

Óbuda University  
Alba Regia Technical Faculty



**CURRICULUM OF**  
**Land Surveying and Land Management BSc**

Budapest, 2017.

# CURRICULUM OF LAND SURVEYING AND LAND MANAGEMENT BSc

## 1. Aim of the course:

The aim of the course is to train professionals in different tasks of land surveying (surveying, land administration, engineering geodesy, photogrammetry, remote sensing, etc.) including in situ measurements, application of remote sensing technics, processing and managing geoinformation, interpretation of spatial data, general knowledge in the related legal and management sciences. The graduates acquire improved skills in using state-of-the-art technologies of measurement, processing, administration, information service and optimization.

## 2. Field of the course: agrarian

## 3. Duration:

- full time (regular)                      7 semesters                      2282 contact classes

## 4. Number of credits to obtain: 210

## 5. Educational level and qualification indicated in the degree:

- Educational level: Bachelor (baccalaureus, abbreviated: BSc)
- Name of qualification Land Surveying and Land Management Engineer

## 6. Main areas of the course:

	Credits
Mathematics and natural sciences (16-24 credits)	24
Informatics (14-22 credits)	19
Fundamentals of technology and environmental sciences (6-12 credits)	12
Economics and management (4-8 credits)	7
Legal and public administration studies (4-8 credits)	5
Social science and EU studies (4-8 credits)	4
Data acquisition and data management (55-65 credits)	62
Specialization (20-40 credits)	22
Optional subjects (10 credits)	10
Field practice (30 credits)	30
Thesis	15
<b>Altogether:</b>	<b>210</b>

## 7. Field practice:

The field practice consists of two segments: field courses conducted by the institute (2 weeks of Field Practice in Surveying, 2 weeks of Field Practice in Land Surveying, 2 weeks of Complex Field Practice) and a continuous (10 week) Off-site Professional Practice. The total credits of the field practices is 30 credits.

## **8. Physical education:**

At the regular training it is a criterion requirement.

## **9. Type of training:**

- full-time (regular)

## **10. Means of evaluation:**

- a) signature
- b) practical mark
- c) examination
- d) final examination

## **11. Conditions to take the final examination:**

- a) final certificate
- b) thesis approved by a reviewer
- c) fulfilment of specified 210 credits
- d) fulfilment of institute language criterion examinations

Admission to the final examination is subject to the obtainment of a final certificate. The final certificate is issued to students having fulfilled all educational requirements specified in the curriculum – except for language certification – and obtained the necessary amount of credits.

## **12. Components of the final examination:**

The final examination comprises the defense of the thesis and oral examinations specified in the curriculum (with preparation times at least 15 minutes per subject), which have to be taken the same day. Simultaneously one student takes examination in front of the examination board.

## **13. Result of the final examination (F):**

The overall result of the final examination is the average of grades obtained for the thesis (Th) and the subjects of the oral part of the final examination (S1, S2, ..., Sm):

$$F = (Th + S_1 + S_2 + \dots + S_m) / (1 + m)$$

**14. Conditions to issue the degree:**

Successful final examinations

**15. Training in dual form:**

The dual form of education is available for regular training students, based on cooperation between the student, a company and the university in order to deliver students most fitting to the demands of the company. The conditions of the dual form training are defined in a contract between the company and the university, and a contract between the student and the company.

**16. Available specializations:**

- Geoinformatics
- Land Management

**17. Date of effect:** 01 September 2018

Cofirmed by Senat of Obuda University at 16<sup>th</sup> July 2018

Budapest, 16<sup>th</sup> July 2018

St.

Dr. habil. György Györök  
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## **Mathematics and Natural Sciences**

<b>Name:</b> <i>Mathematics I – Calculus I</i>		<b>NEPTUN-code:</b> NAMMA1SENE	<b>Number of periods/week:</b> full-time: 3 lec + 3 sem + 0 lab
<b>Credit:</b> 6 <b>Requirement:</b> examination		<b>Prerequisite:</b> -	
<b>Responsible:</b> Aurél GALÁNTAI, DSc.	<b>Position:</b> professor	<b>Faculty and Institute name:</b> John von Neumann Faculty of Informatics Institute of Applied Mathematics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>The aim of the course is to bring up students' mathematical skills to an even level, introduce them to the methods of higher mathematics, to the use of Matlab software, and get them acquainted with the elements of one-variable calculus. Course material: number sets, algebraic expressions, equations and inequalities. Trigonometry. Complex numbers. Vectors and operations. Matrices and operations. Relations and functions, elementary discussion, sketching, elementary functions. Converging series. Continuity and limits of functions. One-variable differential calculus, differentiation rules, applications, curve sketching. Definite integral. Symbolic and numerical integration techniques, applications.</p>			
<b>References:</b>			
Apostol T. M.: Calculus, Volume 1, One-Variable Calculus with an Introduction to Linear Algebra, Wiley, 1967, ISBN 978-0-471-00005-1			
Apostol T. M.: Calculus, Volume 2, Multi-Variable Calculus and Linear Algebra with Applications, Wiley, 1969, ISBN 978-0-471-00007-5			
Landau E.: Differential and Integral Calculus, American Mathematical Society, ISBN 0-8218-2830-4			
McQuarrie D. A.: Mathematical Methods for Scientists and Engineers, University Science Books, 2003, ISBN 978-1-891389-24-5			



<b>Name:</b> <i>Mathematics II</i>		<b>NEPTUN-code:</b> AGIMA2AFNE	<b>Number of periods/week:</b> full-time: 3 lec + 3 sem + 0 lab
<b>Credit:</b> 6 <b>Requirement:</b> examination		<b>Prerequisite:</b> NAMMA1SENE Mathematics I – Calculus I	
<b>Responsible:</b> Aurél GALÁNTAI, DSc.	<b>Position:</b> professor	<b>Faculty and Institute name:</b> John von Neumann Faculty of Informatics Institute of Applied Mathematics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Linear equation systems, general form. Matrixalgebra. Representation of linear equation systems by matrices.</p> <p>Solution of equation systems by the Cramer's rule, and with the use of the inverse matrix.</p> <p>Overdetermined systems and their application for geodesy.</p> <p>Linear mappings. The matrix of linear transformation. Eigenvalue, eigenvector.</p> <p>LP programming tasks.</p> <p>Combinatorics (finite sets, direct product, basic theorems). Sampling schemes from finite sets. Basics of probability theory: event, empirical and theoretical probability. Kolmogorov's probability axioms, conditional probability. Probability variables and their distribution, further properties. Expected value and standard deviation, their estimation in discrete and continuous distribution. Probability distributions. Sample in statistics, sampling, statistical function, sample mean, empirical scattering, empirical distribution function. Estimation theory and its applications: point estimation, interval estimation, confidence interval, hypothesis test, student-test, F-test, <math>\chi^2</math>-test. Basics of correlation and regression analysis. Linear regression.</p>			
<b>References:</b>			
Meyer, C. D.: Matrix Analysis and Applied Linear Algebra, Society for Industrial and Applied Mathematics (SIAM), 2001, ISBN 978-0-89871-454-8			
Leon, S. J.: Linear Algebra With Applications, 7th edition, Pearson Prentice Hall, 2006			
DasGupta A.: Probability for Statistics and Machine Learning: Fundamentals and Advanced Topics, Springer Science & Business Media, pp. 784, 2011			

<b>Name:</b> <i>Geometry I</i>		<b>NEPTUN-code:</b> AGIGM1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> -	
<b>Responsible:</b> Lóránt FÖLDVÁRY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Matrix, determinant, vector. Skalar product (dot product), vectorial product (cross product), triple product. Coordinatesystems. Transformation of polar, cylindrical and Cartesian coordinate systems. Analytic (coordinate) geometry. Geometry of a line. Relative position of two lines. Analytic geometry of a plane. Coincident, intersecting, perpendicular and parallel lines. Metric solutions. Equation system of bisectric lines (and planes). Distance of skew lines, equation system of normal transversal. Conic sections. General equations of conic sections. Equation of the sphere. Equation of the ellipsoid. Equation of the tangent line of conic sections. Equation of the asymptotes of a hyperbola. Properties of the tangent line of the parabola. Basic terms of spherical geometry. Spherical bi-angle (digon) and spherical triangle. Area of spherical triangles, spherical excess. Relationship between spherical triangle parameters. The theorem of sine and the theorem of cosine in spherical geometry. Spherical distance.</p>			
<b>References:</b>			
Struik D. J.: A Source Book in Mathematics, 1200-1800 (Source Books in the History of the Sciences), Harvard University Press, pp. 446, 1969, ISBN-10: 0674823559, ISBN-13: 978-0674823556			
Serdarushich V.: Vectors and Coordinate Geometry, CreateSpace Independent Publishing Platform, pp. 184, 2016, ISBN-10: 1523688661, ISBN-13: 978-1523688661			
Eisenhart L. P.: Coordinate Geometry, Dover Books on Mathematics, Dover Publications, pp. 320, 2005, ISBN-10: 0486442616, ISBN-13: 978-0486442617			
Stanley A. D.: An Elementary Treatise of Spherical Geometry and Trigonometry, Leopold Classic Library, pp. 128, 2015			

<b>Name:</b> <i>Geometry II</i>		<b>NEPTUN-code:</b> AGIGM2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geometry I</i>	
<b>Responsible:</b> József BORBÉLY, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>The basic questions of geometric modeling. Methods of plane representation of the space. The basic of the Descriptive geometry.</p> <p>Description of points, lines and planes. Distance and angle between elements. Parallel and orthogonal elements.</p> <p>Design with contour lines.</p> <p>The basic of projective geometries. The projective plane and projective space. The homogeneous coordinates.</p> <p>The Desargues's theorem. The Pappus's hexagon theorem.</p> <p>The tools of 3D transformation. Rotation matrix. 3D transformation with homogeneous coordinates.</p>			
<b>References:</b>			
Coxeter H. S. M.: Introduction to Geometry, 2nd edition, Wiley Classics Library, pp. 496, 1989, ISBN-13: 978-0471504580			
Pare E. G., Loving R. O., Hill I. L.: Descriptive Geometry, 9th edition, Peachpit Press, pp. 455, 1996, ISBN-13: 978-0023913419			
Blessing G. F., Darling L. A.: Elements of Descriptive Geometry, Createspace Independent Publishing Platform, 2016, ISBN-13: 978-1540493576			

<b>Name:</b> <i>Physics</i>		<b>NEPTUN-code:</b> AMIFI1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 1 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Mathematics I – Calculus I</i>	
<b>Responsible:</b> Ervin RÁCZ, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Kandó Kálmán Faculty of Electrical Engineering Institute of Power Engineering	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Mechanics (kinematics of particles, dynamics of particles, mechanics of many body systems, mechanics of solids states, oscillations, waves). Thermodynamics (basics, main laws for thermodynamics, basics of the kinetic theory of gases, heat propagation). Moving of high energy particles (for example: electrons). Basics of quantum mechanics. Basics of solid state physics.			
<b>References:</b>			
Bhagat S.: Elementary Physics I: Kinematics, Dynamics And Thermodynamics, Bookboon, pp. 172, 2014, ISBN 978-87-403-0632-3			
Gebreselasie D.: Mechanics, Thermodynamics, Oscillations and waves, College Physics I: Notes and exercises, pp. 321, 2015, ISBN: 978-87-403-0995-9			
Griffiths D. J.: Introduction to Quantum Mechanics, 2nd Edition, Benjamin-Cummings Publishing Company, pp. 480, 2005, ISBN-13: 978-0131118928, ISBN-10: 0131118927			
Sakurai J. J., Napolitano J. J.: Modern Quantum Mechanics, 2nd Edition, Pearson, pp. 550, 2010, ISBN-13: 978-0805382914, ISBN-10: 0805382917			

## **Informatics**

<b>Name:</b> <i>Informatics I</i>		<b>NEPTUN-code:</b> AGIIA1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>The algorithms. The graphical representation of the algorithms: flowcharts, other representations. The properties of the algorithms.  Searching and sorting algorithms. Spatial algorithms.  The basic elements of a program: type, variable, constant, literal, operator, expression, command, control sequence, function, class, method, comment, preprocessing command, docstring.  The basic tools of the programming: compiler, linker, interpreter, IDE, library, debugger, I18N, L10N, version control.  Programming paradigm: structured programming, object-oriented programming, functional programming, logical programming, aspect oriented programming, generic programming.  Program design tools: class diagram, state diagram, activity diagram.  The Python 3 programming language. Simple and object-oriented programs.</p> <p>Digital data representation: numbers (integer and float), text (simple codepages, Unicode, UTF16, UTF8). Digital storing of Sound, picture and video.  Coding methods of data compress and error correction. Cryptography methods.  The basic of the computers. The hardware elements.  The computer networks. The layers of the OSI model. The IPv4, IPv6, TCP and UDP protocols. The most important protocols of the application layer.  The operating system. Programs, processes and threads. Scheduling and memory management. Filesystems.</p>			
<b>References:</b>			
Cormen T. H., Leiserson C. E., Rivest R. L.: Introduction to Algorithms, 3rd edition, The MIT Press, pp. 1292, 2009, ISBN-13: 978-0262533058			
Tanenbaum A. S., Bos H.: Modern Operating Systems, 4th edition, Pearson, pp. 1136, 2014, ISBN-13: 978-0133591620			
Tanenbaum A. S., Wetherall D. J.: Computer Networks, 5th edition, Pearson, 2013, ISBN-13: 978-9332518742			

<b>Name:</b> <i>Informatics II</i>		<b>NEPTUN-code:</b> AGIIA2AFNE	<b>Number of periods/week:</b> full-time: 1 lec + 0 sem + 2 lab
<b>Credit:</b> 3 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Informatics I</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Basic concepts of databases. The relational databases. Designing of relational databases. The relational algebra. Keys, relationships. Normal forms.</p> <p>Data types. Index methods, hash algorithms, B-trees.</p> <p>The SQL language. The data definition and the data manipulation language. The SELECT command, FROM, JOIN, WHERE, GROUP BY, HAVING, ORDER BY keywords. Sub-queries.</p> <p>Expressions in the SQL commands. Operators, functions, aggregates in these expressions.</p> <p>Concurrency control, transactions, locks and deadlocks. ACID transactions.</p> <p>Other database objects: Views, Sequences, Functions, Triggers.</p> <p>NoSQL databases. Document oriented databases. Key-value databases. Blockchain systems.</p> <p>Soft computing. Fuzzy logic and fuzzy sets, artificial neural networks, evolutionary computation.</p>			
<b>References:</b>			
Garcia-Molina H., Ullman J. D., Widom J.: Database Systems, The Complete Book, 2nd edition, Pearson, pp. 1248, 2014, ISBN-13: 978-9332518674			
Cormen T. H., Leiserson C. E., Rivest R. L.: Introduction to Algorithms, 3rd edition, The MIT Press, pp. 1292, 2009, ISBN-13: 978-0262533058			
SQL:2016 Standard, ISO/IEC 9075-1:2016			

<b>Name:</b> CAD Applications (E-learning)		<b>NEPTUN-code:</b> AGICA1AFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 3 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> Informatics I	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Basics of CAD, CAM and CAE. Input functions in a CAD software: define a position, select objects. The object types in the CAD softwares. Organizing CAD objects, the layers.</p> <p>Curves. Lines, conoids, splines, Bézier curves, NUBS, NURBS. Surfaces and solids, CSG.</p> <p>Coordinate systems. Coordinate transformations. Transformation parameters from same point. Georeferencing.</p> <p>The basic of computer graphics. The outputs of the CAD systems.</p> <p>Drawing with lines and curves in the plane.</p> <p>Drawing with solids in 3D.</p> <p>Blocks. Dinamic blocks. Layouts.</p> <p>Map editing by CAD softwares. Create topology.</p> <p>Create digital elevation models. Using DEMs in CAD softwares.</p> <p>Using point clouds in CAD softwares.</p>			
<b>References:</b>			
Shrock C.R., Heather S.: Beginning AutoCAD 2017, Exercise Workbook, Industrial Press Inc., ISBN-13: 978-0831136024			
Shumaker T.M., Madsen D.A., Madsen D.P.: AutoCAD and Its Applications Basics 2017, ISBN-13: 978-1631267352			
Chappel E.: AutoCAD Civil 3D 2016 Essentials, Autodesk Official Press, ISBN-13: 978-1119059592			



<b>Name:</b> <i>Geoinformatics I</i>		<b>NEPTUN-code:</b> AGITI1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 3 lab
<b>Credit:</b> 5 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Informatics II</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>The aim of the course is to introduce the concepts of construction, data integrating functions, elements and databases of geospatial data, computer modeling of the real world: problems of mapping the entity, vector and raster model, user interface and evaluation, and customization of a geospatial system. Students learn the basic processes of geoinformation modeling, learn practical knowledge in creating a physical model.</p>			
<b>References:</b>			
Márkus B., Végső F.: Geoinformatics, TÁMOP lecture note, Székesfehérvár, NYME GEO, TÁMOP, 2010			
Snyder J. P. : Map Projections: A Working Manual, U.S. Government Printing Office, pp. 385, 1987			
Hengl T.: A Practical Guide to Geostatistical Mapping, e-book, Lulu.com, pp. 291, 2009, ISBN 978-90-9024981-0			
de Smith M. J., Goodchild M. F., Longley P. A.: Geospatial Analysis - A comprehensive guide, 5th edition, The Winchelsea Press, 2015			

<b>Name:</b> <i>Geoinformatics II (E-learning)</i>		<b>NEPTUN-code:</b> AGIT11AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geoinformatics I</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Basic functions. Spatial analyses. Nearest functions. Network analysis. Geocoding. Interpolation. Elevation models. TIN and spline. DEM functions. 3D analysis. Spatial decision support by a case study. Applications and softwares.</p> <p>By demonstrating the typical applications, we demonstrate the possibility of multiple use of GIS.</p>			
<b>References:</b>			
Mitchell A.: The ESRI Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics and Zoning, Geographic Information Systems at Work in the Community, ESRI Press, pp. 190, 2001, ISBN: 9781879102064			
Mitchell A.: The ESRI Guide to GIS Analysis, Volume 3: Modeling Suitability, Movement, and Interaction, ESRI Press, pp. 432, 2012, ISBN: 9781589483057			
Márkus B.: Spatial Analyses, TÁMOP lecture note, Székesfehérvár, NYME GEO, TÁMOP, 2010			
de Smith M. J., Goodchild M. F., Longley P. A.: Geospatial Analysis - A comprehensive guide, 5th edition, The Winchester Press, 2015			

## **Fundamentals of technology and environmental sciences**

<b>Name:</b> <i>Environmental Studies (E-learning)</i>		<b>NEPTUN-code:</b> AGIKT1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> examination		<b>Prerequisite:</b> -	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>The importance of environmental studies and its connection with the related fields of science. General geology, hydrology, structural geology. Plate tectonics, volcanoes, earthquakes, Earth's spheres, mineralogy.</p> <p>Soil science, soil as a natural resource, soil particles, soil formation, classification. Physical, chemical and biological properties of soil, pedology, water management of soils. Soil mapping and classification, related fields of science.</p> <p>Land management, land use categories, farming systems, plant production possibilities.</p>			
<b>References:</b>			
Hartai É.: Geology, lecture notes, University of Miskolc, TÁMOP, 2011			
Kátai J.: Applied soil science, lectures notes, University of Debrecen, TÁMOP, 2013			
Nagy J., Rátonyi T.: Soil cultivation and land use, University of Debrecen, TÁMOP, 2013			

<b>Name:</b> <i>Basics of Engineering I</i>		<b>NEPTUN-code:</b> AGIMI1AFNE	<b>Number of periods/week:</b> full-time: 1 lec + 2 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> mind-term mark		<b>Prerequisite:</b> <i>Mathematics I</i>	
<b>Responsible:</b> Péter TARSOLY, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Fundamentals of mechanics, methods. Definition of force. Axioms of statics. Constrains, resultant and balance. Theorems of planary forcives. Forcives with a common intersection point. Parallel forcives. Force couples, general forcives. Vector method, projection method. Equilibrium and balance. Beam theory, supporting of beams. Supported beam. The shape and cross-section of beams. Loads and equilibrium. Sheer force diagram and bending moment diagram for the case of different load structure. Statics. Normal stress, shear stress, bending moment. Deformation. Dimensioning. Building materials, building technologies. Load-bearing structures. Roof structures. Complementary building structures.</p>			
<b>References:</b>			
Hibbeler R. C.: Engineering Mechanics Statics, 12th Edition, Pearson, pp. 672, 2009, ISBN-10: 0136077900, ISBN-13: 978-0136077909			
Chudley R., Greeno R.: Building Construction Handbook, 3rd revised edition, Butterworth Heinemann, pp. 640, 1998, ISBN-10: 0750637536, ISBN-13: 978-0750637534			
Kibert C. J.: Sustainable Construction: Green Building Design and Delivery, 3rd edition, Wiley, pp. 560, 2012, ISBN-10: 0470904453, ISBN-13: 978-0470904459			

<b>Name:</b> <i>Basics of Engineering II</i>		<b>NEPTUN-code:</b> AGIMI2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Basics of Engineering I</i>	
<b>Responsible:</b> Péter TARSOLY, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>The development of traffic. The history of roads. The types of roads.  The types of vehicles, axle loads, motion variables. Range of vision. The motion of vehicles in circular arc and transition curves. Horizontal and vertical track geometry.  Principles and basic terms of road design. Design velocity. The definition of the autonomous traffic.  Crosssection design of roads. Slope and cant. Road widening.  The forming of slopes. Crosssections. Land mass calculation.  Deaquation of roads. Junctions. Road accessories. Earthworks, soil mechanics.  Roadway constructions. Soil stabilizations, pavements. Environment protection in road construction.  Tasks and documentation of road designing.  Regulations of agricultural roads. Basics of railway design.</p>			
<b>References:</b>			
Department of Main Roads: Road planning and design manual, 1st edition, Queensland Government, 2009			
Finnish Transport Agency: Road Planning Process, Finnish Transport Agency, pp. 20, 2010			
Wolhuter K. M.: Geometric Design of Roads Handbook, CRC Press, pp. 626, 2017, ISBN 9781138893504			

<b>Name:</b> <i>Land use and land valuation (E-learning)</i>		<b>NEPTUN-code:</b> AGIFF1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Environmental Studies</i>	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Relationship between environment and society, basic concepts. Land use and geoculture. Soil, as a natural resource. The climatic and environmental facilities of Europe. Land using in Europe and in the Carpathian Basin. The land cultivation's development and the changes of the landscape. Categories of production sites and soil types. Environment protection. Environmental damages in land use. Land valuation's methods. Land use systems.			
<b>References:</b>			
Kapur S., Eswaran H., Blum W.E.H. (Eds.): Sustainable Land Management, Springer, 2011			
Randolph, J.: Environmental Land Use Planning and Management. Islandpress, 2011			
Manakos I., Braun M. (Eds.): Land Use and Land Cover Mapping in Europe, Springer, 2014			

## **Economics and management**



<b>Name:</b> <i>Macroeconomics</i>		<b>NEPTUN-code:</b> AMIKG2BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b>	
<b>Responsible:</b> András MEDVE, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Keleti Faculty of Business and Management	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Basic categories of macroeconomics. Basic correlations of macroeconomy. Players of macroeconomy. Output and income. Measuring macroeconomic performance. Macroeconomic rotation. Demand for commodity markets. Consumption demand. Consumption and saving functions. Investment demand. The Investment function. Equilibrium income. The Labour market. The Production function. Macro demand and macro supply. Labour market and employment. Money and money market. Modern-day money and banking system. Money demand, money supply. Money market equilibrium. Joint equilibrium in the commodity and money markets. IS-LM model. Economic growth. The factors and nature of economic growth. Types, causes, characteristics of business cycles. Inflation. Degrees and causes of inflation. Inflation and unemployment. Short-run and long-run Phillips-curve. The role of the State in the economy. Fiscal and monetary policy. Supply-side economics, monetarism. The fiscal-monetary mix.</p>			
<b>References:</b>			
Froyen R. T.: Macroeconomics theories and policies, 10th edition, 2013, ISBN 9780132831529			
Parkin M.: Macroeconomics, 11th edition, University of Western Ontario, 2014, ISBN 9780133020250			
Fine B., Dimakou O.: Macroeconomics : a critical companion, Pluto Press, 2016, ISBN 9781783718061			

<b>Name:</b> <i>Microeconomics</i>		<b>NEPTUN-code:</b> AMIKG2BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 1 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Macroeconomics</i>	
<b>Responsible:</b> András MEDVE, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Keleti Faculty of Business and Management	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Scarcity and efficiency. The relation of supply and demand. Consumer attitude and demand. Preference system and Neutrality map. Marginal rate of substitution. Income, optimization of prices. The budget line. Consumers' optimal choice. Demand flexibility. Consumer surplus. Company and enterprise. The Production function. The system of isoquants. Returns to scale function. Production costs. Profit. The cost function. Market structures. Corporate supply in the case of perfect competition. The long-run supply. Monopoly. Profit maximization. Natural monopolies. Monopolistic competition. Oligopolies. The market for factors of production. Labour supply and labour market. Capital, interest, investment. Asset markets, factor prices, distribution of income. The stock markets. The supply of real capital and its rental cost. Natural resources. The effects of monopoly on the market of resources. Monopsomy. Bilateral monopoly. External economic effects.</p>			
<b>References:</b>			
Fine B.: <i>Microeconomics : a critical companion</i> , Pluto Press, 2016, ISBN 9781783717798			
Besanko D. A., Braeutigam R. R.: <i>Microeconomics</i> , 4th edition, John Wiley, 2011, ISBN 9780470563588			
Sexton R.: <i>Exploring microeconomics</i> , 7th edition, Cengage Learning, 2016, ISBN 9781285859453			

<b>Name:</b> <i>Basics of Management (E-learning)</i>		<b>NEPTUN-code:</b> AMIME1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 1 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b>	
<b>Responsible:</b> Bianka PARRAGH, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Keleti Faculty of Business and Management	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>The organisation as an objective oriented system. Organizational roles. Leadership competency, management skills. Management functions. Requirements specified for managers. Planning of future trends. Organisational objectives. Strategy success factor. Management styles, management characteristics. Managerial incentives. Effective management communication. Organising managerial information, leading discussions, meetings. Methods of management. Team methods in management. Manager's time management, the importance of time in managerial work. Efficiency of managerial work and its measurement. Continuous development of the organisation and the management, change management. Supporting transformational leadership. Leaders' training. Definition, interpretation, fields of action and methods of organisation. Organisation science. Basics of organisation activities. Organisation objectives, processes and organisations. Minor techniques of organisation.</p>			
<b>References:</b>			
Stoner J.A.F.: Management, sixth edition, Englewood Cliffs, New Jersey: Prentice Hall, pp. 30., 1995, ISBN 0-13-149444-9			
Griffin R.W.: CUSTOM Management: Principles and Practices, International Edition, 11th Edition, Cengage Learning UK, 2014			
Gomez-Mejia L.R., Balkin D.B., Cardy R.L.: Management: People, Performance, Change, 3rd edition, New York: McGraw-Hill, 2008, ISBN 978-0-07-302743-2			

## **Legal and public administration studies**

<b>Name:</b> <i>State and Jurisprudential Studies</i>		<b>NEPTUN-code:</b> AGIJI1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> József MÉSZÁROS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>System of politics and jurisprudence, articulation of rule of law.  Enforcement of law. Legal relation, legal facts, law.  Emergence of law. Thesis of law, legal rule, publication.  Types of legal norms. Legal norm (complete behavior rule).  Speciality of source of law. Formation of law. Constitution of law-source of law. Definition of law.  Structure of state, state-organization, specialities of state.  Relationship between state and social-economical environment. System of the state organisations.  Function of state. Development of modern state. The fundamental law of Hungary. Constitution of law.  Administrative law  Civil law, basics of business law.  Local municipalty system of Hungary.  Family law</p>			
<b>References:</b>			
Scaletta, Ph. J.: Foundations of business law, Boston, 1990			
CIVIL CODE, ILS Nemzetközi Fordító Szolgálat Kft., Complex Kiadó, Budapest, 2014			
Schmuk P.: TRANSFORMATION OF THE HUNGARIAN LEGAL SYSTEM 2010-2013, Complex Kiadó, Budapest, 2013			

<b>Name:</b> <i>Land Registry</i>		<b>NEPTUN-code:</b> AGIIN1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 1 lab
<b>Credit:</b> 3 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>State and Jurisprudential Studies</i>	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Concept of real estate  Data of land registration  Principles of land registration  History of land registration  Rights and obligations in real estate law  Procedure of land registration  The Land Registry Office  The Ownership card</p>			
<b>References:</b>			
CIVIL CODE, ILS Nemzetközi Fordító Szolgálat Kft., Complex Kiadó, Budapest, 2014			
Slossberg L. T.: The essentials of real estate law for paralegals, Third Edition, 1998			
Hinkel D.: Practical real estate law, Cengage Learning, Stamford, 2014			

## **Social science and EU studies**

<b>Name:</b> <i>Communication</i>		<b>NEPTUN-code:</b> AGIKO1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> József HALÁSZ, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>The students get an overall picture about the communication process, most importantly, about the elements of effective oral and written communication.</p> <p>Basics about the communication process; needs and elements of communication. Context and situation in communication. Instruments of communication; verbal and non-verbal communication. Self-knowledge (perception, cognition, self-representation, identity, motivation). The efficiency of communication at personal level and at the level of society: manipulation, emotions. Intercultural communication. Communication forms and situations at workplace. Strategy of negotiations.</p>			
<b>References:</b>			
McLean S: Business communication for success, Arizona Western College, 2010			
Rosengren KE: Communication: An introduction, SAGE, 2000			
Leutenberg EA, Liptak JJ: The communication skills workbook, Whole Person Associates, 2008			



<b>Name:</b> <i>Agrarian Law in the EU</i>		<b>NEPTUN-code:</b> AGIEA1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
History, political and economical background of the EU integration. The Treaty of Rome, the Single Market, the structure of the EU, legal regulations. Financial aspects. Development and reforms of CAP, special regulations, market regulation, subsidizing system. Agricultural policy and rural development, SPS and SAPS, decoupling, greening and capping. Future plans and scenarios.			
<b>References:</b>			
Popp J.: Agricultural policy, lecture notes, University of Debrecen, TÁMOP, 2013			
Kruppa É., Kovács A.: EU studies, lecture notes, Edutus College, TÁMOP, 2013			
Ungos Atty. P. D., Ungos Jr. P. Q.: Agrarian Law and Social Legislation, pp. 381, 2013, ISBN 978-971-23-6510-2			

## **Data acquisition and data management**

## Core Studies

<b>Name:</b> <i>Surveying I</i>		<b>NEPTUN-code:</b> AGIGE1AFNE	<b>Number of periods/week:</b> full-time: 3 lec + 3 sem + 0 lab
<b>Credit:</b> 6 <b>Requirement:</b> examination		<b>Prerequisite:</b> -	
<b>Responsible:</b> Péter TARSOLY, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Fundamentals of surveying and geodesy. Figure of the Earth. Units. Geodesian networks, base points and benchmarks. Coordinate transformations. Horizontal measurements. Teodolite surveying. Calculations. The fundamentals of satellite positioning. The fundamentals of TS-surveying.			
<b>References:</b>			
Chabdra A.M.: Surveying, NEW AGE INTERNATIONAL(P) LIMITED, PUBLISHERS, New Delhi, pp. 338, 2005, ISBN (13) : 978-81-224-2532-1			
Schofield W., Breach M.: Engineering Surveying, ISBN 9780750669498, Oxford, pp. 637, 2007			
Subramanian R.: Surveying and levelling, Oxford, pp. 582, 2012			

<b>Name:</b> <i>Surveying II</i>		<b>NEPTUN-code:</b> AGIGE2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 3 sem + 0 lab
<b>Credit:</b> 5 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Surveying I, Mathematics I – Calculus I</i>	
<b>Responsible:</b> Péter TARSOLY, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Traversing, levelling and trigonometrical height measurements. Distance measurement. Electronical theodolites, tacheometers and total stations. Special surveying instruments. Error theory.			
<b>References:</b>			
Chabdra A.M.: Surveying, NEW AGE INTERNATIONAL(P) LIMITED, PUBLISHERS, New Delhi, pp. 338, 2005, ISBN (13) : 978-81-224-2532-1			
Schofield W., Breach M.: Engineering Surveying, ISBN 9780750669498, Oxford, pp. 637, 2007			
Subramanian R.: Surveying and levelling, Oxford, pp. 582, 2012			

<b>Name:</b> <i>Mapping</i>		<b>NEPTUN-code:</b> AGITT1AFNE	<b>Number of periods/week:</b> full-time: 1 lec + 2 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
The definition of map, parameterization (scale, bar scale), generalization. Symbols, the classification of maps. The methods and instruments of map editing. Sketch and detailed map. The figure and shape of the Earth – basic definitions. Datums. The relation between the map and the field. Map projections, parameters of the projections used in surveying. Domestic Datums. Mapping systems. The short history of map editing. Mapping organizations world wide.			
<b>References:</b>			
Baerwald T. J., Fraser C.: World Geography Building a Global Perspective, 7th edition, Prentice Hall Press, 2005, ISBN 10: 0131817078 ISBN 13: 9780131817074			
Essential Atlas of the World, 6th Edition, Dorling Kindersley Publishing, 2008, ISBN-10: 0756638194, ISBN-13: 9780756638191			
Grafarend E., Krumm W.: Map Projections, Cartographic Information Systems. Springer, 2007			

<b>Name:</b> <i>Map projections</i>		<b>NEPTUN-code:</b> AGIVE1AFNE	<b>Number of periods/week:</b> full-time: 1 lec + 2 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Surveying I, Geometry I</i>	
<b>Responsible:</b> Lóránt FÖLDVÁRY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Datum surface, projection surface, projective and mathematical projection, central, orthogonal, clinogonal projections. Datum surfaces: rotational ellipsoid (ellipsoidal longitude and latitude, meridians and parallels, prime meridian, azimuth, normal section and geodesic, loxodrome, radius of curvature in the prime vertical, radius of curvature in the meridian), sphere (spherical latitude and longitude, meridians and parallels, azimuth, geodesic, loxodrome, fundamental tasks of surveying on sphere, spherical triangles). Projection surfaces and distortions. Aspect of the projection (normal, transverse, oblique), aspect of the surfaces (tangent, reduced). Projection equations. Map scale factor and reduction scale factor. Conformal, equal-area, partially equidistant projections. Distortion metrics: linear modulus, area modulus, angular modulus, Tissot's indicatrix, principle directions, first and second arc-to-chord reduction, meridian convergence. Azimuthal, stereographic and pseudostereographic, cylindrical and pseudocylindrical, conic and pseudoconic projections. Domestic and international projection systems. Graticules. Transformations: in case of identical datums (using projection equations, using reductions), in case of various datums (similarity transformations, Helmert-transformation, Bursa-Wolf method). Three-dimensional similarity transformation. Transformations using EHT, HungaPro and GeoCalc softwares.			
<b>References:</b>			
Grafarend E., Krumm W.: Map Projections, Cartographic Information Systems. Springer, 2007			
Maling D.: Coordinate Systems and Map Projections. 2nd Edition, Oxford, 1992			
Timár G., Molnár G.: Map Grids and Datums. University handout, ELTE Földrajz- és Földtudományi Intézet, Budapest, 2013			

<b>Name:</b> <i>Adjustment Calculations</i>		<b>NEPTUN-code:</b> AGIKS1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Surveying II, Map Projections</i>	
<b>Responsible:</b> Lóránt FÖLDVÁRY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Tasks and concept of Adjustment Calculations. Basics of statistics. Basics of Least Squares, groups of Adjustment Calculations. Adjustment of repeated measurements (I. Adjustment Group). Adjustment of back and force levelling. Adjustment of indirect measurements (II. Adjustment Group). Normal equation, measures of reliability. Network adjustment. Regression line, regression plane, regression circle. Adjustment of direct measurements (III. Adjustment Group). Conditions, conditional equations. Traverse lines, traverse networks. Adjustment of direct measurements with constrains (IV. Adjustment Group). Adjustment of direct measurements with normal equations (V. Adjustment Group). Adjustment of direct measurements with normal equations and constraints (VI. Adjustment Group).			
<b>References:</b>			
Vaniček P: Introduction to Adjustment Calculus, University of New Brunswick, pp. 241, 1974			
Sneeuw, N., Krumm, F., Roth, M.: Adjustment Theory, Lecture Notes, Geodätisches Institute, Universität Stuttgart, 2009			
Bjerhammar: Theory Of Errors and Generalized Matrix Inverses, Elsevier, 1973			

<b>Name:</b> <i>Photogrammetry I</i>		<b>NEPTUN-code:</b> AGIFG1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geometry II, Physics</i>	
<b>Responsible:</b> Tamás JANCSÓ, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Divisions in photogrammetry. Coordinate systems. Rotation matrix. Coordinate transformations. Adjustment in photogrammetry. Optical imaging. Properties of central projection. Imaging devices. Camera calibration. Properties of analogue films. Scanning of analogue photos. Properties of metric photos. Interior and exterior orientation elements. Properties of digital images. Basics of image processing. Optical photo rectification and its instruments. Differential photo rectification and its instruments. Analytical photo rectification. Digital orthophoto production. Digital monoplottting. Possible products, evaluation methods in planar photogrammetry. Possible application areas in photogrammetry using only one image.			
<b>References:</b>			
Kraus K.: Photogrammetry: Geometry from Images and Laser Scans, Second Edition, Walter de Gruyter, 2007, ISBN: 978-3-110-19007-6			
Wang Z.: Principles of Photogrammetry, Press of Wuhan Technical University of Surveying and Mapping, Peking, 1990, ISBN: 7-81030-000-8/P 13			
Luhmann T., Robson S., Kyle S., Harley I.: Close Range Photogrammetry, Whittles Publishing, 2006, ISBN 1-870325-50-8			



<b>Name:</b> <i>Photogrammetry II</i>		<b>NEPTUN-code:</b> AGIFG2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 5 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Photogrammetry I</i>	
<b>Responsible:</b> Tamás JANCSÓ, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Stereoscopic vision and observing. Photogrammetric instruments for spatial evaluation. Digital photogrammetric workstations. Orientation and evaluation of image pairs. Terrestrial photogrammetry. Aerial photogrammetry. Planning of aerial survey missions. Methods of exterior orientation during aerial survey. Piloted airplanes and other aircraft vehicles. Remotely piloted aircraft systems (RPAS). Oblique photography, Characteristics and advantages of processing. Aerial triangulation. Laser scanning. Possible products and evaluation methods in spatial photogrammetry. Applications areas of photogrammetry.			
<b>References:</b>			
Kraus K.: Photogrammetry: Geometry from Images and Laser Scans, Second Edition, Walter de Gruyter, 2007, ISBN: 978-3-110-19007-6			
Wang Z.: Principles of Photogrammetry, Press of Wuhan Technical University of Surveying and Mapping, Peking, 1990, ISBN: 7-81030-000-8/P 13			
Luhmann T., Robson S., Kyle S., Harley I.: Close Range Photogrammetry, Whittles Publishing, 2006, ISBN 1-870325-50-8			

<b>Name:</b> <i>Land and Urban Management I</i>		<b>NEPTUN-code:</b> AGIFR1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Large Scale Mapping I</i>	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>History of the land use and management in Hungary. Reforms, and legal regulations during the last centuries. Land tenure and land ownership nowadays. Land management and land use planning. Technical background, steps and milestones. Land management scenarios and modelling. Hungarian and international best practices. Experimental projects, institutional background.</p> <p>Soil protection, agricultural road planning, water management, melioration, land use planning. Nature protection, environmental management, land evaluation. Ecological aspects, zonation, green energy.</p>			
<b>References:</b>			
Harsányi E., Juhász Cs., Nagy A.: Land use and landscale management, lecture notes, University of Debrecen, TÁMOP, 2013			
Silberstein J., Maser C.: Land-Use Planning for Sustainable Development, Second Edition, CRC Press, pp. 296, 2013, ISBN 9781466581142			
Aspinall R. J., Hill M. J.: Land Use Change: Science, Policy and Management, CRC Press, pp. 216, 2007, ISBN 9781420042962 orge W.: Geodesy, 3rd Edition, Walter de Gruyter, Berlin, New York, 2001			

<b>Name:</b> <i>Topography</i>		<b>NEPTUN-code:</b> AGITG1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Surveying II</i>	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Basic definitions of maps. Fundamentals of topography. Topographical mapping systems. Generalization. Symbols. Basic definitions of relief elements. Planar and relief elements of a topographic map. Hydrological elements of a topographic map. Nomenclature. Surveying technologies. Height determination methods. Phototopographic methods. Precision and accuracy of a topographic map. The process of topographic surveying. Map corrections and map rectification methods. Fundamentals of digital topographic mapping. The fundamentals of 3D-models. DITAB. The short history of the Hungarian topographic mapping.			
<b>References:</b>			
American Society of Civil Engineers: Topographic Surveying, ASCE Press, pp. 96, 2000, ISBN 0784403740			
Department of the Army: FM 3-34.331: Topographic Surveying, Field Manual, Washington, 2001			
Department of the Army, US Army Corps of Engineers: Manual No. 1110-1-1005: Control and Topographic Surveying, Engineering Manual, Washington, 2007			

<b>Name:</b> <i>Large Scale Mapping I</i>		<b>NEPTUN-code:</b> AGINT1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Adjustment Calculations</i>	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Fundamentals and history of large scale mapping, cadastral surveying. Classification of cadastral surveying methods and technologies. The concept of cadastral surveying. Laws and standards of cadastral surveying. Basic definitions of the digital cadastral mapping. DAT database. The workflow of a new survey. Digital cadastral surveying with photogrammetrical methods. The parameters of digitalization and combined mapping technologies. Map restoration of DAT database.			
<b>References:</b>			
Cadastral Data Content Standard for the National Spatial Data Infrastructure, v1.3, NSDI, 2003			
Rahman A. A. et al.: Developments in Multidimensional Spatial Data Models, Springer, 2013			
Cole G. M., Wilson D. A.: Land Tenure, Boundary Surveys, and Cadastral Systems, CRC Press, 2016			
Stoter J. E., van Oosterom P.: 3D Cadastre in an International Context: Legal, Organizational, and Technological Aspects, CRC Press, 2006			

<b>Name:</b> <i>Engineering Surveying I</i>		<b>NEPTUN-code:</b> AGIMG1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geodetic Networks</i>	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Fundamentals, definitions of engineering surveying. Planning and construction of different engineering projects. Base points and benchmarks, point networks used by the different engineering surveying projects. Planning a point network. Setting out. Precision and accuracy. Laws and standards.			
<b>References:</b>			
Ogundare J.O.: Precision Surveying: Principles and Geomatics Practice, Wiley, p. 648, 2015, ISBN: 978-1-119-10251-9			
Schofield W., Breach M.: Engineering Surveying, ISBN 9780750669498, Oxford, pp. 637, 2007			
Moore J.F.A.: Monitoring Building Structures, Blackie and Son Ltd., 1992, ISBN 0-216-93141-X			

<b>Name:</b> <i>GIS Applications (E-learning)</i>		<b>NEPTUN-code:</b> AGITA1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 0 sem + 2 lab
<b>Credit:</b> 3 <b>Requirement:</b> mind-term mark		<b>Prerequisite:</b> <i>Geoinformatics II</i>	
<b>Responsible:</b> Malgorzata VERŐNÉ WOJTASZEK, CSc.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Overview of different GIS applications. And based on their own application making exercises. Applications of geographic information systems. LIS origin, necessity, land based LIS, questions about creating LIS. Organizational issues, system specifications. System selection and customization, data conversion, maintenance. GIS and utilities. Types, structure and nature of public utilities. The digital base map is the basis of the LIS. Typical public utilities. The hardware and software needs of utilities applications. Urban applications. Municipal sub-systems. Specific features of local government geoinformatics. Typical local government systems. International outsourcing</p>			
<b>References:</b>			
Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. W.: Geographical Information Systems: Principles, Techniques, Management and Applications, 2nd Edition, Abridged, pp. 404, 2005, ISBN: 978-0-471-73545-8			
Keranen K., Kolvoord R.: Making Spatial Decisions Using GIS and Remote Sensing: A Workbook, ESRI Press, 2013			
Williamson I., Enemark S., Wallace J., Rajabifard A.: Land Administration for Sustainable Development, ESRI Press, 2009			

<b>Name:</b> <i>Remote Sensing</i>		<b>NEPTUN-code:</b> AGITE1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> Photogrammetry I.	
<b>Responsible:</b> Malgorzata VERŐNÉ WOJTASZEK, CSc.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and oral examination			
<b>Course description:</b>			
<p>The fundamental concepts and physical principles of remote sensing covering the components of this process: the energy source, interaction of energy with the atmosphere, and the surface. The characteristics of remote sensing platforms, sensors and the data they collect. A range of sources of remotely gathered data and data collection techniques. Data acquisition, free sources of the data. GIS and Image processing software (IDRISI, eCognition). Exploration of remotely sensed imagery and image processing techniques. Digital image interpretation and analysis. Introduction to the basic principles of digital image processing. Commonly used procedures in analyzing: preprocessing, image enhancement, image transformation. Data preparation for classification. Principal Components Analysis for multispectral imagery, indexes. Pixel-based and object-based classification (OBIA): examples and practical considerations. Supervised and unsupervised classification. Application of remote sensing (agricultural, forest mapping, land cover and land use detection). Change Analysis - pairwise and multiple image comparison. Examples of domestic and international projects (CORINE, MePAR, NÖVMON): objectives, basics and applications.</p>			
<b>References:</b>			
Verőné Wojtaszek M.: Data acquisition and integration: Remote sensing module, Szfvár, NymE GEO, TÁMOP, 2010			
Lillesand T.M., Kiefer R.W., Chipman J.: Remote Sensing and Image Interpretation, 7th Edition, John Wiley & Sons, Inc. 2015			
Blaschke T., Lang S., Hay G.: Object-Based Image Analysis, Springer, p. 817, 2008, ISBN 978-3-540-77057-2			

<b>Name:</b> <i>Satellite Positioning</i>		<b>NEPTUN-code:</b> AGINT1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> exam		<b>Prerequisite:</b> <i>Field Practice in Land Surveying</i>	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
The concepts of network RTK. Kinematic methods, traditional RTK. Static measurement technics. Case-studies for use of measurement techniques. GNSS-processing softwares. RINEX format. Mathematical models of processing GNSS-data. Transformation models (1D, 2D, 3D) between the GNSS and local datums. GNSS networks: IGS, EUREF, EPN, OGPSH. GNSS infrastructure. The Hungarian active network and its services. GNSS base networks, past, present and future: GPS, GLONASS, GALILEO, BEIDOU. DGPS-technology and navigation. Applications of GNSS-technology.			
<b>References:</b>			
Hofmann-Wellenhof B., Lichtenegger H., Collins J.: GPS, Theory and Practice, Springer, Wien, 2007			
Teunissen P.J.G., Montenbruck O. (editors): Springer Handbook of Global Navigation Satellite Systems, Springer, pp. 1327, 2017, ISBN 978-3-319-42926-7			
Grewal M.S., Andrews A.P., Bartone C.G.: Global Navigation Satellite Systems, Inertial Navigation, and Integration, 3rd Edition, Wiley, pp. 608, 2013, ISBN: 978-1-118-44700-0			



<b>Name:</b> <i>Geodetic Networks</i>		<b>NEPTUN-code:</b> AGIGH1AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 3 lab
<b>Credit:</b> 5 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Adjustment Calculations</i>	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Basic definitions related to geodetic base points and geodetic networks. Structure and history of Hungarian horizontal networks. Point densification with angular and distance measurements: preparatory work, point establishment, processing and adjustment methods.</p> <p>Structure and history of Hungarian vertical networks. Point densification with levelling and trigonometrical height measurement.</p> <p>Structure, history and role of GNSS networks in Hungary. Fundamentals of GNSS-surveying: code and phase measurements, field measurements techniques, processing of GNSS-observations.</p> <p>The nomenclature, registry and service of Hungarian base points and benchmarks. Integrated networks. Perspectives of geodetic base networks.</p>			
<b>References:</b>			
Epstein E. F., Duchesneau T. D.: The Use and Value of a Geodetic Reference System. Orono, Me.: University of Maine, 1984			
Federal Geodetic Control Committee (FGCC): Standards and Specifications for Geodetic Control Networks, September. Rockville, Md.: National Geodetic Survey, 1984			
Torge W.: Geodesy, 3rd Edition, Walter de Gruyter, Berlin, New York, 2001			

## **Specialization of Geoinformatics**

<b>Name:</b> <i>Large Scale Mapping II</i>		<b>NEPTUN-code:</b> AGINT2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 3 lab
<b>Credit:</b> 5 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Large Scale Mapping I</i>	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Fundamentals and basic terms of special surveying tasks. Setting-outs. Determination of setting-out parameters of an arc of the circle. Land parcel dividing tasks. Land-value parameters. Land-parcel identification system, indication of land parcel change. Surveying tasks in the land parcel registration. Expropriation. Surveying judicial activities. Registration and service of state surveying data bases.			
<b>References:</b>			
Cadastral Data Content Standard for the National Spatial Data Infrastructure, v1.3, NSDI, 2003			
Rahman A. A. et al.: Developments in Multidimensional Spatial Data Models, Springer, 2013			
Cole G. M., Wilson D. A.: Land Tenure, Boundary Surveys, and Cadastral Systems, CRC Press, 2016			
Stoter J. E., van Oosterom P.: 3D Cadastre in an International Context: Legal, Organizational, and Technological Aspects, CRC Press, 2006			

<b>Name:</b> <i>Digital Cartography</i>		<b>NEPTUN-code:</b> AGIDK1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geoinformatics II</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Visual thinking and communication. Classification procedures. Generalization. The types of maps; Thematic cartographic methods; Terrain Visualization, 3D visualization of surfaces; Geovisualisation; Geonames and typography; Maps on the Internet; Color Systems, Printing processes; Mapping software; The map design and editing steps.			
<b>References:</b>			
Kraak M. J., Ormeling F.: Cartography, Third Edition: Visualization of Spatial Data, 2015, ISBN-13: 978-1609181932, ISBN-10: 160918193X			
Slocum T. A., McMaster R. B., Kessler F. C., Howard H. H.: Thematic Cartography and Geovisualization, Slocum Paperback, pp. 576, 2013			
Department of Economic and Social Affairs Statistics Division: Handbook on geographic information systems and digital mapping, United Nations, New York, pp. 197, 2000			

<b>Name:</b> <i>GIS Management</i>		<b>NEPTUN-code:</b> AGITM1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 0 sem + 2 lab
<b>Credit:</b> 3 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geoinformatics II</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Overview of GIS projects, tasks, applications and related tasks. Applied learning on a project task. The basic concepts of GIS management. Importance of the environment: internal, company-specific and external environment. Geoinformatic project management - project planning, project marketing and monitoring. The GIS implementation process from project to implementation: user needs assessment, planning based on information needs, and parts of work. Logical framework matrix. Creating a Gantt chart. Data and IT Management. Cost and benefit analysis. Quality management. Change management. The place, role and effects of GIS in the body. Trends in development.</p>			
<b>References:</b>			
Márkus B.: GIS Management, lecture notes, University of West Hungary, Faculty of Geoinformatics, Székesfehérvár, 2010			
Holdstock D. A.: Strategic GIS Planning and Management in Local Government, CRC Press, 2016			
Croswell P. L.: The GIS Management Handbook, Kessey Dewitt Publications, 2009			

<b>Name:</b> <i>Geodesy</i>		<b>NEPTUN-code:</b> AGIFG1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Geodetic Networks</i>	
<b>Responsible:</b> Lóránt FÖLDEVÁRY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Tasks of geodesy. Geoid and the vertical. Mathematical background (vector-scalar and vector-vector functions, gradient, divergence, rotation). Gravity field of the Earth (gravitation, centrifugal force, tides). Gravity gradients, normal gravity field. Potential, gravity anomaly, gravity disturbance, deflection of the vertical, geoid undulation, height anomaly. Physical and mathematical relationship between potential, gravity anomaly, gravity disturbance, deflection of the vertical and geoid undulation (Stokes integral, Vening-Meinesz integral). Geodetic observations: use of surveying methods, astrogeodesy, gravimetry, gradiometry, basics of satellite-borne observations (Kepler-elements, Kepler-laws, observation techniques of satellite geodesy), satellite-borne techniques (stellar triangulation, SLR, satellite altimetry, Doppler-method, GNSS, gravity satellites, VLBI, InSAR). Geometry of reference ellipsoid, determination of the reference ellipsoid with arc-measurement method, and with the method of surfaces (deflection of the vertical adjustment). Determination of the reference ellipsoid with physical methods. Geodetic datum; positioning and orientation of reference ellipsoid. Determination of the geoid along horizontal directions. Determination of geoid vertically (stellar levelling, gravimetric methods), reduction of gravity anomaly. Determination of geoid by satellite-borne observations. Determination of the height above geoid.</p>			
<b>References:</b>			
Torge W.: Geodesy, 3rd Edition, Walter de Gruyter, Berlin, New York, 2001			
Smylie D.E. Earth Dynamics: Deformations and Oscillations of the Rotating Earth. Cambridge Univ. Press. p. 546, 2013			
Kaula: Theory of Satellite Geodesy, Dover Publications, p. 140, 2003, ISBN-13: 978-0486414652, ISBN-10: 0486414655			

<b>Name:</b> <i>Engineering Surveying II</i>		<b>NEPTUN-code:</b> AGIMG2BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Engineering Surveying I</i>	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Fundamentals of minig. Subsurface surveying and setting out.</p> <p>Horizontal and vertical deformation monitoring. Planning and establishment of deformation monitoring networks. Planning of deformation monitoring measurements. Involvement of Laser measurement techniques in engineering surveying.</p> <p>AM/FM surveying. Planning and realization of construction supervising and control measurements.</p>			
<b>References:</b>			
Ogundare J.O.: Precision Surveying: Principles and Geomatics Practice, Wiley, p. 648, 2015, ISBN: 978-1-119-10251-9			
Schofield W., Breach M.: Engineering Surveying, ISBN 9780750669498, Oxford, pp. 637, 2007			
Moore J.F.A.: Monitoring Building Structures, Blackie and Son Ltd., 1992, ISBN 0-216-93141-X			

<b>Name:</b> <i>Estate Valuation (E-learning)</i>		<b>NEPTUN-code:</b> AGIIE1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 1 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Land Registry</i>	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Definition of property. Property market. The role of valuation in the farming processes. Mathematical and economic basics of the assessment. Process of the evaluation, estate valuation methods and applications. Market value, value-in-use, investment value, investment value, insurable value, liquidation value. Approaches of value: sales comparison approach, cost approach, income approach. Legal background of estate valuation. Content and structure of expert's reports.			
<b>References:</b>			
TEGoVA: European Valuation Standards, 8th edition, Gillis, The European Group of Valuers' Associations, pp. 378, 2016, ISBN 978-90-819060-1-2			
RICS: RICS Valuation – Global Standards 2017, (a.k.a. 'Red Book'), Incorporating the International Valuation Standards, pp. 272, 2017, ISBN 978 1 78321 196 8			
Brueggeman W. B., Fisher J.: Real Estate Finance & Investments, 15th Edition, McGraw-Hill Education, pp. 832, 2015, ISBN-13: 978-0073377353			



## **Specialization of Land Management**

<b>Name:</b> <i>Large Scale Mapping II</i>		<b>NEPTUN-code:</b> AGINT2AFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 2 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Large Scale Mapping I</i>	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
Fundamentals and basic terms of special surveying tasks. Setting-outs. Determination of setting-out parameters of an arc of the circle. Land parcel dividing tasks. Land-value parameters. Land-parcel identification system, indication of land parcel change. Surveying tasks in the land parcel registration. Expropriation. Surveying judicial activities. Registration and service of state surveying data bases.			
<b>References:</b>			
Cadastral Data Content Standard for the National Spatial Data Infrastructure, v1.3, NSDI, 2003			
Rahman A. A. et al.: Developments in Multidimensional Spatial Data Models, Springer, 2013			
Cole G. M., Wilson D. A.: Land Tenure, Boundary Surveys, and Cadastral Systems, CRC Press, 2016			
Stoter J. E., van Oosterom P.: 3D Cadastre in an International Context: Legal, Organizational, and Technological Aspects, CRC Press, 2006			

<b>Name:</b> <i>Land and Urban Management II</i>		<b>NEPTUN-code:</b> AGIFR2BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Land and Urban Planning I</i>	
<b>Responsible:</b> Malgorzata VERŐNÉ WOJTASZEK, CSc.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>The basic principles of the in-plant land consolidation. The contexts of the agricultural country planning, commassation and road infrastructure. Components and process of land consolidation. Scripts of property redistribution. Possession politics aims and National Foundation. The agricultural country planning its relation to water management and melioration tasks.</p> <p>The aspects of the development of the Vásárhelyi Plan on land use and property redistribution. Land management aspects of forestry, forest engineering. The concept land consolidation of undivided ownership. Use of geoinformatics for land consolidation.</p>			
<b>References:</b>			
Biró S., Remetey-Fülöpp G., Tanka E., Tóth E., Varga Gy.: Land Fragmentation and Land Consolidation in the Agricultural Sector, A Case Study from Hungary, Food and Agricultural Organization of the United Nations, pp. 77, 2002			
Demetris D.: The Development of an Integrated Planning and Decision Support System (IPDSS) for Land Consolidation, Springer International Publishing, pp. 340, 2014, ISBN 978-3-319-02346-5			
van Dijk T.: Complications for traditional land consolidation in Central Europe, Geoforum 38(3):505–511, 2007			

<b>Name:</b> <i>Rural and Urban Development</i>		<b>NEPTUN-code:</b> AGIVT1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 2 sem + 0 lab
<b>Credit:</b> 3 <b>Requirement:</b> examination		<b>Prerequisite:</b> <i>Land and Urban Planning I</i>	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Agricultural and rural development strategy of the EU, CAP, aims and subsidizing system, environmental aspects. Global Questions and Answers.</p> <p>Regional planning in Hungary and in the EU. Legal and financial background. Territorial differences, integration and competitiveness, sustainability. Strategic and operational plans, organisations.</p>			
<b>References:</b>			
Popp J.: Agricultural policy, lecture notes, University of Debrecen, TÁMOP, 2013			
Baranyi B.: Integrated Regional Development, lecture notes, University of Debrecen, TÁMOP, 2013			
Moseley M. J.: Rural Development, SAGE Publications Inc, pp. 240, ISBN10 0761947671, ISBN13 97807619476772003			

<b>Name:</b> Water management		<b>NEPTUN-code:</b> AGIVM1BFNE	<b>Number of periods/week:</b> full-time: 2 lec + 2 sem + 0 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> Basics of Engineering II	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and written or oral examination			
<b>Course description:</b>			
<p>Properties of water, water supplies.  Hidrological cycle and elements.  Watersheds and runoff.  Morphology of waters: lakes and streams.  Water management of streams and rivers.  Water management of lakes.  Surface and subsurface waters.  Water management in plains and in hills.  Hydrometric. Water uses.  Water management in Europe and in Hungary. Havarias in the Earth.</p>			
<b>References:</b>			
Eslamian S.: Handbook of Engineering Hydrology: Environmental Hydrology and Water Management, CRC Press, 2014			
Grafton Q.R., Hussey K.: Water Resources Planning and Management, Cambridge, 2011			
Chen D.H.: Sustainable Water Management, CRC Press, 2016			

<b>Name:</b> <i>Remote Sensing Applications</i>		<b>NEPTUN-code:</b> AGITA1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + sem + 3 lab
<b>Credit:</b> 4 <b>Requirement:</b> examination		<b>Prerequisite:</b> Remote Sensing	
<b>Responsible:</b> Malgorzata VERŐNÉ WOJTASZEK, CSc.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests and oral examination			
<b>Course description:</b>			
<p>An overview of Earth observation satellite systems. Free sources of remote sensing data, data search criteria. Copernicus earth observation programme, the Sentinel missions. Digital processing of remote sensed data, especially object-based image analysis. The role of segmentation in image classification: segmentation algorithms. Hard and soft classification procedures e.g. Fuzzy classification methods, the CART (classification and regression tree) algorithm. Geospatial post-processing of data deriving from remote sensing. Application of remote sensing in different fields. Land cover and land use detection: mapping tool and qualitative image comparison using Land Change Modeler (LCM). The analysis of long time series of quantitative images using Earth Trends Modeler (ETM). Vegetation analysis: overview of vegetation index models, mapping tool. Large-scale UAS data collection, processing and management for agriculture and environment. Case studies, project tasks.</p>			
<b>References:</b>			
Giri C.P.: Remote sensing of land use and land cover, CRC Press Taylor & Francis Group, 2012			
Lillesand T.M., Kiefer R.W., Chipman J.: Remote Sensing and Image Interpretation, 7th Edition, John Wiley & Sons, Inc. 2015			
Blaschke T., Lang S., Hay G.: Object-Based Image Analysis, Springer, p. 817, 2008, ISBN 978-3-540-77057-2			

<b>Name:</b> <i>Estate Valuation (E-learning)</i>		<b>NEPTUN-code:</b> AGIIE1BFNE	<b>Number of periods/week:</b> full-time: 1 lec + 1 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Land Registry</i>	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Definition of property. Property market. The role of valuation in the farming processes. Mathematical and economic basics of the assessment. Process of the evaluation, estate valuation methods and applications. Market value, value-in-use, investment value, investment value, insurable value, liquidation value. Approaches of value: sales comparison approach, cost approach, income approach. Legal background of estate valuation. Content and structure of expert's reports.			
<b>References:</b>			
TEGoVA: European Valuation Standards, 8th edition, Gillis, The European Group of Valuers' Associations, pp. 378, 2016, ISBN 978-90-819060-1-2			
RICS: RICS Valuation – Global Standards 2017, (a.k.a. 'Red Book'), Incorporating the International Valuation Standards, pp. 272, 2017, ISBN 978 1 78321 196 8			
Brueggeman W. B., Fisher J.: Real Estate Finance & Investments, 15th Edition, McGraw-Hill Education, pp. 832, 2015, ISBN-13: 978-0073377353			

## **Optional Subjects**



<b>Name:</b> <i>Agrarian Management Studies</i>		<b>NEPTUN-code:</b> AGIAG1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 2 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Agrarian Law in the EU</i>	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
General aspects of agricultural production, basics of farming. Main crops and animal husbandry. Use of plants in food chain, in energy production and in industry. Basics of plant production and animal husbandry.			
<b>References:</b>			
Dobos A. Cs.: Precision farming, lecture notes, University of Debrecen, TÁMOP, 2013			
Sárdi K.: Soil management, lecture notes, University of Debrecen, TÁMOP, 2013			
Popp J.: Agricultural policy, lecture notes, University of Debrecen, TÁMOP, 2013			

<b>Name:</b> <i>Natural and Environmental Protection</i>		<b>NEPTUN-code:</b> AGITK1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 2 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> Land use and land valuation	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Basic concepts of environmental protection, natural resources, environmental elements. The relationship between natural and environmental protection. History of environmental protection. Land use and land management. The facts influencing the environment: pollution and protection. National Environmental Protection Projects. The tools of environmental protection: regulations, economic controls, land valuation, land monitoring. Natural protection. History and basic concepts, natural values. Organisms and policy in natural and environmental protection.			
<b>References:</b>			
Elworthy S., Holder J.: Environmental Protection, Text and Materials, Law in Context, 1997			
Das O.: Environmental Protection, Security and Armed Conflict, A Sustainable Development Perspective, Edward Elgar Publishing, 2013			
Malik A., Grohmann E.: Environmental Protection Strategies for Sustainable Development, Springer, 2012			

<b>Name:</b> <i>Urban Studies</i>		<b>NEPTUN-code:</b> AGITL1CFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Basics of Engineering II</i>	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>The basic concepts of settlements, network of settlements.  Function of settlements: villages and cities.  Structure and development of cities.  Hierarchy in settlements.  Land use in cities.  Morphology in settlements: villages and cities.  Land management and settlement development.</p>			
<b>References:</b>			
Palermo P. C., Ponzini D.: <i>Spatial Planning and Urban Development</i> , Springer, 2010			
Maheshwari B., Singh V.P., Thoradeniya B.: <i>Balanced Urban Development: Options and Strategies for Liveable Cities</i> , Springer, 2016			
Gruen C.: <i>New Urban Development, Looking Back to See Forward</i> , Rutgerspress, 2014			

<b>Name:</b> <i>GIS Applications II.</i>		<b>NEPTUN-code:</b> AGITA2CFNE	<b>Number of periods/week:</b> full-time: lec + sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> GIS Applications I.	
<b>Responsible:</b> Malgorzata VERÓNÉ WOJTASZEK, CSc.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Overview of different environmental spatial applications, the role of GIS technologies in the environmental management. The most important tasks of environmental protection. The main elements of European and domestic environmental policy. Environmental status survey. Environmental status assessment. Vegetation mapping.</p> <p>The fundamental operation in GIS: database query, IDRISI approach. The use of GIS as a decision support system: types of decision making processes, use of GIS for suitability mapping (multi-criteria evaluation) and resource allocation decisions. Suitability mapping by using distance and context operators. Multi-criteria evaluation (MCE) as a common method for assessing and aggregating many criteria. Decision Strategy Analysis in the IDRISI: criteria development and the boolean approach, non-boolean standardization and Weighted Linear Combination, Ordered Weighted Averaging. Exploring the power of Macro Modeler (MM): cartographic modeling as an organizational tool and layout tool for analytical sequences. Using the Modeler to explore “what if” scenarios. Case studies, project tasks.</p>			
<b>References:</b>			
Eastman J.R.: IDRISI Selva Manual, Clark University, IDRISI Production, pp. 322, 2012			
Longley P.A., Goodchild M.F., Maguire D.J., Rhind D.W.: Geographical Information Systems: Principles, Techniques, Management and Applications, 2nd Edition, Abridged, pp. 404, 2005, ISBN: 978-0-471-73545-8			
Longley P.A., Goodchild M.F., Maguire D.J., Rhind D.W.: Geographic Information Science and Systems, 4th Edition, Abridged, pp. 496, 2015, ISBN: 978-1-118-67695-0			

<b>Name:</b> <i>Development of Web Applications</i>		<b>NEPTUN-code:</b> AGIWA1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Geoinformatics II</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Creating a Developing Environment.  MVC frameworks.  Server-side programming.  Client-side programming: HTML, CSS, JavaScript and databases.  Possibilities and tools for implementing GIS functions.</p>			
<b>References:</b>			
Rubalcava R.: ArcGIS Web Development, pp. 248, 2014, ISBN 9781617291616			
Fu P.: Getting to Know Web GIS, pp. 409, 2016, ISBN: 9781589484634			
Davis S.: GIS for Web Developers: Adding 'Where' to Your Web Applications 1st Edition, ISBN-13: 978-0974514093			
DuVander A.: Map Scripting 101: An Example-Driven Guide to Building Interactive Maps with Bing, Yahoo!, and Google Maps, 1st Edition, ISBN-13: 978-1593272715			

<b>Name:</b> <i>Industrial Measurement Systems</i>		<b>NEPTUN-code:</b> AGIIM1CFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Engineering Surveying I</i>	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Basics of mechanical engineering. Surveying tasks of different mechanical engineering projects. The history, development and structure of industrial measurement systems. Line alignment, options of automatization. Regression line, circle and plane using Matlab. Field static laser scanning, and its use for surveying linear objects.			
<b>References:</b>			
Webster J.G. (editor): The Measurement, Instrumentations and Sensors Handbook, CRC Press LLC, 1999, ISBN 0-8493-2145-X			
Nawrocki W.: Measurement Systems and Sensors, Artech House Publishers, pp. 342, 2005, ISBN-10: 1580539459, ISBN-13: 978-1580539456			
Moore J.F.A.: Monitoring Building Structures, Blackie and Son Ltd., 1992, ISBN 0-216-93141-X			

<b>Name:</b> <i>Quality Management</i>		<b>NEPTUN-code:</b> AGIMB1CFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> György BUSICS, PhD.	<b>Position:</b> Associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Fundamentals of quality and quality management. The history of quality management. Quality philosophies. Fundamentals of TQM. Standards. Standards in the quality management. ISO 9000:2000 standard. Quality-technologies. Analysing and plotting methods, problemsolving strategies. The human influence on quality. The institution of quality management. The documents of quality management. Certification: rules and process. Metrology, standardization and calibration. The quality of a map. Map-standards.			
<b>References:</b>			
Zairi M.: Total Quality Management for Engineers, 1st Edition, Woodhead Publishing, pp. 192, 1991, ISBN: 9781855730243			
Pearn W.L., Kotz S.: Encyclopedia and handbook of process capability indices: A comprehensive exposition of quality control measures, World Scientific, Singapore, 2006			
Mitra A.: Fundamentals of quality control and improvement, Prentice Hall, Englewood Cliffs, NJ, 1998			

<b>Name:</b> CAD Systems		<b>NEPTUN-code:</b> AGICR1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> CAD Applications	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Complex 3D drawing tasks. Creating GIS databases from CAD data. Using raster images in CAD softwares. Creating and using Digital Elevation Models. Creating and using Point Clouds. Using other CAD softwares.			
<b>References:</b>			
Chappel E.: AutoCAD Civil 3D 2016 Essentials, Autodesk Official Press, ISBN-13: 978-1119059592			
Tickoo S.: Exploring AutoCAD Map 3D 2017, CADCIM Technologies, ISBN-13: 978-1942689454			
Ellis R., Martin R.: A Practical Guide to AutoCAD Map 3D 2017, ISBN-13: 978-1934865293			



<b>Name:</b> <i>Fundamentals of physical geography</i>		<b>NEPTUN-code:</b> AGIAF1CFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
<p>Surface and subsurface forces, selective denudation.  Geomorphology.  Landform evolution: hillslope dynamics and mass movement.  Slope evolution.  Fluvial erosion, River form.  Fluvial geomorphology.  Lakes. Glacial, interglacial cycles.  Coastal and marine geography.  Climatic change and the future.</p>			
<b>References:</b>			
Strahler A.H.: <i>Introducing Physical Geography</i> , 6th Edition. Wiley, 2013.			
Holden J.: <i>An Introduction to Physical Geography and the Environment</i> , 4th Edition. Pearson, 2017			
Muller W., de Blij H. J.: <i>Physical Geography: The Global Environment Text Book &amp; Study Guide</i> . Oxford University Press, 2003			

<b>Name:</b> <i>Digital Photogrammetry</i>		<b>NEPTUN-code:</b> AGIDF1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mind-term mark		<b>Prerequisite:</b> <i>Photogrammetry II</i>	
<b>Responsible:</b> Tamás JANCSÓ, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Introduction, evaluation process, applied software, other learning tools. Digital orientations – camera definition, interior orientation, automated measurement. Exterior orientation, control points. Model definition. Measurement of object co-ordinates. DTM measurement and generation, automated measurement, accuracy checking, quality control. Production of orthophotos. Evaluation methods, mapping. Theory of aerial triangulation – measurement and block adjustment. Mosaics of DTMs and orthographic images. Practical lessons in close range photogrammetry. Theory and practice of Digital Monoplotting. 3D modelling in photogrammetry.			
<b>References:</b>			
Linder W.: Digital Photogrammetry, A Practical Course, Third Edition, Springer-Verlag, 2009, ISBN: 978-3-540-92724-2			
Jancsó T.: Photogrammetry, Modular Course Book of Data Acquisition and Integration, Chapter 5, University of West Hungary, Project No: TÁMOP - 4.1.2-08/1/A-2009-0027, 2011			
Luhmann T., Robson S., Kyle S., Harley I.: Close Range Photogrammetry, Whittles Publishing, 2006, ISBN 1-870325-50-8			

<b>Name:</b> <i>Geography of Europe</i>		<b>NEPTUN-code:</b> AGIEF1CFNE	<b>Number of periods/week:</b> full-time: 2 lec + 0 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Margit HOROSZNÉ GULYÁS, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Physical geography of Europe. Geology, hydrology, flora, fauna. Western Uplands. North European Plain. Central Uplands. Alpine Mountains. Carpathian Mountains. Summarize, maps.			
<b>References:</b>			
Blouet B.W.: The EU and Neighbors: A Geography of Europe in the Modern World, 2nd Edition, Wiley, pp. 576, 2012, ISBN-10: 0470943408, ISBN-13: 978-0470943403			
Holden J.: An Introduction to Physical Geography and the Environment, 4th Edition. Pearson, 2017			
Unwin T.: A European Geography, 1st Edition, Wiley, Routledge, pp. 408, 1998, ISBN-10: 0582294851, ISBN-13: 978-0582294851			

<b>Name:</b> <i>Laser Scanning Technologies</i>		<b>NEPTUN-code:</b> AGILS1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 0 sem + 2 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Zoltán TÓTH, PhD.	<b>Position:</b> assistant professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Learn the basics of terrestrial laser scanning, the physical background of technology. Instrument Management Skills. Presentation of laser scanning procedures for different application fields (geodesy, architecture, monument protection, geology, etc.). Appointment of processing software (Leica Cyclone, PointCloudScene). Presentation of processing methods.			
<b>References:</b>			
Van Genechten B.: Theory and practice on Terrestrial Laser Scanning: Training material based on practical applications, Universidad Politecnica de Valencia Editorial, 2008, ISBN: 978-84-8363-312-0			
Wang C.C. (editor): Laser Scanning, Theory and Applications, InTechOpen, 2011, ISBN 978-953-307-205-0			
Marshall G.F.: Handbook of Optical and Laser Scanning, Marcel Dekker Inc., 2004, ISBN 0-8247-5569-3			

<b>Name:</b> <i>Meteorological Studies</i>		<b>NEPTUN-code:</b> AGIME0CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 2 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> -	
<b>Responsible:</b> Péter UDVARDY, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Engineering	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Basics of meteorology, the structure of the atmosphere, the composition of the air, basics of climatology. Climate and relief, radiation, wind, temperature, water. Ozone problems and greenhouse effect, weather forecast and instruments.			
<b>References:</b>			
Torma Cs., Horváth L., Hufnagel L., Csete M.: Climate change, lecture notes, lecture notes, Corvinus University of Budapest, TÁMOP, 2013			
Brugge R., Burt S.: One hundred years of Reading weather, University of Reading, pp. 200, 2015, ISBN 978-0-9569485-1-9			
Stull, R.: Meteorology for Scientists & Engineers, 3rd Edition, Univ. of British Columbia, pp. 938, 2011, ISBN 978-0-88865-178-5			

<b>Name:</b> <i>Organization of Systems</i>		<b>NEPTUN-code:</b> AGIRS1CFNE	<b>Number of periods/week:</b> full-time: 0 lec + 2 sem + 0 lab
<b>Credit:</b> 2 <b>Requirement:</b> mid-term mark		<b>Prerequisite:</b> <i>Informatics II</i>	
<b>Responsible:</b> Andrea PÓDÖR, PhD.	<b>Position:</b> associate professor	<b>Faculty and Institute name:</b> Alba Regia Technical Faculty Institute of Geoinformatics	
<b>Way of assessment:</b> - mid-term tests			
<b>Course description:</b>			
Introduction of object-oriented software development through examples. - UML, development strategies - demands and requisites - analysis, previous design - design - impenetation, validation			
<b>References:</b>			
Tomlinson R.: Thinking About GIS: Geographic Information System Planning for Managers, Fifth Edition, pp. 295, 2013, ISBN: 9781589483521			
Peters D.: Building a GIS: System Architecture Design Strategies for Managers, Second Edition, pp. 374, 2012, ISBN: 9781589483071			
Pick J.B.: Geo-Business: GIS in the Digital Organization, pp. 416, 2008, ISBN: 978-0-471-72998-3			