54. Advanced Remote Sensing (PH049IU)

Module designation	*This course provides knowledge and skills of digital image processing for extracting environmental information from satellite and airborne imaging systems. Applications of pre-processing, enhancement, classification, and modeling image processing routines are for environmental monitoring, modeling, and management, and applicable for biological, terrestrial, atmospheric, and oceanic sciences.*
Semester(s) in which the module is taught	1, 2
Person responsible for the module	Dr. Phan Hiền Vũ
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, lesson, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/4.62 ECTS
Required and recommended prerequisites for joining the module	Previous course: Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)

Module objectives/intended learning outcomes	Upon the successful completion of this course students will be able to:	
	Competency level	**Course learning outcome (CLO)**
	Knowledge	CLO1. Develop applications of remote sensing in natural disasters and environmental pollution.
	Skill	CLO2. Experiment remotely sensed data for monitoring natural hazards and environment, such as drought, flooding, sea level rise, air pollution, urban expansion, etc.
	Attitude	CLO3. Show the impact of remote sensing techniques for disaster risk and environmental management, and sustainable development.

Content	*The description of the contents should clearly indicate the weighting of the content and the level.*
	Weight: lecture session (3 hours)
	Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Chapter 1 Remote sensing and digital image processing	1	T
Chapter 2 Remote sensing data collection	1	T, U
Chapter 3 Digital image processing hardware and software	1	T, U
Chapter 4 Image Quality Assessment and Statistical Evaluation	1	T, U
Chapter 5 Display Alternatives and Scientific Visualization	1	T, U
Chapter 6 Electromagnetic Radiation Principles and Radiometric Correction	1	T, U
Chapter 7 Geometric Correction	2	T, U
Chapter 8 Image Enhancement	1	T, U
Chapter 9 Thematic Information Extraction: Pattern Recognition	1	T
Chapter 10 Information Extraction Using Artificial Intelligence	1	T
Chapter 11 Change Detection	2	T, U
Chapter 12 Remote Sensing–Derived Thematic Map Accuracy	2	T, U

Examination forms	Short-answer questions
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	**Textbooks:** [1] Jensen, J.R, *Introductory digital image processing: a remote sensing perspective*, 4th edition, Pearson, 2015. **References:** [2] Q. Weng, *Advances in environmental remote sensing: sensors, algorithms, and applications*, CRC Press (2011). [3] W.G. Rees, *Physical principles of remote sensing*, Cambridge University Press (2012).