to the earth.
3. Nonstandard refraction. Meteorological conditions associated with nonstandard refraction)
4. Radar detection of particles (Radar equation. Backscattering by small spherical water or ice spheres. Complex index of refraction. Range of Rayleigh backscattering. Effective radar reflectivity factor. Backscattering by melting spheres and nonspherical particles)
5. Attenuation of radio waves (Attenuation by atmospheric gases, hydrometeors, clouds, rain, snow and hail)
6. Use of Radar for precipitation measurements
7. Remote sensing of the atmosphere by Laser (Principles of Lidar. Lidar equation. Use of Lidar)

- Spectrum in the visible, near-middle and thermal infrared

1. Introduction (spectral distribution, spectral signatures, model atmosphere, line by line and band models for transmittance).
2. Satellite meteorology – climatology (cloud and fronts recognition, low and high pressure systems, depressions, distribution of temperature and atmospheric gases with altitude, etc.)

- Digital image processing (atmospheric-radiometric and geometric correction, contrast stretch, unsupervised/supervised classification, etc.)

- Remote sensing application for:
1. Urban environment (land use/land cover, land surface temperature, urban heat island, energy budget, urban form, urbanization trends, thermal comfort, cooling and heating degree days, etc.)
2. Marine and coastal environment (sea surface temperature, chlorophyll concentration, sea currents, etc.)
3. Natural disasters and extreme weather events
4. Forested and agricultural environment

- Laboratory for photo interpretation of satellite images (visible, thermal

infrared, water vapour channels)
- Laboratory for digital image processing of satellite images
- Geographic Information Systems (GIS)
- International remote sensing programs for the environment and climate