TITLE OF THE Curricula/Module

REMOTE SENSING APPLICATIONS (METHODICAL INSTRUCTION ON PRACTICE)

TIIAME/Uzbekistan

March, 2020

Template of the Curriculum/Module Description

Short Name of the University/Country code Date (Month/Year)	TIIAME/UZ 03/2020
TITLE OF THE Curricula/Module	**Code**
Remote Sensing Applications (Methical instruction on Practice)	

Teacher(s)	Department
Coordinating: **Zokhid Mamatkulov** **Others:**	Department of Geodesy and Geoinformatics

Study cycle	Level of the module	Type of the module
BA/**MA**/PhD	Master degree	

Form of delivery	Duration	Langage(s)
online/offline	16 weeks	uzbek, english

Prerequisites	
Prerequisites: To know: Geodesy; Cartography; Photogrammetry; Computer technologies; GIS Fundamentals. Possess: Basic programming skills	**Co-requisites (if necessary):**

ECTS (Credits of the module)	Total student work load hours	Contact hours	Individual work hours
4	120	54	66

Aim of the module (course unit): competences foreseen by the study program

This course aims at remote sensing and digital image processing knowledge, techniques and skills for getting information from imagery and ability to solve complex tasks based on remote sensing. Emphasis is placed on gaining a practical understanding of the principles behind each technique and a consideration of their

appropriateness in different applications.

Learning outcomes of module (course unit)	Teaching/learning methods	Assessment methods
To know: Application Remote sensing on Precision Agriculture and crop modeling To point: • fields of application of Remote Sensing; To explain: • describe and analyses image data from satellites using image processing methods; To numerate: • principles of calibration and image processing for satellite and airborne sensors To recognize: • importance of remote sensing on precision agriculture and other fields To give examples of: • examples of applications: remote sensing based resource mapping (land cover/, land change detection, forestry, agricultural, etc.) and some special applications (space-based atmosphere studies, scatterometry, aerosol studies methods, georadar, etc.) To describe: • how to perform key processing tasks in practice using state-of-the-art techniques and tools To formulate: • image Classification and Analysis, concept of image classification: Unsupervised, Supervised, Pixel-based classification, Segmentation, Object-based classification (OBIA).	Practical tasks	Quiz
To be able to: • Remote sensing data gathering; • explain the principles of calibration and image processing for satellite and airborne sensors; • evaluate data quality in remote sensing products; • identify specific applications where remote sensing may be used as a tool for monitoring and research, collect systematically, understand, analyses critically and apply the results of a significant field of science; • evaluate existing theories and technologies and identify the needs for improvement • recognize in analyzing, integrating and managing spatial data	Implementation of the training project	Presentation of an educational project
Possess: • create crop and soil maps using by remote sensing data; • analyses on obtained data;	Implementation of the training project	Presentation of an educational project

• classifying by Supervised and Unsupervised and Object based classification methods. • illustrating geometric and atmospheric correlation									

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Collecting relevant data: satellite images	0	0	0	4	0	0	**4**	**4**	Listing open source free download dataset and registration; Defining area, checking cloud cover percent, temporal and spatial resolution. Downloading images with bulk downloader
Software background	0	0	0	6	0	0	**6**	**6**	Recognizing windows, Menu System, toolbars, and etc. of IDRISI, ERDAS, eCognition Developer. Creating new project, modifying projects, open exist projects and other capabilities; Add data, manage data, overlying, grouping, searching and

									designing
Image processing tasks	0	0	0	6	0	0	**6**	**6**	Application of pre-processing, image enhancement (contrast stretch, filtering algorithms), image transformations, indices (NDVI, etc., …);
Image Classification and Analysis	0	0	0	8	0	0	**8**	**10**	Application of Unsupervised, Supervised, Pixel-based classification, Segmentation, and Object-based (OBIA) classification
Land Cover/Land Use and Change Detection	0	0	0	6	0	0	**6**	**8**	Application of ISO calstering and Maximum Likehood Classification algorithm. Creating Land cover change modelling.
Plant Growing Monitoring and Mapping Crop Status	0	0	0	6	0	0	**6**	**8**	Utilizing multi-temporal satellite images for monitoring agricultural crops as cotton and winter wheat. Producing and analyzing indices as EVI, NDVI and etc. Application of time series analysis, patterns

									of shifting, agricultural statistics and crop production assessments.
Identification of crop related problems	0	0	0	6	0	0	6	8	Studying crop related problems as lack of sowing, cultivation, stressed plants) and identifying them by analyzing the satellite images.
Soil mapping and Soil degradation	0	0	0	6	0	0	6	8	Sentinel 2 satellite image Analyzing and determining soil types, degradation and erosion. Creating operational Soil map for decision making
Other applications of Remote Sensing	0	0	0	6	0	0	6	8	Application of Remote Sensing in Environmental protection, water resource management, Climate change etc.
Total	**0**	**0**	**0**	**54**	**0**	**0**	**54**	**66**	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Running control 1	35	8 week	preliminary presentation of the project
Running control 2	35	14 week	Presentation of an educational project
Final exam	30	16 week	Final quiz

Compulsory literature/Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Canty M.J	2014	Image Analysis, Classification and Change Detection in Remote Sensing: With Algorithms for ENVI/IDL and Python	ISBN 9781138613225	CRC Press https://www.researchgate.net /publication/268172718_Ima ge_analysis_classification_a nd_change_detection_in_re mote_sensing_With_algorith ms_for_ENVIIDL_and_Pyth on_3rd_ed
Charles Elachi, Jakob Van Zyl	2006	Introduction to the physics and techniques of remote sensing	ISBN-13 978-0-471-47569-9	A JOHN WILEY & SONS, INC., PUBLICATION https://epdf.pub/queue/introd uction-to-the-physics-and-techniques-of-remote-sensing.html
Jian Guo Liu. Philippa J. Mason	2006	Essential Image Processing and GIS for Remote Sensing	ISBN 978-0-470-51032-2 (HB)	Academic Press.
Chandra P. Giri	2012	Remote Sensing of Land Use and Land Cover		CRC Press Taylor & Francis Group
Additional literature				
Lillesand T. M., Ralph W. K., Jonathan W. C	2004	Remote sensing and image interpretation Fifth Edition	ISBN 978-0-470-05245-7	John Wiley & Sons https://epdf.pub/remote-sensing-and-image-interpretation.html
Schowengerdt RA	2006	Remote Sensing: Models and Methods for Image Processing		Academic Press.
J.Ronald Eastman	2009	IDRISI Taiga Guide to GIS and Image Processing		Clark Labs, Clark University 950 Main Street Worcester, MA, 01610-1477 USA

ANOTATION /course summery

This course aims at remote sensing applications and digital image processing knowledge, techniques and skills for getting information from imagery and ability to solve complex tasks based on remote sensing. Emphasis is placed on gaining a practical understanding of the principles behind each technique and a consideration of their appropriateness in different applications.

List of themes and short description

Themes	Contact work hours
Collecting relevant data Fundamentals and principles of data gathering. Unmanned aerial vehicles (UAV), airplane and satellite sensors and platforms. Acquisition of passive Earth Observation data. Types of resolutions (spatial, spectral, temporal, radiometric). Data acquisition process.	4
Software background Interface of Idrisi Selva, ERDAS and Ecognition Developer. Menu System and Toolbars. Create, modify and open projects. Data upload and updating.	6
Image processing tasks Digital Image Processing. Radiometric correction. Geometric correction. Histogram, filtering, contrast stretching. Pan-sharpening and band composite.	6
Image Classification and Analysis Visual interpretation. Classification (supervised classification, unsupervised classification, pixel-based classification, segmentation, OBIA). Scatter diagram. Classifier methods and algorithms.	8
Land Cover/Land Use and Change Detection Visual interpretation of land change in remotely sensed data. Basic qualitative change detection techniques (post-classification differencing). Maximum likelihood classification and ISO clustering. Create land cover maps. Land Change Modelling.	6
Plant Growing Monitoring and Crop Status Mapping Crop condition monitoring. Crop spectral signatures. Precision crop management. Vegetation indices. Crop identification and mapping.	6
Identification of crop related problems Identifying stressed plants. Water shortage related stress. Lack of cultivation stress. Pest management. Salty soil related stress.	6

Soil mapping and Soil degradation Monitoring soil degradation. Modelling soil erosion. Soil salinity detection. Soil moisture detection. Soil degradation assessment.	6
Other applications of Remote Sensing Forest monitoring. Surface water management. Environmental management. Watershed analyses. Runoff modelling. Climate change modelling.	6