UNIVERSITY OF PRISHTINA “HASAN PRISHTINA”

FACULTY OF CIVIL ENGINEERING

DEPARTMENT GEODESY – MSc.

2015 – 2018

3. Study programs in evaluation

3.1. Study Program: MASTER IN GEODESY

3.1.1. Basic information on study program

Name of the Academic Programme	**Geodesy**
NFQ Level (BA, MA, PhD, doctorate programme, university course)	**Level 7** **MA**
Academic degree or certificate, spelled out in full and in abbreviated form	**Master of Geodesy-Study Program: Geodesy**
Study Area according to *Erasmus Subject Area Codes (ESAC)*	**07.6**
Profile of the Academic Programme (specialization)	**Geodesy**
Minimum period of study	**Minimum 2 years of study**
Type, Structure and Cycle (Full time or Part time, Distance Learning)	**Full time**
Number of ECTS (total and annual)	**120 ECTS,** **60 ECTS, one year**
Program (short overview)/Courses	**Obligatory:** Sem. I 1. Geodetic reference systems 2. Geospatial databases and data integration 3. Geovisualization 4. Research methodology Sem. II 1. Global Navigation Satellite Systems (GNSS) 2. Advanced theory of errors 3. Geoinformation Science & Spatial analysis 4. Cadastre Information Systems Sem. III

	1. Physical geodesy 2. Advanced Image Processing and RS 3. Engineering surveying (mine included) 4. Project management **Electives:** Sem. I 1. Applied mathematics 2. Foreign language 3. Advanced digital photogrametry Sem. II 1. Land market economy 2. Real estate 3. Virtual cartography Sem. III 1. Web GIS 2. Agriculture information systems
Number of student places	**20 students**
Person in charge of the academic programme	**Perparim Ameti, Associate Professor**
Scientific/artistic staff (number per staff category)	**11 professors and 10 teaching assistants**
Tuition fees	**According to the fee from UP**

3.1.2. Rationale of the Programme for Labor Market

Geodesy is an old science on measurements of the Earth's surface to produce topographic maps. Historically, maps have been used to create land and real property registers called land cadastre which is the basis of taxation in Europe. In modern times, maps are also produced from photographs taken from airplanes or from digital satellite images (such as Google Earth images). Modern global navigation satellite systems (e.g. GPS) have made geodetic survey more accurate and effective. With computer-based Geographic Information Systems (GIS), maps and location-related geographic information can be used in many areas such as construction of road and railroads, urban and rural planning, management of agriculture and forestry, monitoring pollution in land and in water, etc.

After the independence in 2008, Kosovo faces serious problem in the field of geodesy and mapping: all information on maps and basic geodetic infrastructure is lost due to 1999th war. The country needs to build an independent national geodesy/mapping agency, and a new geodesy/mapping infrastructure.

With different funding sources, a national cadastre system is under construction in Kosovo to register and privatize land and real properties. This new cadastre system provides legal and technical basis to protect private ownership, facilitate land transaction and taxation, and promote investment and production. Land reform is dependent on a cadastre system and accurate, easily accessible maps and other geographic information (data about boundary, area, ownership, value, taxation, etc.).

However, geodesy and cadastre education in Kosovo does not meet the needs and requirements of the country. During the Yugoslavia era, Kosovars went to Belgrade and Zagreb to study geodesy and cartography. As an independent country, Kosovo now urgently needs its own higher education institution in geodesy. In 2003 a bachelor program in geodesy was started within the Faculty of Civil Engineering at University of Pristina (UP). The low academic level of the present geodesy BSc program at UP does not meet the demands for highly qualified specialists by the national mapping agency (KCA) and by private engineering consulting companies. Many sectors need specialists at master or even doctoral levels in order to follow the country development efforts and EU Integration

3.1.3. International comparison of study program

The Study program in field of geodesy has been designed through TEMPUS financed project Master Program in Geodesy under the lead of KTH Stockholm and with partner universities: University of West Hungary, Aristhoteli University of Thessaloniki, Vilnius Technical University. A final version of the structure of the master programe modules has been designed by involving al four EU Tempus partners.

3.1.4. Target group that is dedicated the study program

The master study level for structure, it is offered for the group of candidates who have finished the undergraduate level of bachelor degree in three years study with 180 ECTS.

The group of candidates who are offered this program of study must have finished their studies for a bachelor degree in the geodetic sciences.

3.1.5. Study Program Relation With Leading Principles Of Institution

Study program Geodesy represents the base of study in Department of Civil Engineering and is on the orientation with the mission for development of Faculty, with the main principle of management of institution.

3.1.6. Goal and Profile of Study Program: Geodesy - Master Level

Today's geodesy education at UP is not fulfilling society's needs of specialists who can think critically, work independently and with project management skills. New pedagogy and quality assurance mechanism must be introduced. Therefore, UP as well as other Kosovar universities have not realized the strategic importance of GIS for geodesy and other fields (such as spatial planning, environmental monitoring, agricultural and forestry management) which also use maps and digital geographic information. This has hindered the more widely use of GIS in Kosovo, both in the public sectors and in the private industry.

To address the above difficulties, this Tempus project aimed to develop a new master program in geodesy at UP in order to support sustainable development in Kosovo.

The specific objectives are to:

1) Identify the needs and requirements of Kosovo society on geodesy education

2) establish a new geodesy laboratory at UP

3) re-train Kosovo teaching staff, mostly in Kosovo

4) develop a new master curriculum in geodesy

5) develop 8 new teaching materials in geodesy and GIS

6) test run the geodesy master programme in Autumn 2015

7) implement new pedagogy and quality assurance in geodesy/GIS education

8) create a student career service centre

3.1.7. Learning Outcomes

After completion of the programe, Individulas are able to work professionally in geodesy, cartography and land Geo-information systems; carry out geodetic tasks from positioning objects and drawing their representation on maps to providing engineering and industrial services, or conducting satellite, photogrametric and remote sensing surveys; prepare analyses and undertake actions regarding real estate management; use modern measuring techniques and the latest computer application to collect and process all types of information about land; assess the value of real estates and value of business entities; elaborate strategic documents dealing with real properties; prepare programmes aiming at improved competitiveness of cities, communes and regions.

3.1.8. The Ratio between theoretical and practical parts/ or experimental

The master studies' structure has been developed in base of subjects programs (no modular) and the ratio between theoretical, practical, laboratories and exams part are predicted inside of the subject. The averages of those ratios, based from the different subjects, are as following: theoretical part 30%, numerical part 30%, laboratory and experimental (examination) part 40%.

3.1.9. Calculation of ECTS

According to the Statute of the UP, for 1 ECTS are calculated 25 studying hours.

An example of working load calculation that reflects into assigning the ECTS to a course.

Activity	Hour	Day	Week	Total
Lectures	2		15	30
Theoretical excercises/laboratory	2		15	30
Practical work	1		15	15
Contacts with lecturer/consultations	1		15	15
Field excercises				
Colocfiums, seminars				
Home work	1		10	30
Self study time (in library or at home)	2		10	20
Final preparation for the exam				20
Time spent on evaluation (tests, quizzes, final exam)	1		10	10
Projects, presentations, etc.				
Total				150

150/25 = 6 ECTS

3.1.10. Practical work – internship

The Civil Engineer Faculty, Geodetic department, has an agreement for cooperation with local company structural enterprises, through which the selected groups of students are to reach the professional skills. The internship part is implemented as a part of the diploma thesis and practical experience. Main counterparts in this field are:

- Kosovo Cadastral Agency
- Ministry of Agriculture and Forestry
- Independent Commission of Mines and Minerals
- Geo&Land LLC
- GIZ

3.1.11. Planned research program / programs in assessment

The researches are oriented in several directions:

- Definition of geodetic reference systems
- Application of GIS in land use, agriculture, forestry etc.
- Determination of different earth models
- Analyzis of deformation by using satellite techniques
- Photogrametry and remote sensing analysis

3.1.12. Requirements for admission of students and selection procedures

The selection of applicants is based on the following criteria:

- The students with GPA ≥ 7.5 are accepted directly without the entry exam and ranking until the requested number of students is fulfilled
- The students with GPA < 7.5 will submit the entry exam, to complete the free spaces, until the requested number of students is fulfilled.
- The ranking will serve to fulfill rightfully the requested number of students.

3.1.13. Study plan:

First Year						
Sem I			**Hours/ Week**			
Nr.	**O**	**Subjects**	**L**	**E**	**ECTS**	**Professor**
1	O	Geodetic reference systems	2	2	6	Perparim Ameti / Huaan Fan
2	O	Geospatial databases and data integration	2	2	6	Perparim Ameti / Andrea Podor

3	O	Geovisualization	2	2	6	Bashkim Idrizi / Andrea Podor
4	O	Research methodology	2	1	3	Violeta Nushi
		Total	**8**	**7**	**21**	
Nr.	**E**	**Subjects**	**L**	**E**	**ECTS**	**Professor**
1	E	Applied mathematics	2	2	6	Abdullah Zejnullahu
2	E	Foreign language	2	0	3	Nedime Belegu
3	E	Advanced digital photogrametry	2	2	3	Bashkim Idrizi / Vassilios
		Total	**4**	**3**	**12**	
		Total 21+9 =30 ECTS				
Sem. II			**Hours/ Week**			
Nr.	**O**	**Subjects**	**L**	**E**	**ECTS**	**Professor**
1	O	Global Navigation Satellite Systems (GNSS)	2	2	6	Perparim Ameti
2	O	Advanced theory of errors	2	2	6	Ismail Kabashi / Huaan Fan
3	O	Geoinformation Science & Spatial analysis	2	2	6	Bashkim Idrizi / Bela Markus
4	O	Cadastre Information Systems	2	2	6	Murat Meha
		Total	**8**	**8**	**24**	
Nr.	**E**	**Subjects**	**L**	**E**	**ECTS**	
1	E	Land market economy	2	2	6	Besnik Bislimi / Nicola Karanikolas
2	E	Real Estate	2	2	6	Murat Meha / Nicola Karanikolas
3	E	Virtual Cartographic Modeling	2	2	6	Bashkim Idrizi / Temenoujka Bandrova
		Total	**2**	**2**	**18**	
		Total 24+6=30 ECTS				
Second Year						
Sem. III			**Hours/ Week**			
Nr.	**O**	**Subjects**	**L**	**E**	**ECTS**	**Professor**

1	O	Physical geodesy	2	2	6	Perparim Ameti
2	O	Advanced Image Processing and RS	2	2	6	Bashkim Idrizi / Dimitris Kaimaris
3	O	Engineering surveying (mine included)	2	2	6	Ismail Kabashi
4	O	Project management	2	0	3	Venera Demukaj
		Total	**8**	**7**	**21**	
Nr.	**E**	**Subjects**	**L**	**E**	**ECTS**	**Professor**
1	E	Web GIS	2	2	6	Perparim Ameti
2	E	Agriculture Information Systems	2	2	3	Perparim Ameti
		Total	**4**	**3**	**9**	
		Total21+9=30 ECTS				
Sem. IV						
1		Diploma Thesis			30	
		Total			**30**	

3.1.14. Course brief descriptions

GEODETIC REFERENCE SYSTEMS

Short Introduction:The course starts with basic knowledge about geodetic reference systems and geodetic reference frames, global reference system, ellipsoid, coordinate transformation, height referent surface, basic concepts of geophysics and gravimetry. Then, the course ends with defining of reference heights surface, variations and geodynamic of geodetic reference frames.

Learning Objectives and Learning Outcomes**:**The students describe various aspects of geodetic reference systems (geometric, kinematic, geodynamic) and are capable to follow critically new developments in this field.Learning Outcomes**:**After completion of this course, students should be familiar with:

- Types of coordinate reference systems
- Transformations between geodetic reference systems
- Definition of geodetic referent frames
- Geodetic base when geodetic surveying are referenced
- Designing different professional projects independently

Teaching and Learning Methods**:** Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria**:**Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT**:**video projector, laptop, blackboard

Ratio between Theory and Practice**:**

Theoretical Part	Practical Part
60%	40%

Basic Course Literature**:**

1. Torge, W.: Geodesy, 3rd Edition, Walter de Gruyter, 2001.
2. Seber, G.: Satellite Geodesy, 2nd Edition, Walter de Gruyter, 2003
3. Skuka Q.: Gjeodezia e Larte, Libër Universitar, 2008, Tirane

GEOSPATIAL DATABASES AND DATA INTEGRATION

Short Introduction:Geographic Information Systems (GIS) are being used in a wide variety of applications. A key component of any GIS application is the underlying spatial database which must be designed to support efficient data storage, access and analysis operations. Students will work in small groups to develop a conceptual design for a GIS database and will then work individually to build a spatial database using digital data available through digital library as well as data digitized from existing maps, imagery and field data collected using GPS. The resulting database will be used to perform some basic spatial analysis.

Learning Objectives and Learning Outcomes:This course focuses on the design and development of spatial databases. Particular emphasis will be placed on the use of data modeling techniques to design a GIS database for a specific application.Learning Outcomes:

- Students will have a good understanding of the principles and techniques of relational database design as they apply to spatial databases.
- Students will be able to apply these principles and techniques in designing and building spatial databases.
- Use spatial databases to perform common types of queries and spatial analysis
- Students will have a good understanding ofbasic operations of the Oracle Spatial databases and PostGIS/PostgreSQL open-source spatial database.
- Students will know more about Advances and trends in spatial databases: network data model, spatio-temporal data model, spatial data mining, etc.

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
50%	50%

Basic Course Literature:

1. P. Rigaux, M. Scholl and A. Voisard (2002): Spatial Databases with applications to GIS, Morgan Kaufmann
2. S. Shekhar and S. Chawla (2003): Spatial Databases: A Tour, Prentice Hall

GEOVISUALIZATION

Short Introduction**:** Geovsualization includes more on Map symbols and graphic variables: size, colours, textures, orientation, patterns; Topographic and thematic map design and symbolisation; Map design for presentation, synthesis, analysis and exploration of spatial data; Exploratory data analysis, graphical data analysis techniques; 2D, 2.5D, 3D and 4D graphics and its representation; Virtual models; Cartography on internet; publication alternatives for distribution of electronic atlases; Programming, scripting and automation for visualization and publishing electronic atlases.

Learning Objectives and Learning Outcomes:The major objective of this course is to learn the principles of cartography and techniques for effective visualization of geographic data. On the completion of this course, students should be able to design analogue and digital cartographic products using an existing geographic information system, and to gain critical thinking skills essential to avoid being misled by cartographic products.Learning Outcomes:

- To have knowledge of Map symbols and data classification
- Visual variables: spacing, size, orientation, shape, arrangement, height, hue, value, saturation.
- Topographic and thematic map design and symbolization
- Map design for presentation, synthesis, analysis and exploration of spatial data.
- Exploratory data analysis, graphical data analysis techniques

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT**:**video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Terry, B. Robert, Thematic Cartography and Geovisualization, 3rd edition, 2008
2. M.-J. Kraak & F. Ormeling, Cartography – Visualization of Geospatial Data, Prentice Hall, 2nd edition, 2003
3. D. Jason, A. Maceachren, M. Jan Krak: Exploring Geovisualization, 2005

RESEARCH METHODOLOGY

Short Introduction: Collection, study and systematization of information. Meaning, types and verification of hypotheses. Meaning, scope and elements characteristic of the seminar notes.Data collection. Analysis of the data. Methods of research work. Modelling methods. Statistical method. Mathematical methods. Experimental methods. Communications Theory as method. The case study method. Visual methods. Method of survey and interviews.

Learning Objectives and Learning Outcomes: Aftercompletionof the coursecandidateswillbe abletowritedifferent reports,differenttextsandwill beable to completethenarrativeaspect of scientific workincludingtheMaster thesis.

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Zelenika R. Methodology and technology prepared the research work, Rijeka 1999;
2. Fellows,R.; Liu, A. Research Methods for Constructions, Oxford: The Blackwell Science, 1997;
3. Holt.D.G.: A guide to successful dissertation study for students of the built environment.

APPLIED MATHEMATICS

Short Introduction: This course includes statics, kinematics in ne dimension, Dynamics of Particles, Vectors, Motion in a plane.

Learning Objectives and Learning Outcomes: A course based on this syllabus should: provide a relevant, stimulating and motivating course of advanced study in mathematics, including the provision of a suitable foundation for further study in science and engineering;develop a variety of skills in modelling, logical reasoning and problem solving;encourage student interest and satisfaction through the development and use of mathematics in a variety of applications;promote an awareness of the relevance of mathematics to other fields of study and to other practical applications.

Learning Outcomes:

- apply their knowledge of relevant mathematical techniques in a variety of contexts;
- construct rigorous mathematical arguments through an appropriate use of precise statements, logical deduction and by manipulation of mathematical expressions;
- evaluate mathematical models, including an appreciation of the assumptions made, and interpret, justify and present the results from a mathematical analysis in a form relevant to the original problem;
- communicate mathematical ideas and methods, including the use of appropriate mathematical notation, terminology, conventions and diagrams, in a clear, logical and well-structured presentation

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Introduction to Applied Mathematics by Strang, Gilbert, 1986
2. Applied Mathematics by Phagan, R. Jesse, 2010
3. Applied Mathematics by Logan, J. David, 2013

FOREIGN LANGUAGE

Short Introduction:Introduction to Technical English Language course. Engineering construction as a profession. Reasons for choosing engineering as a profession. The main principles of building materials. Creating modern structures. Environmental Engineering. Bridges and tunnels. High buildings. Compilation of sentences using technical vocabulary.

Learning Objectives and Learning Outcomes:Aftercompletionof the coursecandidateswill first submit themselves to a test of their knowledge of English, acquired in previous education with emphasis on English grammar. Then, they willimprove and increase to a higher level of English, with an emphasis on the language used in the professional literature and business correspondence.Learning Outcomes**:** The goal of this course is to

- Improve reading, writing, listening and speaking skills of the students.
- Increase students' abilities to communicate in English, both in writing and in speaking.
- Enrich students' vocabulary by independent reading and listening in English language.
- Students should acquire knowledge in grammar by learning and practicing it in the given context.
- Enrich students' vocabulary with technical jargon by using written, transcribed and commented words in English language and the same translated in Albanian.

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Lectures offered by his teacher
2. Internet - Sites Big Building program, Brantacan, ASCEN

ADVANCED DIGITAL PHOTOGRAMETRY

Short Introduction: Advanced stereoscopic imaging and epipolar geometry; Bundle block adjustment of photogrammetric blocks; Matching techniques (Interest operators, least squares image; matching, area and feature based matching); Digital Terrain Model (DTM) extraction; Orthoimage and orthomosaic production; Accuracy assessment of photogrammetric projects and products; Visualization of photogrammetric products.

Learning Objectives and Learning Outcomes: After the course, students should be able to understand sophisticated techniques for the extraction of reliable 3D information from overlapping images in a photogrammetric project. Students should be able to deliver 3D models of objects and Digital Terrain Models (DTM),

orthorectified images, and other value added photogrammetric products using (processing) scanned aerial photographs, digital aerial images, stereoscopic satellite images and close range images within specialized photogrammetric software.

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Michel Kasser, Yves Egels,Digital Photogrammetry, by Taylor & Francis,
2. Fotogrametria, Karl Kraus (e përkthye në shqip Namik Kopliku), 2011

GLOBAL NAVIGATION SATELITE SYSTEMS (GNSS)

Short Introduction:This subject includes: history of satellite geodesy, satellite orbit computation and representations, signal propagation in the atmosphere, satellite positioning: systems, observables and computations, statistical concepts including Kalman filtering and smoothing, applications of GNSS. Other geodetic satellite systems
Learning Objectives and Learning Outcomes:Theoretical and practical basics of satellite positioning by the global systems: GPS, GLONASS, Galileo, etc. An introduction also to other geodetic satellite methods.Learning Outcomes: After the course, students will be able to:

- Describe the principle of satellite positioning methods, the main components in a satellite navigation system and their functions.
- Account for and analyse the influence of different error sources on the positioning precesion.
- Plan, perform and process precise GNSS measurements.
- Identify proper instruments, measurement and processing methods for different applications.
- Independently prepare various professional projects

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Sjöberg, LE (2009) Theory of satellite geodesy, KTH
2. Hofmann-Wellenhof, et al. (2008): GNSS, Springe
3. Isufi, E.: Sistemi i Pozicionimit Global - GPS, 2006.

ADVANCED THEORY OF ERRORS

Short Introduction:Theory of errors and least squares adjustment is an important subject within the geomatics programmeoffered at KTH. This is due to the fact that surveying and mapping (or production of spatial data) oftenrequires mathematical processing of measurement data. Furthermore, the general methodology of spatialdata processing is essentially the same as that for data processing in other science and engineering fields,even though data collection procedures and data types can be different. Theory of errors is related toand comparable with what is called estimation theory used in automatic control and signal processing.

Learning Objectives and Learning Outcomes:The course aims to teach in advanced level of Theory of Errors and methods.Learning Outcomes:After completing the course the student should be familiar with key knowledge in advanced error theory.

- Define the relation between measurements and errors in all surveying processes.
- Discuss reasons why the theory of errors is necessary, before the recognition of the final results from the geodetic measurements,
- Recognize problems and define the adjustment method,
- Be able to simulate and compare adjustment methods,
- Be able to evaluate results and define the residuals,
- Support effectively decisions of the final results

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Fan, H. (2006). Theory of Errors and Least Squares Adjustment. KTH;
2. Nela, K. (2007). Teoria e Barazimit te Matjeve Gjeodezike (*Theory of equalization of Geodetic measurements. UP,* Lectures

GEOINFORMATION SCIENCE & SPATIAL ANALYSIS

Short Introduction:GIS and its principles, definitions; GIS building blocks (hardware, software, database and human resources); Data acquisition and data integration;Spatial operations; Geostatistics; Performing spatial data analysis; Spatial decision support; GI project management; GIS applications and trends.

Learning Objectives and Learning Outcomes: The course aims to teach advanced level of Geoinformation Science and Spatial analysis methods.Learning Outcomes:By completing the module, the student should:

- Be familiar with key GI concepts and terms
- Identify major components of GIS from both technical organisational point of view
- Use geostatistical techniques to solve practical problems
- Be able to evaluate results of data analysis, criticize process, and defend the conclusion
- Discuss reasons why spatial information provides added value
- Define typical GIS applications
- Support effectively spatial decision process

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. K. T. Chang: Introduction to Geographic Information Systems, Mc Graw-Hill International Edition, 6th Edition, 2011, p. 432
2. M. de Smith - P. Longley - M. Goodchild: Geospatial Analysis - A comprehensive guide, Winchelsea Press, 4th Edition, 2012, p. 348
3. P. Longley et al.: Geographic Information Systems and Science, 2nd Edition, John Wiley & Sons Ltd., 2005. p. 517

CADASTRE INFORMATION SYSTEMS

Short Introduction:Concept of cadastral Information system, principles anddefinitions; Major components of cadastral Information system (hardware, software, database and human resources); Multipurpose Cadastral information System; Web application and Cadastral information System; The role of surveyors in Cadastre.

Learning Objectives and Learning Outcomes:The course aims to teach new cadastral Information Systems and methods.Learning Outcomes:By the end of completing the module, the student should:

- Be familiar with the concept of cadastral Information system.
- Identify major components of cadastral Information.
- Understand aspects of Multipurpose Cadastral information.
- Explain the responsibilities of Public and Private Sectors to the cadastral Information
- Explain correlation between cadastral and spatial data information.
- Be able to evaluate and defend technology for Cadastre Information system,
- Be able to define the relation between GIS applications technical science and cadastral information.

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. J. Kaufmann, D. Steudler. CADASTRE 2014 – A Vision for a Future Cadastral System. of FIG Commission 7. July 1998, p 102, eng. and alb.
2. Larsson, G. Land Registration and Cadastral Systems: Tools for land information and management. Longman Scientific and Technical, Essex,

LAND MARKET ECONOMY

Short Introduction:The Supply of Land; The Demand for Land and Land Related Resources; Land Resource Requirements; The Economic Framework of Land Use; The Institutional Framework of Land Use; Property Rights in Land and the Legal Dimension; Public Policy Controls over Land Use; Land Resource Policy

Learning Objectives and Learning Outcomes: Learning Outcomes:

- To provide an overview of the theoretical principles, policy instruments, and current practice of using economics in understanding land markets.
- To understand the market system, the externalities causing market failure, and the mechanisms to correct for externalities.
- To apply economic tools for evaluating land-use policies.

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT: video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. G. Beaur, P. R Schofield, J.M. Chevet, M.T. Perez-Picazo: Property Rights, Land Markets and Economic Growth in the European Countryside, 2013
2. S.V. Lall, M. Freire, B. Yuen, R. Rajack, J.J. Helluin: Urban Land Markets, 2009
3. J. Gareth, W. M. Peter, Methodology for Land and Housing Market Analysis, 1994

REAL ESTATE

Short Introduction:The purpose of the courses is to gain an understanding of the economic forces that drive real estate value in the market. Students will learn the concepts, tools, and techniques for evaluating individual real estate assets, based on the application of economic theory and principles of urban economics, for the purpose of real estate valuation.

Learning Objectives and Learning Outcomes: Upon completion of the course, students should have a broad understanding of how market dynamics, constrained by the geographic, physical and legal parameters, determine values of individual assets in the market. (In short, at the end of the course, if someone points to any property and asks, "what is it worth?" or "how much should we pay for it?" you will know how to determine an answer.) Learning Outcomes:After completion of this course students should be familiar with:

- Market and property analysis
- Land Rent of Land Use Patterns
- Site analysis
- Land value
- Sales Comparison Approach

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Commercial Real Estate Analysis and Investments, Second Edition, by David Geltner, Norman G. Miller, Jim Clayton, and Piet Eichholtz, Cengage Learning, 2007.

VIRTUAL CARTOGRAPHIC MODELING

Short Introduction: Processing of cartographic models and geo-images in their specific, variety, metric, and dynamic characteristics. Systematizing of knowledge from cartography, computer graphics, psychology of perception and their summarizing for achievement of professional cartographic modelling. Designing of cartographic models by the modern computer techniques and technologies in the process of catrographic production. Creation right vision and technical skills to students for models making for different needs and users. Introduction in three-dimensional (3D) cartographic space, 3D cartographic models in their contents: main, secondary and additional.
Learning Objectives and Learning Outcomes: The course on VCM aims to teach the students and give them the following knowledge, skils and experience:

- on VCM concepts and terms;
- on designing of cartographic models by the modern computer techniques and technologies;
- on models making for different needs and users;
- on three-dimensional (3D) cartographic models;
- on advantages and disadvantages in comparison with traditional cartographic models;
- on preparation of database, processing, 3D mapping, visualization and animation of cartographic models;

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homeworks 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Axel Hildebrand (1996) A Homogenous Approach from Image Processing in Virtual Reality, Eurographics’96 Tutorial, Fraunhofer IGD, Germany
2. Bandrova T., 3D Cartographic Modeling in Educational Process, 26th International Cartographic Conference, 25-30 August 2013, Dresden, Germany, On-line Proceedings, ISBN 978-1-907075-06-3;
3. Bandrova T., Bonchev St., 3D maps – scale, accuracy, level of details, 26th International Cartographic Conference, 25-30 August 2013, Dresden, Germany, On-line Proceedings, ISBN 978-1-907075-06-3;

PHYSICAL GEODESY

Short Introduction:Gravitational law, Laplace's equation and boundary value problems; Gravity field, normal field and anomalous field of the earth; Global gravitational field and spherical harmonic expansions; Stokes' formula, Poisson's integral and Vening Meinesz formula. Truncation errors, combination of Stokes' formula with global gravitational models; Molodenski's theory, Bjerhammar's methods and collocation.

Learning Objectives and Learning Outcomes: Knowledge about determination of the external gravity filed of the Earth as one of the main tasks in geodesy, based on the measured physical parameters on and above the Earth's surface, knowledge and skill during the practical measurement of those parameters.Learning Outcomes: After completing the course, students should:

- Be familiar with the mathematical and physical fundamentals of physical geodesy.
- Understand the principles of gravity field determination.
- Be able to carry out practical geoid computations.
- Be familiar with Stokes formula, Poisson's integral and Vening Meinesz formula.
- Be familiar with Molodenski's theory, Bjerhammar's methods and collocation.

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT: video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
50%	50%

Basic Course Literature:

1. Fan, H. (2008). Theoretical Geodesy. KTH
2. Moriz, H.: Advanced Physical Geodesy, Wichman Verlag, Karlsruhe 1989.
3. Klak, S.: Geophysic (Lecture Notes in Croatian), University of Zagreb, 1984.

ADVANCED IMAGE PROCCESING AND RS

Short Introduction:This is an advanced remote sensing course on sophisticated methods and techniques for collecting, processing and analyzing remotely sensed data; as well as applications of remote sensing in urban planning, environmental monitoring and natural resource management. Throughout the course, emphasis will be placed on image processing, image analysis, image classification, remote sensing and GIS data integration, and applications of remote sensing in various applications.

Learning Objectives and Learning Outcomes: Students will gain theoretical knowledge and practical skills on digital image processing, analysis, and applying these techniques in various remote sensing applications.Learning Outcomes:After completing the course, students should be familiar with:

- Remote Sensing & In Situ Data and Image Processing Systems
- Image Processing
- Image Analysis
- Image Classification
- Digital Change Detection
- Remote Sensing Application

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Jensen, J.R., 2005. Introductory Digital Image Processing: A Remote Sensing Perspective, 3rd edition, Prentice Hall, Upper Saddle River, New Jersey. 526 pp.
2. Gonzalez C. R, Woods E. R: Digital Image Processing, 2007

ENGINEERING SURVEYING

Short Introduction:Implementation and verification of geodetic bases; Determining the surface elements of the reference system; Underground transmission system reference; Achieving in the underground topographic base, Underground raising details; Topographical work leading mining; Achieving topographic networks careers; Determining excavated volumes in underground and surface mines.

Learning Objectives and Learning Outcomes: The aim of the course is to introduce the students to the fundamental tasks of engineering surveying. The students will get basic theoretical and practical knowledge about different kind of surveying instruments and methods used in various engineering problems.Learning Outcomes:After completing the course, students should be familiar with:

- Advanced knowledge in Engineering Surveying.
- Concepts and measurements with advanced sensory.
- Geomonitoting and usage of the system of geomonitoring .
- Surveying and geotechnical methods in determining the deformation of different objects – geomonitoring online.
- Deformation Analysis.
- Concepts and knowledge of deformation methods, Hannover and Karlsruhe method.
- Using GI in mines, underground measurements, ground measurements, and the linkage between one or more vertical wells.

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria: Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Kolonja, Y., Hamzai J. Gjeodezia inxhinierike, Libri 2 dhe 3. Tiranë
2. Kavanagh B.F. (2010) Surveying with Construction Applications.
3. Schofield W., Breach M. (2007) Engineering Surveying. Elsevier Ltd

PROJECT MANAGEMENT

Short Introduction:Basic principles of management: what is the management, who are managers. Development of the management, management development, management functions. Working persistence; definition of Determination, the problems and errors in decision making, methods of forecasting. Project management: definition, project leader, project goals, types of projects. The composition of the economy and its circle; basics of organization management, organizational goals, organizational structure, technological aspects, economic and social organization, the impact of district organizational structure, job specifications of the participants in geodesy.

Learning Objectives and Learning Outcomes:Aftercompletingof thiscourse,studentwillbe abletounderstand and properly use in practice definitions of management, major principles of organization and operational management of one project. Another main goal of this subject in particular is to make future engineers experts that can easily overpass difficulties of one project in regards to the management side.Learning Outcomes:After completion of this course student will be familiar with:

- Fundamental principles of management
- Project Management
- Management goals, organizational structures, technological aspects.
- Planning work process
- Reporting and ways of reporting.

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Menadžent za inzenjere, Mariza Katavic, Sveučilište u Zagrebu, Gradevinski Fakuletet, Zagreb 2006.
2. Management for the Construction Industry, Stephen Lavender, Longman and The Chartered Institute of Building, Eseex, England 1996.

WEB GIS

Short Introduction:Geospatial web services and open geo-tools/services, Web-based data editing, GIS analysis on the web, Web GIS design principles, Mobile GIS, 3D web scenes, Developing Land Information Systems, Geoportals: concept and application, Web GIS in e-government, e-business and e-science and Interoperability between data, Principles of web GIS programming

Learning Objectives and Learning Outcomes:The aim of this course is to teach students the fundamental theories and technologies for disseminating and processing geographic information by means of Internet and World Wide Web.Learning Outcomes:At the end of the course, students should know:

- How to design and implement web maps, Internet-based geographic analysis.
- Basics of computer networking, Internet, WWW
- Client/server computing and the distributed component framework
- Open source and commercial (ESRI) Internet mapping software
- Standards for distributed GIS services
- Design and implementation of dynamic maps and geographical analysis via the WWW

Teaching and Learning Methods: Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard.

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Menno Jan Kraak; Alllan Brown: Web Cartography, Taylor and Francis, New York, 2001.
2. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks, authored by Dr. Zhong-Ren Peng and Dr. Ming-Hsiang Tsou. Published by Wiley. 2003.
3. http://opengeo.org/products/consulting/cartography/

AGRICULTURE INFORMATION SYSTEMS

Short Introduction:This course includes application of GIS and GPS in agriculture. GIS is used to assist precision farming, balancing the need between the economy return from a crop with the environmental impact. An increasing number of farmers are investing in GPS receivers which can pinpoint precise locations by locking onto a network of satellites. Combining this information with digital mapping using GIS allows the farmer to store, analyse and display a wide range of data.

Learning Objectives and Learning Outcomes: In the end students should demonstrate that they have advanced their understanding and practice of precision agriculture. They should acquire the most complete, accurate and current source of information in this field provided by the course.Learning Outcomes:After the completion of the course, students should be familiar with:

- GPS & Guidance
- Yield Monitoring & Mapping
- Remote Sensing for Agriculture
- Soil & Crop Sensing
- Electronics & Control Systems

Teaching and Learning Methods:Advanced lectures; discussions, individual work, group work, presentations.

Evaluation Methods and Passing Criteria:Colloquium 1 10%; Colloquium 2 10%; Homework 5%, Attendance 20%, Final exam 55%.

Concretization Tools/ IT:video projector, laptop, blackboard

Ratio between Theory and Practice:

Theoretical Part	Practical Part
60%	40%

Basic Course Literature:

1. Francis J. Pierse, David Clay: GIS applications in agriculture, 2007