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# Implementation of NICoPA project: New master program discussion for TUIT

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# Curriculum analysis of EU partner Universities

№	University	Faculty / Department	Master / Bachelor program in Precision agriculture
1.	Agricultural University Plovdiv	Faculty of Agronomy	<p><b>МК "Инновационные технологии в точном земледелии"</b></p> <p>Магистерский курс «Инновационные технологии в точном земледелии» рассчитан на специалистов со степенью бакалавра в профессиональных областях «Агрономия» и «Защита растений».</p>
2.	Czech University of Life Sciences Prague	Faculty of engineering Department of Agricultural Machines	<p><b>Course Program TFX85E - Precision Farming</b></p> <p>Course Objectives: To provide students with knowledge on the use of new precision farming technologies such as yield mapping, Global Positioning System (GPS), automatic detection of differences between crops and soil from vehicles, aircraft or satellites, variable speed applications (seeds, fertilizers, agrochemicals) and economic aspects</p>
		Faculty of Technology Department of recycling machines (IP)	<p><b>TIT24E-Geoinformatics for mechanical engineering</b></p> <p>Студентам знакомят с основными принципами геоинформатики в технике. Студенты получают обзор об использовании инструментов <u>географических информационных систем (GIS)</u> и <u>дистанционного зондирования (RS)</u>. Помимо обзора возможностей использования данных, возможностей их применения и теоретических знаний, студенты должны управлять фундаментальными упражнениями по <u>визуализации и интерпретации изображений</u> и уметь пользоваться базовыми инструментами анализа ГИС и РС.</p>

# Curriculum analysis of EU partner Universities

№	University	Faculty / Department	Master / Bachelor program in Precision agriculture
3.	Technical University of Berlin	<p>Институт геодезии и географических информационных технологий Fakultät IV Elektrotechnik und Informatik:</p>	<p><b>Geodesy and Geoinformation Science</b></p> <p>The Geodesy and Geoinformation Science programme from TU Berlin is a diversified engineering discipline strongly relying on mathematics and natural sciences. It covers essential tasks such as acquisition, modelling and processing of spatial data.</p>
		<p>Faculty of Technology Department of recycling machines (IP) <b>Институт геодезии и географических информационных технологий</b></p>	<p><b>GNSS дистанционного зондирования, навигации и позиционирования</b></p> <p>Проводятся лекции по 2 часа семестра в неделю. Две разные серии лекций предлагаются поочередно. Сотрудничество с Потсдамским университетом, в частности новая международная магистерская программа «Географическая информация, дистанционное зондирование и визуализация», планируется с 2020 года.</p> <p>В летнем семестре 2019 года будет проведена лекция «Отдельные разделы навигации и позиционирования (SGN)» за 6 СР, завершенная устным экзаменом. Профессор Галас проводит половину лекций за 3 КП. Вот краткий обзор содержания лекций, которые пройдут с 2020 года.</p> <p><b>Серия лекций 1, GNSS: введение и продвинутые основы</b></p> <p>Отдельные аспекты спутниковой геодезии, а также основы и приложения геодезических пространственных процессов, GPS, ГЛОНАСС, сигнальные структуры и новые спутниковые системы Galileo, BeiDou, QZSS, Распространение электромагнитных волн в электрически нейтральной атмосфере и ионосфере, многоразовые эффекты, Позиционирование, навигация, ориентация, Применение GNSS в различных сферах жизни общества.</p> <p><b>Серия лекций 2, GNSS: Приложения для наблюдения Земли</b></p> <p>Обзор наблюдения Земли GNSS и различных геофизических применений, Дистанционное зондирование атмосферы Земли с помощью навигационных спутников: методологические основы и приложения в прогнозировании погоды, исследованиях атмосферы и климата, наземных и спутниковых методах, Дистанционное зондирование поверхности воды, льда и суши отраженными сигналами GNSS: основы метода и геофизические применения, введение в наземные, летные и спутниковые методы, Основы и применение методов GNSS реального времени в геодинимике / геофизике</p>

# Core curricula/modules recommended by NICoPA



## 9 core curricula/modules

- ✓ Remote Sensing and Application of Earth and Environment related PA
- ✓ Using of SENTINEL 1-2-3 imagery for agricultural field monitoring
- ✓ Global Navigation Satellite Systems (NAVSTAR, GLONASS, GALILEO, etc.)
- ✓ Optimizing computer vision algorithms and real-time implementations
- ✓ Web technologies (Agro SDI, Geo-portals, Geo-services, Geo-analytical systems)
- ✓ Basics of the Precision agriculture – characteristics, technologies, economic efficiency, optimal use of resources
- ✓ Yield sensors for Precision Agriculture
- ✓ Soil physical properties and its measurement
- ✓ Application of Precision Agriculture for crops growing

## 3 Transferrable curricula

- ✓ Start up initiatives for future engineers
- ✓ Management and Decision Making in Precision Agriculture
- ✓ Intensive course to leverage acceptance of the new technologies “in-field”

## Updated current curricula in the target field

## Linking to the labor market

- ✓ Establishing PASO

## New supporting learning environment

- ✓ Joint web based platform
- ✓ PAL and VCR

# Courses to update

Title of the existing course to update	Name of the person(s) responsible for update + email	ECTS and hours for lecture/practical work	Teaching materials that will be used	How will the teaching materials improve the existing course? What will be new in the course due to the teaching materials?	% of readiness of the course
<p>Curricula of MA programs: 5A330501 Computer engineering Training period 2019-2021 academic year (Computer system design)</p> <p><b>Geoinformation Systems</b></p>	<p>Djumanov Jamoljon <a href="mailto:jamoljon@mail.ru">jamoljon@mail.ru</a></p>	<p>6 credits, total 180h. 30h lectures, 15h. practice, 135h. independent work</p>	<p>Geographical Information System (GIS Internet, Mobile, and Distributed GIS), (GIS Advanced Methods for Geospatial Analysis)</p> <p>Using software applications and open libraries</p> <ul style="list-style-type: none"> <li>• ArcGIS</li> <li>• QGIS</li> <li>• GRASS</li> <li>• PostGIS DB</li> <li>• using OGC</li> </ul> <p>Methods of manual and automatically processing scheme of satellite data</p>	<p>30% improve the module content. Advanced Methods for Geospatial Analysis. Using different advanced applications, open source libraries to create, and analysis satellite data. Processing algorithms of satellite data, high-tech sensors, and using GPS systems.</p>	<p>60%</p>
<p>Curricula of MA programs: 5A330501 Computer engineering Training period 2019-2021 academic year (Applied applications design)</p> <p><b>Computer vision</b></p>	<p>Kuchkorov Temurbek <a href="mailto:timanet4u@gmail.com">timanet4u@gmail.com</a></p>	<p>4 credits, total 120h. 30h lectures, 90h. independent work</p>	<p>Image processing approaches: image classification and segmentation, AI – Machine learning – Deep learning, Object and motion detection, Object classification, GIS-Geovisualization</p>	<p>40% improve the module content. Using different image processing methods. Image classification, semantic and instance image segmentation. Using machine-learning algorithms for image classification. Object detection. Neural networks and deep learning algorithms for image processing</p>	<p>50%</p>

# New Courses

Title of the possible new course	Name of the person(s) responsible for developing + email	ECTS and hours for lecture/practical work	Teaching materials that will be used
<p>Curricula of MA programs: 5A330501 Computer engineering Training period 2019-2021 academic year (Applied applications design)</p> <p><b>Remote sensing and Application of Earth and Environment</b></p>	<p>Rakhimov Mekhridin <a href="mailto:raximov022@gmail.com">raximov022@gmail.com</a></p>	<p>6 credits, total 180 h. 45h lectures, 135h. independent work</p>	<ul style="list-style-type: none"> <li>• Remote sensing techniques</li> <li>• Spatial resolution</li> <li>• GIS Geo-visualization</li> <li>• GIS Internet and Mobile</li> <li>• Distributed GIS</li> </ul> <p>GIS Advanced Methods for Geospatial Analysis Using GIS and SENTINEL1-2-3 imagery for agricultural field monitoring</p>
<p>Curricula of MA programs: 5A350902 (Intellectual information-communication systems) Training period 2019-2021 academic year</p> <p><b>Satellite image processing</b></p>	<p>Atadjanova Nozima Allamuratova Zamira <a href="mailto:zamira.lars@gmail.com">zamira.lars@gmail.com</a> <a href="mailto:natadjanova@bk.ru">natadjanova@bk.ru</a></p>	<p>4 credits, total 120h. 30h lectures, 15h practice 75h. independent work</p>	<p>Spatial resolution analysis. GIS. Data processing and adjustment, Processing of remote sensing data obtained from satellites, Spatial databases and infrastructures Space Geodetic Techniques Using GIS and SENTINEL1-2-3 imagery for agricultural field monitoring</p>

# New Curricula/Modules for MA Program “Geoinformation technologies”

No.	Subjects, blocks and types of activities	Volume of overall hours and ECTS		
		hours	%	ECTS
1	2	3	4	5
<b>1.00</b>	<b>General Methodological Subjects</b>	<b>300</b>	<b>21</b>	<b>10</b>
1.01	Research methodology	60		2
1.02	Innovation and project management	60		2
1.03	Search and extract of information	60		2
1.04	<b>Artificial Intelligence and Neural Networks</b>	60		2
1.05	Algorithm design and analysis	60		2
<b>2.00</b>	<b>Specialty subjects IICS</b>	<b>690</b>	<b>48</b>	<b>23</b>
2.01	<b>Geoinformation Systems</b>	180		6
2.02	<b>Remote Sensing Technologies and Applications</b>	120		4
2.03	<b>Web technologies (Agro SDI, Geo-portals, Geo-services, Geo-analytical systems)</b>	150		5
2.04	<b>Computer vision</b>	120		4
2.05	<b>Structural and object-oriented programs using MATLAB and PYTHON</b>	120		4
<b>3.00</b>	<b>Specialty selective subjects of the IICS</b>	<b>450</b>	<b>31</b>	<b>15</b>
3.01	Specialty selective subjects	180		6
3.02	Specialty selective subjects	150		5
3.03	Specialty selective subjects	120		4
	<b>Overall</b>	<b>1440</b>	<b>100</b>	<b>48</b>
<b>4.00</b>	<b>Science activities</b>	<b>2160</b>		<b>72</b>
4.01	Preparation and defending the master thesis	1560		52
4.02	Scientific pedagogical work	240		8
4.03	Internship	360		12
	<b>Overall</b>	<b>3600</b>		<b>120</b>

## Specialty selective subjects:

1. SENTINEL 1-2-3 imagery for agricultural field monitoring
2. Basics of the Precision agriculture – technologies, optimal use of resources
3. Application of Precision Agriculture for crops growing
4. Machine learning, Big Data and Data Mining Fundamentals
5. Global Navigation Satellite Systems (NAVSTAR, GLONASS, GALILEO, etc.)
6. GIS Advanced Methods for Geospatial Analysis (QGIS, GRASS, PostGIS DB)

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Thank you for attention!

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