FACULTY OF
EXACT SCIENCES AND ENGINEERING
# COURSE CATALOGUE 2016-2017

Field: Environmental Engineering  
Programme: Bachelor’s Degree Programme in Environmental Engineering  
Length of studies: 4 years (8 semesters),  
Total number of ECTS credits: **230 + 10 for the B.Sc. Thesis**  
Language of teaching: Romanian (English/French tutoring available for Erasmus students)  
Form of education: Full-time

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Field: Electronic Engineering and Telecommunications
Programme: Bachelor’s Degree Programme in Applied Electronics
Length of studies: 4 years (8 semesters),
Total number of ECTS credits: 230 + 30 for the B.Sc. Thesis
Languages of teaching: Romanian (English/French tutoring available for Erasmus students)
Form of education: Full-time

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COURSE CATALOGUE 2016-2017

Field: COMPUTER SCIENCE
Programme: Bachelor’s Degree Programme in Computer Science (Informatics)
Length of studies: 3 years (6 semesters)
Number of ECTS Credits: 180 +30 for the B.Sc. Thesis
Languages of teaching: Romanian (English/French tutoring available for Erasmus students)
Form of education: Full-time

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COURSE CATALOGUE 2016-2017

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Programme: Bachelor's Degree Programme in Land Surveying and Cadastre
Length of studies: 4 years (8 semesters),
Total number of ECTS credits: 240 + 30 for the B.Sc. Thesis
Languages of teaching: Romanian (English/French available for Erasmus students)
Form of education: Full-time

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SYLLABUS

TOPOGRAPHY 1
Course Code: IG 1105
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: Luciana OPREA, PhD
Full time studies

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COURSE AIMS:
The final objectives of the course for 1st semest refereas to the preparation of field activities, field recognition, measurement planning, measurements and the calculations. Progress in building surveying and geodetic instruments, positioning the emergence of modern technologies should be presented in the course, meeting the requirements of a modern higher education.
The specific objectives:
- knowledge of surveying equipment;
- making topographic measurements.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
Course contents:
1. Object of discipline;
2. Notions of measurement error theory;
3. Planimetry;
4. Benchmarking;
5. Direct measurement of distances;
6. Angles measuring;
7. Indirect measurement of distances;
8. Triangulation networks;
9. The calculation of triangulation networks orientation;
10. The increasing of triangulation networks.

Laboratory contents:
1. Notion of Safety in Surveying;
2. Math in surveying;
3. Benchmarking alignments, Direct measurement of distances;
4. Theodolite - verification, measurements;
5. Measurement of horizontal angles - Simple Method;
7. Measurement of horizontal angles - method of reiterations;
8. Measurement of horizontal angles - method of horizon tour and binary series;
9. Measurement of vertical angles;
10. Distances measuring - Tacheometric Method;
11. Distances measuring - Parallactic Method;
12. Distances measuring - Trigonometric Method;
13. Electronic measuring distances;
14. Test of the lab.

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C1. Designing and building networks for space geodetic topographical, cadastral and other engineering works
C5. Determination of displacements and deformations of buildings and lands.
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - oral / written examination and Partial test (60% of the final grade) 
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
- Deaconescu, C. - Topografie și desen tehnic, Editura Didactică Pedagogică, București, 1979;
- Dima, N. ş.a. - Topografie minieră, Editura Corvin, Deva, 1996;
- Dima, N. ş.a. – Topografie generală și elemente de topografie minieră, Editura Universitas, Petroșani, 2005;
- Leu, N. I. ş.a - Topografie și Cadastru Editura Universul, 2002;
- L. Oprea, I. Ienciu – Topografie I - îndrumător de laborator, Seria „Didactica”, Universitatea „1 Decembrie 1918”, Alba Iulia, 2009;
- L. Oprea – Topografie - îndrumător de proiect, Seria „Didactica”, Universitatea „1 Decembrie 1918”, Alba Iulia, 2009;
- Pădure, I.; Kovacs L. - Topografie Generală, Editura Risoprint, Cluj Napoca, 2005;
SPECIAL MATHEMATICS 1
Course Code: IG 1107
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Daniel Breaz, PhD
Seminar tutor: Assis. Ioan-Lucian Popa, PhD
Full time studies

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COURSE AIMS:
The overall objective of this discipline is to strengthen the concepts of trigonometry and algebra studied in high school, including at the same time, elements of algebra required higher education and other objects.

ENTRY REQUIREMENTS:-

COURSE CONTENTS:
1. Units of measurement angles and arcs
2. Trigonometric functions sine and cosine. Graphics, accurate values of their properties
3. Tangent and cotangent functions. Formula for \( \cos (a-b) \cos (a + b) \sin (a-b) \sin (a + b) \) and formulas derived from them
4. Inverse trigonometric functions
5. Trigonometric equations
6. Sinus and cosines theorems
7. Area of the triangle using different formulas. The flat faces of different areas
8. Vectors, algebraic properties
9. The dot product, vector product
10. Polar coordinates and Cartesian coordinates
11. Complex numbers. Geometric representation of complex numbers. Module of a complex number
12. Operations with complex numbers in trigonometric form
13. The n root of a complex number. De Moivre's Theorem
14. Solve quadratic equations and three with complex coefficients

TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
In order to obtain credits for this discipline the students have to:
- Know the basic concepts related to measurement units and conversion of degrees angles in radian.
- Know how to deal with trigonometric functions, their inverses and solve elementary trigonometric equations
- Compute Scalar and vector product compute.
- Operate with complex numbers in trigonometric form and solve quadratic equations of degree two and three with complex coefficients.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Final evaluation – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- M. B. Finan, A semester cours in trigonometry, Arkansas Tech University, 2003
COURSE AIMS:
The general objectives of this course are: - the ability to collect, manage and process topographic information; - the ability to adapt to new situations, showing creativity. Progress in building surveying and geodetic instruments are subject to outstanding achievements in the fields of mechanics, physics, mathematics, electronics, etc.. Responding to this need, the course aims to present the main types of tools used in this field with emphasis on specific instruments surveyor work.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
1. Introduction, object of discipline;
2. Instruments for direct measurement of distances
3. Instruments for angles measuring;
4. Instruments for level difference measuring;
5. Instruments for level difference measuring - verification and calibration;
6. Electronic Instruments - verification, calibration, rectification;
7. Electronic theodolites;
8. Electronic levels;
9. Total Stations;
10. GPS;
11. Instruments for determining the size of surfaces.

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C2. Making topographical required to develop specific plans and topographic and thematic maps.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - written examination (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
• Bianu, V. - Optică geometrică, Editura Tehnică Bucureşti, 1962;
• Deaconescu, C. - Topografie şi desen tehnic, Editura Didactică Pedagogică, Bucureşti, 1979;
• Ienciu, I.; Oprea, L.; Voicu, G. E.; Borşan, T. – Instrumente geodezice şi metode măsurare – îndrumător de laborator, Seria Didactica, Universitatea „I Decembrie 1918” Alba-Iulia, 2009;
• Neamţu, M.; Ulea, E.; Atudorei, M.; Boceanu, I. - Instrumente Topografice şi Geodezice, Editura Tehnică Bucureşti, 1982;
• Manual de utilizare al staţiei totale;
• Manual de utilizare al teodolitului electronic;
• Manual de utilizare al GPS.
TECHNICAL AND CARTOGRAPHIC DRAWING

Course Code: IG 1203
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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COURSE AIM:
Knowing the basics on the technical design’s purpose and importance

COURSE CONTENTS:
1. General considerations; introduction to technical drawing
2. General standards used in technical drawing
3. Indicators and folding in technical drawing
4. Scales used
5. Projections layout and representation
6. Views and sections/representation
7. Sections classification and tears/hatches representation
8. Dimensioning in the technical design
9. Elements of technical and cartographic drawing
10. Elements of mapping writing
11. Mapping the land originals of topographic maps and plans

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- Knowing and applying the general standards of technical design
- Developing the technical writing skills
- Developing skills for representing various objects in view and in section
- The ability to draw up the sketch and the survey for an existing object
- Acquiring the ability to draw up the plan for drafting the maps and the topographical plans

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 60%, Verification during the semester- 40%.

RECOMMENDED READING:
- Leu, I.N. si colab, Topografie si cadastru agricol, Didactic and Pedagogic Publishing House, Bucharest, 2000
- Achim, M, - Geometrie descriptiva si desen tehnic, Didactic series, Alba Iulia, 2004;
- Precupetu, P. si colab, T, Desen Tehnic Industrial, Didactic and Pedagogic Publishing House, Bucharest, 1982;
- STAS 103-84- Linii utilizate in desenul industrial;
- STAS 1434-83- Linii utilizate in desenul de constructii
- SR ISO 7200:1994 Indicatorul formelor de desen tehnic
- SR ISO 5457:1994 Formatele de desen tehnic
**TOPOGRAPHY 2**
Course Code: IG 1204
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: Luciana OPREA, PhD
Full time studies

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**COURSE AIMS:**
The final objectives of the course for 1st semest refereas to the preparation of field activities, field recognition, measurement planning, measurements and the calculations. Progress in building surveying and geodetic instruments, positioning the emergence of modern technologies should be presented in the course, meeting the requirements of a modern higher education.
The specific objectives:
- knowledge of surveying equipment;
- making topographic measurements.

**ENTRY REQUIREMENTS:** -

**COURSE CONTENTS:**
Course contents:
1. thickening topographic triangulation networks - intersection before
2. Thickening topographic triangulation networks - intersection back
3. Networks topographic suspended
4. Networks complete topographic
5. Networks and acolytes topографіческі банк
6. Study precision topographic networks
7. Raising details planimetric
8. Calculation surfaces
9. Detaching surfaces
10. leveling (terrestrial elevation)
11. Raising the elevation details
12. leveling traverses
13. The preparation of topographical plans
14. Drawing profiles

Laboratory contents:
1. Calculation Guidelines
2. Calculation sides and coordinates
3. The intersection before. solving trigonometric
4. The intersection before. solving analytical
5. Intersection back. solving trigonometric
6. Intersection back. Express Hansen
7. Intersection back. Express coordinates barycentre
8. Network topographical suspended
9. Complete Topographic Network
10. Topographic Nodal Network
11. Closure of planimetric details and calculation surfaces
12. Leveling geometric
13. The preparation of topographical plan and profiles
14. Supporting laboratory work

**TEACHING METHODS:**
Instruction is a combination of lectures, conversation and theoretical and practical examples

**LEARNING OUTCOMES:**
C1. Designing and building networks for space geodetic topographical, cadastral and other engineering works
C5. Determination of displacements and deformations of buildings and lands.
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - oral / written examination and Partial test (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
- Deaconescu, C. - Topografie și desen tehnic, Editura Didactică Pedagogică, București, 1979;
- Dima, N. ș.a. - Topografie minieră, Editura Corvin, Deva, 1996;
- Dima, N. ș.a. - Topografi generală și elemente de topografi minieră, Editura Universitas, Petroșani, 2005;
- Leu, N. I. ș.a. - Topografie și Cadastru Editura Universul, 2002;
- L. Oprea, I. Ienciu – Topografie I - îndrumător de laborator, Seria „Didactica“, Universitatea „1 Decembrie 1918”, Alba Iulia, 2009;
- L. Oprea – Topografie - îndrumător de proiect, Seria „Didactica”, Universitatea „1 Decembrie 1918”, Alba Iulia, 2009;
- Pădure, I.; Kovacs L. - Topografie Generală, Editura Risoprint, Cluj Napoca, 2005;
COMPUTER PROGRAMMING AND NUMERICAL METHODS
Course Code: IG2101
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Boca Maria Loredana, PhD
Seminar tutor: Boca Maria Loredana, PhD
Full time studies

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COURSE AIMS:
- Understanding IT tool and its use in engineering applications.
- Training the ability to select a specific tool for a specific issue.

ENTRY REQUIREMENTS:
- Fundamental knowledge in computer operation.

COURSE CONTENTS:
The course covers the following main topics:
- Elementary issues for operating systems
- Using the Word editor for topography problems
- Using the Excel editor for topography problems
- Numerical methods for technical problems
- Using numerical program and graphic diagram for topography problems
- Using programming programs for solving engineering problems

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
- C4.1 Defining of basic concepts and principles of computer science and mathematical theories and models.
- C4.2 Interpretation of mathematical and informatics models (formal).
- C4.3 Identifying the adequate models and methods to solve real problems.
- C4.4 Using simulation to study the behavior patterns made and performance evaluation.
- C4.5 Using of formal models in specific applications for various fields.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Projects/Assignments – 60%, continuous assessment – 40%.

RECOMMENDED READING:
- Visual Basic 2005, Beginning, Thearon Willis, Bryan Newsome
- Matlab Programming, y. Kirani Singh, B. B. Chaudhuri
- http://nptel.ac.in/courses/122106033/
CIVIL, INDUSTRIAL AND AGRICULTURAL ENGINEERING ELEMENTS

Course Code: IG 2103
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

<table>
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<tr>
<th>Form of instruction</th>
<th>Number of teaching hours per semester</th>
<th>Number of teaching hours per week</th>
<th>Semester</th>
<th>Form of receiving a credit for a course</th>
<th>Number of ECTS credits allocated</th>
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<td>42</td>
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<td>Autumn</td>
<td>Grade</td>
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</table>

**COURSE AIM:**
The course presents a unified conception of the elements related to both the structural and the non-structural components of the building.

**COURSE CONTENTS:**
1. General formation and classification of constructions. Technical conditions
2. General formation of construction
3. Constructions classification
4. Buildings infrastructure
5. Waterproofing
6. Walls
7. Platforms
8. Stairs
9. Roofs
10. Finishing elements

**TEACHING METHODS:**
Lecture, conversation, exemplification;

**LEARNING OUTCOMES**
- Knowing and understanding the definition and classification of constructions, the general aspects of construction materials, technical conditions, structural frame (basements, foundations, walls, floors, stairs, roofs), waterproofing and finishing elements (plastering, painting, plating, platforms and woodwork)
- Knowing and understanding the particularly useful to students specializing in surveying - cadastre, long-term education and to specialists (engineers, sub-engineers, technicians) working in the construction field.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**
Written test examination - 70%, Verification during the semester- 30%.

**RECOMMENDED READING:**
- Popa, D., - *Construcții Civile*, Didactica Series, Alba Iulia, 2004;
- Stan, D., *Construcții și mediul*, Construction Technique University, Bucharest, 2007
- Mirel, F.D., *Construcții. Subansamblurile constructive*, Construction Technique University, Bucharest, 2006;
The Faculty of Exact Sciences and Engineering

TOPOGRAPHY PROJECT
Course Code: IG 2106
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Luciana OPREA, PhD
Full time studies

<table>
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<th>Form of instruction</th>
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<td>3</td>
<td>Autumn</td>
<td>Grade</td>
<td>2</td>
</tr>
</tbody>
</table>

COURSE AIMS:
The curriculum takes into account all necessary steps to achieve a topographical works endpoints of discipline referring to the actual preparation of a plan topographical and thematic plans in areas such as agriculture, construction, etc., which are always preceded documentation the surveying and geodetic, and finally the preparation of topographic maps or plans.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
1. Recognition of the land and site takeover
2. Identification of support network
3. Drawing up the outline, choice of route network and picketing lift
4. Measuring angles and distances in the network terrain
5. Calculation Guidelines, sides and coordinates provisional
6. Compensation planimetric network
7. Calculation of elevation network quotas points
8. Raising details planimetric and altimetry
9. Calculation of coordinates of the points of detail
10. Reporting points
11. The preparation of topographical plan
12. The preparation of topographical plan – inscriptions
13. Presentation of the project

TEACHING METHODS:
practical examples

LEARNING OUTCOMES:
C1. Designing and building networks for space geodetic topographical, cadastral and other engineering works
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Presentation of the project - practical (100% of the final grade)

RECOMMENDED READING:
- Deaconescu, C. - Topografie și desen tehnic, Editura Didactică Pedagogică, București, 1979;
- Dima, N. ş. a. - Topografie minieră, Editura Corvin, Deva, 1996;
- Dima, N. ş. a. – Topografie generală și elemente de topografie minieră, Editura Universitas, Petroșani, 2005;
- I. Ienciu, L. Oprea – Topografie generală, Seria „Didactica”, Universitatea „1 Decembrie 1918”, Alba Iulia, 2014;
- Ienciu, I.; Oprea, L.; Borșan, T. – Caiet de practică – Măsurători terestre și cadastru – an I, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2008;
- Leu, N. I. ş. a - Topografie și Cadastru Editura Universul, 2002;
- Pădure, I.; Kovacs L. - Topografie Generală, Editura Risoprint, Cluj Napoca, 2005;
INFOGRAPHICS FOR TOPOGRAPHY AND CADA斯特
Course Code: IG 3103
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: Luciana OPREA, PhD
Full time studies

<table>
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<td>4</td>
<td>Autumn</td>
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</table>

COURSE AIMS:
• The general objective of discipline is the implementation of a routine regarding computer-aided graphics. In order, to cover all topics, we chose to work with complementary themes applied to deepen the topics treated in the course.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
1. General concepts of graphical data processing;
2. Raster and vector images;
3. Surfer - software;
4. Vextractor - software;
5. AutoCAD - General remarks;
6. AutoCAD - Creating and editing objects;
7. AutoCAD - dimensioning objects;
8. AutoCAD - the georeferencing of raster topographic plans;
9. AutoCAD - „Topograph” application;
10. AutoCAD - „TopoLT” application;
11. AutoCAD - „Sirot” application;
12. AutoCAD - drafting and plotting plans and maps.

Laboratory contents:
1. Notion of Safety in laboratory;
2. Vextractor – software: raster management, vectorization raster data, Export data;
3. Surfer – software: Graphic Mode Achieving Work, 2D models, 3D models, exporting data;
4. AutoCAD: Overview, settings, Import data, management work, creating layers objects, properties of objects, toolbars, drawing plans, georeferencing raster image, plotting works.
5. AutoCAD - „Topograph” application; AutoCAD - „TopoLT” application; AutoCAD - „Sirot” application;
6. Test of the lab.

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C2. Making topographical required to develop specific plans and topographic and thematic maps.
C3. Closure technical networks - the utility angular measurements, distances, differences in level in the geodetic purposes and to reduce them to the reference surface.
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Colloquy at least 2 test subjects - written examination (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
• Ienciu, I.; Oprea, L. - Prelucrarea automată a datelor analitice și grafice din topografie și cadastru, Editura Aeternitas, Alba-Iulia, 2009;
• Ienciu, I.; Oprea, L. – Infografică pentru topografie și cadastru, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2009;
Ienciu, I. - Exploatarea programelor topografice, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2006;
Ienciu, I. - Optimizarea rețelelor geodezice în cadastru, Editura Risoprint, Cluj-Napoca, 2006;
Ienciu, I.; Rîşteiu, M.; Wainberg, D. - Suport informatic de digitizare a datelor din topografie și cadastru, Editura Aeternitas, Alba Iulia, 2003;
*** - Manualul inginerului geodez, Volumul II, Editura tehnică București, 1985;
*** - Manualul inginerului geodez, Volumul III, Editura tehnică București, 1985;
*** - Surfer, Help;
*** - Vextractor, Help;
*** - AutoCAD, Help;
Aplicația TopoLT, Help;
*** - Aplicația Topograph, Help.
PHOTOGRAMMETRY 2
Course Code: IG 3105
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Dreghici Alexandra, PhD
Seminar tutor: Dreghici Alexandra, PhD
Full time studies

<table>
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<td>Autumn</td>
<td>Grade</td>
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COURSE AIMS:
• Using photogrammetric instruments and taking photogrammetric stereo couple images

ENTRY REQUIREMENTS:
Geometry, photogrammetry 1

COURSE CONTENTS:
- Introduction in Stereophotogrammetry
- Stereoscopic natural view
- Stereoscopic artificial view
- Stereoscopic model deformations
- Mathematical elements in stereophotogrammetry
- Stereocamera
- Taking stereo couple images
- Processing methods

TEACHING METHODS:
Lecture, conversation, exemplification, photogrammetric instruments and software

LEARNING OUTCOMES:
• Using photogrammetric techniques of taking stereo couple images
• Photogrammetric measurements

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 60%; continuous assessment – 40%.

RECOMMENDED READING:
• PALAMARIU M., DIMEN L., NOTIUNI DE FOTOGRAMMETRIE TERESTRA, SERIA DIDACTICA UAB, 2002
• VOROVENCI, L., FOTOGRAMMETRIE, ED. MATRIXROM BUCURESTI, 2010
• RUSU A., (1978) FOTOGRAMMETRIE FORESTIERA, ED. CERES
• ZAVOIANU FL. FOTOGRAMMETRIE, ED. TEHNICA BUCURESTI, 1999
• TURDEANU L., FOTOGRAMMETRIE ANALITICA, ED. ACADEMIEI BUCURESTI, 1999
• NUCULESCU ST., (1987) FOTOGRAMMETRIE, LITOGRAFIA UNIVERSITATII DIN PETROSANI
• FRITSCH D., (2005), PHOTOGRAMMETRIC WEEK '05, HERBERT WICHMANN VERLAG, HEIDELBERG
• FRITSCH D., (2007), PHOTOGRAMMETRIC WEEK '07, HERBERT WICHMANN VERLAG, HEIDELBERG
AUTOMATION OF THE TOPOGRAPHICAL AND GEODETIC SURVEYS

Course Code: IG 31071
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Luciana OPREA, PhD
Seminar tutor: George VOICU, PhD
Full time studies

<table>
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<th>Form of instruction</th>
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<td>Autumn</td>
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COURSE AIMS:
The course objectives follow the knowledge progress in building surveying and geodetic instruments and learning methods of automated data acquisition and processing using worksheet.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
Course contents:
- Principles of topo-geodetic works;
- Automation of data collection;
- Laser distance meter. Automated drawing of surveying building;
- Total Station;
- Transferring data to and from the total station;
- GPS;
- Integrated system of GPS and total station;
- Processing data;
- Microsoft Excel – Overview;
- Working with formulas and functions library;
- Working with worksheets, transformation references with copy / move commands;
- Templates used in surveying: calculation guidelines, sides and coordinates, calculation of surface;
- Solving geodetic networks;
- Thickening geodetic networks.

Laboratory contents:
1. Notion of Safety in laboratory;
2. Total Station - overview;
3. Total Station – „surveying” programme;
4. Total Station – „setting out” programme;
5. Total Station – „freestation” programme;
6. Total Station – „area” programme, „tie distance” programme;
7. Total Station – „remote high” programme;
8. Total Station – create formats for downloading;
9. Total Station – downloading and uploading data from total station;
10. Microsoft Excel – calculation of guidelines, sides, coordinates and surfaces;
11. Microsoft Excel – Solving geodetic networks;
12. Microsoft Excel – Thickening geodetic networks;
13. Microsoft Excel – charts performance monitoring land and buildings;
14. Lab test.

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C2. Making topographical required to develop specific plans and topographic and thematic maps.
C3. Closure technical networks - the utility angular measurements, distances, differences in level in the geodetic purposes and to reduce them to the reference surface.
C5. Determination of displacements and deformations of buildings and lands.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - written examination (50% of the final grade)
Test of the lab - practical (50% of the final grade)

RECOMMENDED READING:
• Dima, N. – Geodezie, Editura Universitas, Petroșani, 2005;
• Ienciu, I.; Oprea, L. - Prelucrarea automată a datelor analitice și grafice din topografie și cadastru, Editura Aeternitas, Alba-Iulia, 2009;
• Ienciu, I. – Exploatarea programelor topografice, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2006;
• Ienciu, I.; Oprea, L.; Voicu, G. E. – Automatizarea lucrărilor topo - geodezice, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2008;
• Ienciu, I. – Optimizarea rețelelor geodezice în cadastru, Editura Risoprint, Cluj-Napoca, 2006;
• Ienciu, I.; Rîşteiu, M.; Weinberg, D. – Suport informatic de digitizare a datelor din topografie și cadastru, Editura Aeternitas, Alba Iulia, 2003;
• Tămăioagă, Gh.; Tămăioagă, D. – Automatizarea lucrărilor de cadastru, Editura Matrixrom, București, 2007;
• Vereș, I. – Automatizarea lucrărilor topo – geodezice, Editura Universitas, Petroșani, 2006;
• *** – Manualul de utilizare al stației totale Leica TCR 705;
• *** – Manualul de utilizare al Sistemului integrat stație totală și GPS;
• *** – Microsoft Excel, Manual de utilizare.*** .
ARCHAEOLOGICAL TOPOGRAPHY

Course Code: IG 31082
Type of course: elective
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Voicu George Emanuel, PhD
Seminar tutor: Voicu George Emanuel, PhD
Full time studies

<table>
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<td>4</td>
<td>Autumn</td>
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COURSE AIMS:
• Knowledge of the subject, the scientific areas related to methods and techniques, classical and modern research in archeology.
• Familiarize students with the terrain prospecting methods and techniques in archaeological sites.

ENTRY REQUIREMENTS:
Introduction to archaeology; Auxiliary sciences of archeology.

COURSE CONTENTS:
• Archaeological topography - interdisciplinary science.
• Highlights protohistory.
• Archaeological culture.
• Traditional research methods and techniques in archeology.
• Modern methods and techniques of dating in archeology.
• Archaeological project management. The systematic and preventive research.
• Organizing archaeological sites. Management of archaeological excavation.
• Cabinet investigations in the approaches to the archaeological objectives.
• The field investigations in the approaches to the archaeological objectives.
• Management of topographic works in a ante excavation step.
• Topographic work management during excavation and / or post excavations. Impressive archaeological data collection.
• Evidence of the archaeological data from archaeological sites. Developing plans and thematic research reports.
• Synthesis features of morphology surrounding area. Extrasitu analysis through GIS.
• Spatial distribution analysis of the elements of archaeological interest. Intrasisitu analysis through GIS.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
• understanding the successive stages and steps taken to an archaeological site;
• familiarity with the ways of completing the documentation site
• development of interest in archaeological topography.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 60%; continuous assessment – 40%.

RECOMMENDED READING:
ENGINEERING PHOTOGRAMMETRY
Course Code: IG3201
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Dreghici Alexandra, PhD
Seminar tutor: Dreghici Alexandra, PhD
Full time studies

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<td>Grade</td>
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COURSE AIMS:
- Using photogrammetric instruments and taking photogrammetric images
- Photogrammetric measurements on the taken images, using certain instruments

ENTRY REQUIREMENTS:
Geodesy, photogrammetry

COURSE CONTENTS:
- Digital models in photogrammetry
- Taking terrestrial photogrammetric images
- Taking aerial photogrammetric images
- Photogrammetric images processing
- Digital photogrammetric stations
- Land 3D modeling
- Building 3D modeling

TEACHING METHODS:
Lecture, conversation, exemplification, photogrammetric instruments and software

LEARNING OUTCOMES:
- Using photogrammetric techniques in engineering field activities
- Designing 3D geodetic network for photogrammetric measurements and engineering activity

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 60%; continuous assessment – 40%.

RECOMMENDED READING:
- Ionescu, I., Fotogrammetrie inginerească, Editura MatrixRom, Bucureşti, 2004
- Palamariu, M., Dimen, L., Noţiuni de fotogrammetrie terestră, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2003
- Popa, A., Fotogrammetrie inginerească. Îndrumător de laborator, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2009
- Chiţea, Gh., Kiss, A., Vorovencii, I., Fotogrammetrie şi teledetecţie, Editura Universităţii „Transilvania” din Braşov, 2003
- Kiss, A., Fotogrammetrie forestieră, Editura Universităţii „Transilvania” din Braşov, 1992
- Kiss, A., Vorovencii, I., Fotogrammetrie, Editura Universităţii „Transilvania” din Braşov, 2000
- Rusu, A., Fotografia aeriană şi teledetecţia în economia forestieră, Editura Ceres, Bucureşti, 1988
- Rusu, A., Fotogrammetrie forestieră, Editura Ceres, Bucureşti, 1978
SPATIAL GEODESY
Course Code: IG 3202
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Tudor Borșan, PhD Eng
Seminar tutor: Tudor Borșan, PhD Eng
Full time studies

<table>
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<td>Grade</td>
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COURSE AIMS:
- Knowing, understanding and a correct using of fundamental ideas concerning concepts specific to GNSS.

ENTRY REQUIREMENTS:
Geodesy; Topography; Signals used in Geodetic Measurements.

COURSE CONTENTS:
The course covers the following main topics:
- Introduction in spherical astronomy;
- Introduction to the GNSS. Background and history;
- Earth's atmosphere;
- Basic signal structure and error. GPS signal structure map;
- Positioning techniques;
- Data correction techniques and high resolution accuracy;
- Geodetic coordinate systems;
- Data collection techniques;
- Receiver structures;
- Receiver types;
- Accuracy and error terms;
- Areas of GPS applicability;
- The future of GPS in our country;
- Strategies for measuring and processing of GPS data.

The seminar covers the following main topics:
- GPS principles;
- Predictive modelling for GPS networks;
- GPS project planning;
- GPS Leica SR 510 presentation;
- Static surveys;
- Data post-processing;
- Rapid – static surveying. Wake up-sessions;
- Kinematic and Stop & Go surveying - using static initialization;
- Data post-processing - using Stop&Go surveying method;
- Computing transformation parameters between WGS84 and local coordinates;
- Using a Coordinate System with a Project;
- Creating a Format Template File. Uploading a Format Template File to the Sensor;
- GIS/CAD export;
- Laboratory testing.

TEACHING METHODS:
Conversation, exemplification.

LEARNING OUTCOMES:
- After completing the course, the students shall have knowledge about how satellites positions objects on and above surface of the Earth, as well as in space, knowledge of methods and techniques for determination of Earth size and shape and its deformation and change in time using positioning satellites;
- Knowledge of global positioning satellites applications in for example Construction and building industry, Transport systems, Navigation, and Oceanography.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

- A two-hour written examination (75% of the final grade)
- Carrying out practical work. (25% of the final grade)

RECOMMENDED READING:

- ACKROYD N., LORIMER R., Global navigation – a GPS user’s guide, Lloyd’s of London, 1990;
- DUMVILLE M., Autonomous Guidance and CONTROL of Construction Plant by GPS, Institut of Engineering Surveying and Space Geodesy, Nottingham, 1997
- FRENCH, G.T., - Understanding the GPS, GeoResearch Inc., 1996;
- LEICA 2001- GPS Basic.
URBANISM
Course Code: IG 3205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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<td>Summer</td>
<td>Grade</td>
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COURSE AIM:
Knowing the basics of the importance of urbanism;

COURSE CONTENTS:
1. General aspects of urbanism
2. Methodology for drawing up the urbanism documentation
3. Categories of urbanism documentation
4. The framework content of the general urban plan and the local urbanism rules for GUP
5. GUP foundation studies
6. The framework content of ZUP and the local legal regulation for ZUP
7. Structure of the ZUP framework
8. The content of the Detailed Urban Plan
9. DUP foundation studies

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- Developing the skills for achieving the urbanism documentation;
- Developing the skills and aptitudes for drawing up the studies for ZUP and GUP foundation
- Developing the skills and aptitudes for drawing up the studies for DUP foundation

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 60%, Verification during the semester- 40%.

RECOMMENDED READING:
- Cornelia Bărbulescu, Integrare tehnologică în arhitectura contemporană, Presa Universitară Clujană Publishing House, Cluj-Napoca, 2002;
- Cantacuzino G. M., Despre o estetică a reconstrucţiei, Paideia Publishing House, Bucharest, 2001
- Niculescu Doina, Elemente de urbanism, Publishing House of the Polytechnic University of Timisoara,2000;
- Popa Cristin Nicolae, Rolul administraţiei publice în procesul de urbanizare,Doctoral dissertation, Babeş-Bolyai University, Cluj-Napoca, 2002
MONITORING LAND AND CONSTRUCTION BEHAVIOUR
Course Code: IG 4102
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Dreghici Alexandra, PhD
Seminar tutor: Dreghici Alexandra, PhD
Full time studies

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<td>Autumn</td>
<td>Grade</td>
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COURSE AIMS:
- Measuring methods for land and building monitoring
- Displacement and deformation analysis

ENTRY REQUIREMENTS:
Geodesy, measurement adjustment

COURSE CONTENTS:
- Monitoring objectives, phases
- Displacement and deformation
- Factors that influence the deformation phenomena
- Displacement and deformation parameters
- Monitoring geodetic network
- Measuring methods for horizontal displacements
- Measuring methods for vertical displacements
- Deformation analysis

TEACHING METHODS:
Lecture, conversation, exemplification, field measurements, data processing.

LEARNING OUTCOMES:
- Field measurements in order to determine any land/building displacement or deformation
- Comparative analysis of monitoring systems, using repeated measurements. Results interpretation

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 60%; continuous assessment – 40%.

RECOMMENDED READING:
- Nistor, Gh.: Geodezie Aplicată La Studiul Construcţiilor, Editura Gh. Asachi Iaşi
MINING TOPOGRAPHY
Course Code: IG 4103
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: Andreea BEGOV-UNGUR, PhD
Full time studies

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COURSE AIMS:
Complex technical activities at a mine, mining area or perimeter of operation requires in most cases the presence of topographic representation. For troubleshooting skills required mining topography surveying, geodesy and specific knowledge mining. Training course offers students the opportunity to activate an updated mining or underground.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
• General terms of mining activities;
• Topographical work at mine surfaces;
• Marking and Signalling points from underground;
• Junctions;
• The projection of reference system from surface to underground;
• Junction of design work with topographical network from underground;
• The planimetric system from underground;
• Level project at the mine surface;
• Underground levelling;
• Surveying the underground details. Reception and evidence of mining works. Reception and evidence of underground production;
• Mining problems;
• Surveying work for surface mining;
• Development of topographic plans and stock assessment

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C4. Land application projects of urban and spatial planning, civil engineering, transport networks and artwork, hydraulic engineering and land reclamation etc.
C5. Determination of displacements and deformations of buildings and lands

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Colloquy at least 2 test subjects - written examination (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
• Dima, N. ş.a. – Topografie generală şi elemente de topografie minieră, Editura Universitas, Petroșani, 2005;
• Leu, I. N., ş.a. - Topografie şi cadastru, Editura Universul, București, 2002;
• Neamțu, M.; Ulea, E., ş.a. - Instrumente topografice şi geodezice, Editura Tehnică, București, 1982;
• Ortelecan, M.; ş.a. - Trasarea lucrărilor miniere, Editura "Infomin", Deva, 1999;
• Pădure, I. - Topografie minieră, lucrări practice, Editura Risoprint, Cluj-Napoca, 2005;
• Pădure, I. - Topografie minieră, Editura Corvin, Deva, 1996.
The Faculty of Exact Sciences and Engineering

CADASTRE 2 PROJECT
Course Code: IG 4105
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Luciana OPREA, PhD
Full time studies

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<td>Autumn</td>
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COURSE AIMS:
Curriculum intends to present the relevant legislation on how to prepare cadastral documentation, and finally drawing up a practical thematic project and public presentation of them.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
1. Land Legislation
2. Order no. 700/2014 regarding the content and the documentation topographic
3. Documentation of land located in extravilan Property register
4. Documentation tabulation of land located in town
5. Documentation tabulation of lands with forest
6. Documentation detachment a building land
7. Documentation for a real estate land and construction detachment
8. Documentation for a real estate joining
9. Documentation for registering a definitive construction in the land
10. File external verification of topographic works
11. Presentation of the project

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C4. Land application projects of urban and spatial planning, civil engineering, transport networks and artwork, hydraulic engineering and land reclamation etc.
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Presentation of the project - practical (100% of the final grade)

RECOMMENDED READING:
- Leu, I.N. ş.a - Topografie şi Cadastru, Editura Universul, Bucureşti, 2000;
- Mihăilă, M., ş.a. - Cadastru general şi publicitatea imobiliară, Editura Ceres, Bucureşti, 1995;
- Olaru, Gh., ş.a. - Cadastru funciar, Editura Ceres, Bucureşti, 1978;
- Oprea, L. - Cadastru – Îndrumător de proiect şi practică cadastrală, Editura Aeternitas, Alba Iulia, 2009;
- Oprea, L. - Cadastru – Îndrumător de proiect, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2008;
- Pădure, I. - Cadastru funciar, Editura Risoprint, Cluj-Napoca, 2006;
- Pădure, I., Tudorascu, M., Oprea, L. - Cadastru funciar, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2005;
- Pădure, I., Tudorascu, M., Oprea, L. - Cadastru funciar: in memoriam, Editura Risoprint, Cluj-Napoca, 2009;
- Ordin nr. 700/2014
The Faculty of Exact Sciences and Engineering

ENGINEERING TOPOGRAPHY 1
Course Code: IG 41062
Type of course: Compulsory - elective
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: George VOICU, PhD
Full time studies

<table>
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COURSE AIMS:
• The final objectives of the course covers the activities of the office preparing for the calculation of trace elements or coordinates, recognizing land tracings planning, execution tracing and mapping a network characteristic elements. Progress in building surveying and geodetic instruments, positioning the emergence of modern technologies help achieve the objectives, to the demands of modern higher education.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
Course contents:
1. Object of discipline;
2. Planimetric and altimetric setting out network;
3. Setting out of angles;
4. Setting out of distances;
5. Setting out the level points and slope lines;
6. Setting out the constructions – generalities;
7. Methods of setting out the constructions;
8. Setting out terrestrial communication ways – generalities;
9. Methods of setting out the terrestrial communication ways;
10. Accuracy in setting out the terrestrial communication ways;
11. Connection of communication – calculus of setting out elements;
12. Connection of communication - application projects;
13. Specific problems of engineering topography.

Laboratory contents:
1. Getting the topography safety
2. Draw horizontal angle – methods
3. Plotting distances field roulette – methods
4. Draw distances in the field with theodolite – methods
5. Setting out in the field with the total station by polar method
6. Setting out the land with total station in coordinated
7. Drawing shares with classical instruments
8. Drawing quotas with electronic instruments
9. Plotting platforms
10. construction stakeout - Location Highlights
11. construction stakeout - specific elements of construction
12. Drawing paths of communication
13. Drawing waterworks
14. Verification Test

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C3. Closure technical networks - the utility angular measurements, distances, differences in level in the geodetic purposes and to reduce them to the reference surface.
C4. Land application projects of urban and spatial planning, civil engineering, transport networks and artwork, hydraulic engineering and land reclamation etc.
C5. Determination of displacements and deformations of buildings and lands.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - written examination (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
• Coșarcă, C. - Topografie inginerescă, Editura Matrixrom, București, 2003;
• Dima, N. ș.a. – Topografie generală și elemente de topografie minieră, Editura Universitas, Petroșani, 2005;
• Ienciu, I.; Oprea, L.; Borșan, T. – Caiet de practică – Măsurători terestre și cadastru – an I, Seria Didactica, Universitatea „1 Decembrie 1918” Alba Iulia, 2008;
• Leu, N. I. ș.a - Topografie și Cadastru Editura Universul, 2002;
The Faculty of Exact Sciences and Engineering

GEOGRAPHIC INFORMATION SYSTEMS
Course Code: IG 41072
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Tudor Borşan, PhD Eng
Seminar tutor: Tudor Borşan, PhD Eng
Full time studies

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<td>Autumn</td>
<td>Grade</td>
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COURSE AIMS:
- Knowing, understanding and a correct using of fundamental ideas concerning concepts specific to GIS.

ENTRY REQUIREMENTS: Cartography; Geomorphology; CAD techniques.

COURSE CONTENTS:
The course covers the following main topics:
- Introduction and theoretical issues in GIS;
- Areas of GIS applicability;
- GIS components;
- GIS functions;
- Spatial data structures. Internal representation of vector layers. Internal encoding of a raster;
- Databases;
- Spatial data acquisition;
- Data conversions. Data import. Import from other GIS software. Import from CAD software;
- Data structures. Designing a database for attribute data;
- Acquiring and integrating data;
- Attribute and spatial queries;
- Building surface models;
- Exploratory data analysis;
- Maps and digital cartography. Thematic mapping techniques.

The seminar covers the following main topics:
- Preparation of a GIS project;
- GIS products;
- ArcGis Desktop’s modules;
- Conversion of analog cartographic products;
- Building new shapefile;
- Building new geodatabase;
- Map rectification, georeferencing and digitizing;
- The digitizing process. Digitizing regimes;
- Using symbols and creating annotations in GIS;
- Integrating and manipulating attribute data;
- Attribute and spatial queries;
- Building surface models;
- Spatial analysis;
- Thematic mapping techniques.

TEACHING METHODS:
Conversation, exemplification.

LEARNING OUTCOMES:
- Using GIS enhances students' ability to think critically about analyzing data.
- Using GIS promotes students' ability to use numbers and numeric skills, and to use tools that facilitate processing and transferring information.;
- This technology enables students to visualize spatial patterns, linkages, and relationships. GIS is used not only in geography courses, but in environmental studies, earth science, history, mathematics, chemistry, biology, language arts, and other subjects.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

- A two-hour written examination (75% of the final grade)
- Carrying out practical work. (25% of the final grade)

RECOMMENDED READING:

- GIS by ESRI – Michael Minami, Using Arc Map, Enviromental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
- GIS by ESRI – ***, Editing in Arc Map, Enviromental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
- GIS by ESRI – Aleta Viemmeau, Using Arc Catalog, Enviromental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
DESIGN AND OPTIMIZATION OF GEODETIC NETWORKS

Course Code: IG 4201
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Begov Ungur Andreea, PhD Eng.
Seminar tutor: Begov Ungur Andreea, Lecturer PhD Eng.

Full time studies

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COURSE AIMS:
- knowing, understanding and a correct using of fundamental ideas concerning concepts specific to design and optimization of geodetic networks;
- knowing how to design a geodetic network;
- knowing the categories and criteria of optimization and applying them in the design of geodetic networks.

ENTRY REQUIREMENTS:
Statistics and measurements compensation, Geodesy, Satellite geodesy

COURSE CONTENTS:
1. Generalities.
The component parts of geodetic network project.
4. The materialisation of geodetic networks on the field.
The problem of subdimesionative linear systems.
The problem of supradimesionate linear systems.
6. Scope functions and restrictions to geodetic network optimization.
9. Optimizing the initial data.
10. Optimizing the configuration of geodetic networks.
11. Optimizing the measurements related to the geodetic networks.
12. Examples of optimal elements in geodetic networks

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- to accustom students with terminology, methods, equipment and instruments specific of this discipline;
- to give students the basics concepts needed to design and optimization of a geodetic networks;
- understanding of issues they will encounter in their future profession.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam – 60%; Portfolio of practical work – 40%.

RECOMMENDED READING:
- Bălăcescu O.- Optimizarea bazelor geodezice și topografice utilizate în exploatațiile miniere la zi, Teză de doctorat, Petroșani, 2004;
- Fotescu N.- Contribuții privind optimizarea construcției rețelelor geodezice, Teză de doctorat, ICB, 1979;
- Ienciu, I. – Optimizarea rețelelor geodezice în cadastru, Editura Risoprint, Cluj-Napoca, 2006;
- Palamariu, M. -Geodezie, Editura RISOPRINT, Cluj Napoca, 2006;
- Palamariu, M. - Cartografie și Geodezie (Aplicații), Editura RISOPRINT, Cluj Napoca, 2004;
- *** - Manualul inginerului geodez;
- *** - Instrucțiuni pentru realizarea rețelelor geodezice ale localităților, București, 1983.
**SPATIAL PLANNING AND URBANISM**  
Course Code: IG 4203  
Type of course: compulsory  
Language of instruction: English tutoring available for Erasmus students  
Name of lecturer: Popa Dorin Victor, PhD  
Seminar tutor: Popa Dorin Victor, PhD  
Full time studies

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**COURSE AIM:**  
Developing the capacity for knowing and understanding the importance of spatial planning

**COURSE CONTENTS:**  
1. General considerations;  
2. Background elements;  
3. Drawing up the technical documentation (studies, plans) for national, county, municipal spatial planning;  
4. Characteristics of rural spatial planning;  
5. Categories of spatial planning documentation;  
6. SP documentation elaboration procedure;  
7. The procedure of acquiring the spatial planning documentation;  
8. Principles and procedures for updating the spatial planning documentation;  
9. Population’s involvement in drawing up the spatial planning documentation  
10. Relationship with the urbanism documentation  
11. Content of the spatial planning documentation

**TEACHING METHODS:**  
Lecture, conversation, exemplification;

**LEARNING OUTCOMES**

- The ability to understand and apply the Romanian current legal framework and the alignment to the EU principles and directions;  
- Developing the skills and aptitudes for drawing up the spatial planning documentation;  
- Developing the skills to achieve relationships with the spatial planning documentation;

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**  
Written test examination - 60%, Verification during the semester- 40%.

**RECOMMENDED READING:**  
- Popa D -Amenajarea Teritoriului si Urbanismul,Ed. Risoprint,Cluj Napoca,2010
METHODS AND TECHNIQUES OF PROJECT PRESENTATION
Course Code: IG 4204
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Voicu George Emanuel, PhD
Seminar tutor: Voicu George Emanuel, PhD
Full time studies

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COURSE AIMS:
- Familiarity with the methods of presentation of a project;
- Editing and archiving of documents related to a presentation;
- Use of databases;
- Troubleshooting form of presentation;

ENTRY REQUIREMENTS:
Efficient allocation of communication and networking techniques at the organizational level or professional group assuming specific roles under different hierarchical levels.

COURSE CONTENTS:
- Elements editing documents;
- Archiving techniques;
- Solving problems methodology;
- Team Activity;
- Use of network resources;
- Making presentation objectives;
- Text edit;
- Using the database;
- Conditions teamwork;
- Planning and making the presentation;
- Animation, time publication on Internet;
- Presentation of the project;

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- Planning, execution and publication on the Internet of the presentation of the project;
- Acquiring the qualities of teamwork.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- Mihaela Brut, //Instrumente pentru elearning. Ghidul informatic al profesorului modern//, Polirom, Iaşi, 2006, cap. 4, „Crearea de tutoriale utilizând Microsoft PowerPoint”.
- Bogdan Pătruț, Monica Pătruț, //Aplicatii PowerPoint educationale//, EduSoft, Bacău, 2005, cap. 1, „Utilizarea programului PowerPoint”.
GEONFORMATION

Course Code: IG 42091
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Luciana OPREA, PhD
Seminar tutor: George Voicu, PhD
Full time studies

COURSE AIMS:
Curriculum is considering implementation of a routine regarding the use of software modules E-Terra developed by A.N.C.P.I., given the dynamics of geodesy laws. To cover all topics, it has opted to work with complementary themes applied to deepen the topics covered in the course.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
Course contents:
1. Introduction to geoinformatics. Evidence of topographical fund;
2. Systems for topographical and cadastral registration of the fund in an international context;
3. Organization of cadastral activity in Romania;
4. Legislation land;
5. Legal systems of the property evidence in Romania;
6. Take cadastral works;
7. The organization of cadastre and land registry;
8. Techniques of data storage in databases;
9. Establishment of the cadastre database - The "Body property";
10. E-Terra program;
11. The computer system of managing land registers;
12. Ways of carrying out surveying work.

Laboratory contents:
1. E-Terra Program - the first real estate registration
2. E-Terra Program - dismemberment
3. E-Terra Program - joining
4. E-Terra Program - real estate data update
5. E-Terra Program - apartment
6. E-Terra Program - reapartammt
7. E-Terra Program - grinding abroad
8. Supporting laboratory work

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C1. Designing and building networks for space geodetic topographical, cadastral and other engineering works
C3. Closure technical networks - the utility angular measurements, distances, differences in level in the geodetic purposes and to reduce them to the reference surface.
C6. Making cadastre information systems and specialized fields, and their use for real estate advertising works and the property valuation.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - oral / written examination and Partial test (50% of the final grade)
Test of the lab - practical (50% of the final grade)

RECOMMENDED READING:
- Drăgoi, A. - Elemente de drept civil, drept funciar şi publicitate imobiliară, Editura Aeternitas, Alba Iulia, 2004;
- Ienciu, I. - Exploatarea programelor topografice, Seria Didactica, Universitatea „I Decembrie 1918”, Alba-Iulia, 2006;
• Ienciu, I. – Optimizarea rețelelor geodezice în cadastru, Editura Risoprint, Cluj-Napoca, 2006;
• Pădure, I., Tudorașcu, M.; Oprea, L. – Cadastru funciar, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2005;
• A.N.C.P.I. – e-Terra – suport tehnic;
• A.N.C.P.I. – „Fisa corpului de proprietate” – suport tehnic;
• A.N.C.P.I. – SIGCF – suport ethnic.
COMPUTER SYSTEM ARCHITECTURE
Course Code: INFO 101
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Cucu Ciprian, PhD
Seminar tutor: Cucu Ciprian, PhD
Full time studies

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COURSE AIMS:
- Firstly it provides students with the theoretical elements necessary to understand the basic concepts regarding the architecture and functioning of personal computers.
- Secondly, it allows for the development of practical skills regarding the use of hardware and software resources, through laboratory applications.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
A. Numbering systems
B. Assembly Language
C. Architecture types
D. IBM-PC compatible hardware

TEACHING METHODS:
Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:
Designing, selecting, and interconnecting hardware components and designing the hardware/software interface to create a computing system that meets functional, performance, energy consumption, cost, and other specific goals.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – final evaluation – 50%; continuous assessment Laboratory activities portfolio – 50%.

RECOMMENDED READING:
- http://www.csee.umbc.edu/courses/undergraduate/421/spring03/slides/ch2-2.pdf
COMPUTATIONAL LOGICS

Course Code: INFO 102
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Aldea Mihaela, PhD
Seminar tutor: Aldea Mihaela, PhD
Full time studies

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COURSE AIMS:
The discipline Computational logics aims to provide students opportunities to identify and use knowledge of the laws of human reasoning, for the purposes of mastering proper expertise and especially for their enforcement in the areas of artificial intelligence, analysis and synthesis of logic circuits, the automatic demonstration theorems, the logic programming.

ENTRY REQUIREMENTS: -

COURSE CONTENTS:
1. Propositional Logic: Logical operations, Logical equivalence of formulas, Duality law
2. Decision Problem. Perfect normal forms.
3. Propositional calculus elements: The concept of formula. True formulas
8. Predicate calculus formulas and axioms.
11. Numeral: positional representation of numbers, algorithms for crossing a number from one base to another, the four operations in various numeral, numeral 2, 8, 16; characteristic elements.
12. Representation of numerical information in memory computer systems: fixed-point representation of numerical information, floating point representation of numerical information, arithmetic operations with floating point numbers, IEEE P754 Standard
13. Boolean functions and their realization: the notion of Boolean function of several variables, Boolean operations AND, OR, NOT
14. The operation of AND gate, OR gate, NOT gate circuits; Implementation of Boolean functions. Boolean functions applications

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
Acquiring fundamental knowledge concerning the discipline specific concepts: formal systems, judgments and sentences, modal logic elements, probability, predicate logic elements; training in problem solving skills necessary for circuit design and optimization of computer systems based on structural formulas, representing information in memory computer systems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper –70%; continuous assessment – 30%.

RECOMMENDED READING:
- Stephen G. Simson, *Mathematical Logic*, Department of Mathematics The Pennsylvania State University, University Park, State College PA 16802, 2010
COURSE AIMS:
- Develop algorithmic thinking and skills for developing elementary algorithms.
- Learning basic tools for developing elementary algorithms.
- Knowledge of types of methods and data structure regarding algorithms and their development methods.
- Use of an advanced programming language for implementing the studied algorithms

ENTRY REQUIREMENTS:
No entry requirements needed.

COURSE CONTENTS:
1. General principles for structured programming and algorithm development.
3. Organizing data and structure in structural programming. Linear, alternative and while structures.
5. Elementary algorithms. Switch variable values, alternative structures, While and repeat structures, vectors, mathematical quantification each/exist, Cartesian product algorithm.
7. Evaluation
8. Sub algorithms, defining parameters and variable transfer
9. Elementary sorting methods (Bubble sort, Selection Sort, Numbering Sort, Insertion Sort)
13. Programming structure in C. Instructions IF, WHILE, DO, CASE
14. Elementary algorithms, applications.

TEACHING METHODS:
Lecture, conversation, exemplification, problem solving, documentation.

LEARNING OUTCOMES:
- acquisition of basic and specific knowledge about the concept of elementary algorithm;
- the ability to identify the applicability of the studied algorithms in real problems;
- understanding the need of using elementary methods to create algorithms when addressing problems from an algorithmic perspective;
- acquiring basic knowledge on the concept of algorithms complexity.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exams – 50%;
Continuous assessment and laboratory practical works – 50%.

RECOMMENDED READING:
- Ovidiu Domsa, Imperative / Procedural programming, Course notes, 2013.
LINEAR ALGEBRA, ANALYTICAL AND DIFFERENTIAL GEOMETRY

Course Code: INFO 104
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Aldea Mihaela, PhD
Seminar tutor: Popa Lucian, PhD
Full time studies

Form of instruction | Number of teachinghours per semester | Number of teachinghours per week | Semester | Form of receiving a credit for a course | Number of ECTS credits allocated
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Class | 56 | 3 | Autumn | Grade | 4

COURSE AIMS:
- The overall objective of this discipline is the consolidation of the concepts of linear algebra studied in high school, including at the same time, elements of superior algebra and analytical geometry necessary for other educational objects.

ENTRY REQUIREMENTS:
Knowledge of high school algebra

COURSE CONTENTS:
1. Introduction. Algebraic structures
2. Matrix operations
3. Vector spaces. Euclidean spaces
4. Linear transformations
5. Eigenvectors and eigenvalues
6. Multiline algebra and tensor product. Bilinear applications, quadratic forms
7. Vectors
8. Lines and planes in space
9. Transformations
10. Conics
11. Quadrics
12. Differential geometry
13. Surfaces

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
After going through this course, students will acquire skills in using Linear algebra and analytical geometry to solve some problems in different areas.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – 70%; continuous assessment – 30%.

RECOMMENDED READING:
- R. Horn, C. Johnson, Analiză matriceală, Editura Theta, 2006
- V. V. Konev, Linear Algebra, Vector Algebra and Analytical Geometry, Tomsk Polytechnic University, 2009
- C. Udrişte, Problems in algebra, geometry and differential equations I, II, University Politehnica of Bucharest, 1992
**MATHEMATICAL ANALYSIS**
Course Code: INFO 105
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Daniel Breaz, PhD
Seminar tutor: Assis. Ioan-Lucian Popa, PhD
Full time studies

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**COURSE AIMS:**

After browsing the course, the students will gain skills in the use of mathematical analysis for transposition of problems in various programming languages. So the discipline contributes to the formation of some general skills specific for the study domain.

**ENTRY REQUIREMENTS:**

**COURSE CONTENTS:**

1. **Strings.**
   1.1 Strings applications, real numbers strings, strings in metric spaces.
   1.2 Calculation of string limits

2. **Numerical series.**
   2.1 Applications to numerical series and convergence criteria for series with random terms.
   2.2 Applications to absolute convergent series, semi-convergent series, and series with positive terms.

3. **Functions between metrical spaces.**
   3.1 Applications regarding function calculation of the limits in one point.
   3.2 Continuity of functions between metric spaces.

4. **Integration of real functions.**
   4.1 Calculation of some integrals out of real functions.
   4.2 Applications to calculate defined integrals.

5. **Strings and series of functions**
   5.1 Applications of strings and series of functions.
   5.2 Applications of rise series and Taylor series.

6. **Functions derivations of more than one variable**
   6.1 Applications to function derivations of more than one variable, partial derivations.
   6.2 Applications to functions differentials of more than one variable and functions extremes of more than one variables.
   6.3 Conditioned extremes.

7. **Basic knowledge regarding integrals**
   7.1 Improper integrals applications.
   7.2 Applications of integrals with parameters.
   7.3 Applications of Eulerian integrals and double integrals

**TEACHING METHODS:**
Lecture, discussion, exemplification.

**LEARNING OUTCOMES:**

In order to obtain credits for this discipline the student have to know how to work with elementary mathematical analysis notions, which are necessary in the basic theoretical bases of computer science and formal models.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Final evaluation – 50%; continuous assessment – 50%.

RECOMMENDED READING:

- Breaz D., Acu, M., Mathematic Analysis, Editura Risoprint, Cluj Napoca, 2008
DATA STRUCTURES AND ALGORITHMS
Course code: INFO 109
Type of course: compulsory
Language of instruction: English/Romanian
Name of lecturer: Corina Rotar, PhD
Full time studies

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COURSE AIMS:
Algorithms and Data Structure is a fundamental discipline which is required in the curricula of Computer Science specialization. Course content is designed for training the algorithmic thinking of the students.

Objectives:
- Develop students' ability to design software that is dedicated to solving medium complexity problems.
- Deepening the concept of data structure and gaining the skills to design abstract data types and associated libraries.
- Creating a rigorous and efficient programming style
- Developing students' ability to effectively manage information by using abstract data types and rigorously designing the algorithms to process the data.
- Drawing a coherent documentation on the applications of average complexity.

ENTRY REQUIREMENTS:
- Imperative and Procedural Programming

COURSE CONTENTS:
1. Introduction. Programming paradigms
2. Data structures. Abstract data type (ADT). Examples: Rational ADT, Compex ADT- 2 sessions
3. Dynamic memory allocation
4. Simple linked lists, circulars, stack, and queue.
5. Double Linked lists
6. ADT Trees
7. ADT tables
8. TAD Graphs.
12. Branch and Bound method.
13. Backtracking method. - 2 sessions

TEACHING METHODS:
- Lecture, Cooperative learning, Discussion and survey, Team-based learning.

LEARNING OUTCOMES:
- Implementation and documentation of the software units in high-level programming languages and efficiently used programming environments.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
- Final evaluation (written exam) 60%
- Laboratory activities portfolio -40%

RECOMMENDED READING:
- Eckel, Bruce. *Thinking in C++*,
- Rotar, Corina, Algorithms and Data Structures, Lecture notes (seria Didactica)
MATHEMATICAL BASES OF COMPUTERS
Course Code: INFO 110
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Boca Maria Loredana, PhD
Seminar tutor: Boca Maria Loredana, PhD
Full time studies

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COURSE AIMS:
Acquiring fundamental knowledge in computer operation, understanding how interconnected computer components and how is the interaction human-computer.

ENTRY REQUIREMENTS:
- Fundamental knowledge in computer operation.

COURSE CONTENTS:
The course covers the following main topics:
- Logical combinational circuits
- Normal shapes, diagrams, minimization
- Numerical system: binary, octal, hexadecimal, decimal
- Encoding binary-decimal systems
- Decimal-binary and Binary-decimal conversions
- Arithmetic operations
- Semisum and sum
- Sequential logical circuits: bitable (RS, D, T, JK – Master-Slave)
- Shift registers, numbering machine
- Accumulators, multiplexers
- Finite automata

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
- C4.1 Defining of basic concepts and principles of computer science and mathematical theories and models.
- C4.2 Interpretation of mathematical and informatics models (formal).
- C4.3 Identifying the adequate models and methods to solve real problems.
- C4.4 Using simulation to study the behavior patterns made and performance evaluation.
- C4.5 Using of formal models in specific applications for various fields.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Projects/Assignments – 60%; continuous assessment – 40%.

RECOMMENDED READING:
- M. Fitting: First-order logic and Automated Theorem Proving, Ed. Springer Verlag, 1990
OPERATION SYSTEMS
Course Code: INFO 111
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Cucu Ciprian, PhD
Seminar tutor: Cucu Ciprian, PhD
Full time studies

Form of instruction | Number of teaching hours per semester | Number of teaching hours per week | Semester | Form of receiving a credit for a course | Number of ECTS credits allocated
--- | --- | --- | --- | --- | ---
Class | 56 | 4 | Summer | Grade | 6

COURSE AIMS:
- Developing fundamental knowledge regarding operating system concepts
- Using and configuring operating systems, focusing on Linux.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
A. History of operating systems
B. General concepts
C. Introduction to Linux
D. Filesystems

TEACHING METHODS:
Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:
Configuring and using various Operating Systems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – final evaluation – 50%; continuous assessment Laboratory activities portfolio – 50%.

RECOMMENDED READING:
**GRAPHS ALGORITHMS**

Course Code: INFO 112

Type of course: compulsory

Language of instruction: English tutoring available for Erasmus students

Name of lecturer: Dorin Wainberg, PhD

Seminar tutor: Dorin Wainberg, PhD

Full time studies

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**COURSE AIMS:**

Our aims in this course are twofold. First, to discuss some of the major results of graph theory, and to provide an introduction to the language, methods and terminology of the subject. Second, to emphasize various approaches (algorithmic, probabilistic, etc.) that have proved fruitful in modern graph theory: these modes of thinking about the subject have also proved successful in areas of informatics, and we hope that students will find the techniques learnt in this course to be useful in their future works.

**ENTRY REQUIREMENTS:**

Linear Algebra

**COURSE CONTENTS:**

2. Basic concepts in Graph Theory. Cyclomatic number
3. Graph traversal. Breadth First Traversal. Depth First Traversal
4. Minimum distances in graphs
5. Connected components
9. Maximum flow in transport networks
11. Traversal of a directed tree
13. Binary trees
14. Structural trees

**TEACHING METHODS:**

Lecture, conversation, exemplification.

**LEARNING OUTCOMES:**

Modelling and solving some medium complexity level problems, using the mathematical and computer sciences knowledges.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**

Written paper 50%; mid-term test 30%; seminar activities 20%.

**RECOMMENDED READING:**

- Diestel R., *Graph Theory*, Springer-Verlag, 1997
- Wilson, R.J., *Introduction to Graph Theory*, Addison Wesley Longman, 1996
PROBABILISTIC AND MATHEMATICAL STATISTICS
Course Code: INFO 113
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Lucia Căbulea, PhD
Seminar tutor: Dorin Wainberg, PhD
Full time studies

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<td>3</td>
<td>Summer</td>
<td>Grade</td>
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COURSE AIMS:
This course is designed to introduce students to various topics in probability and uncertainty that they will encounter in Computer Science theory. The concepts are illustrated with actual examples from the specialized literature. Exercises are designed to encourage the student to begin thinking about probability within a theoretical context. Today, the theory of probability has found many applications in science and engineering. In this course, the students will learn the basic terminology and concepts of probability theory and statistics.

ENTRY REQUIREMENTS:
Linear Algebra

COURSE CONTENTS:
1. Field of events
2. Probability field
3. Rules for assigning and calculating probabilities
4. Classical probability distributions
5. Discret random variables
6. Continuous random variables
7. Numerical characteristics of random variables
8. The characteristic function. Moment generating function
9. The law of large numbers for random variables. Limit theorems
10. Statistical selection theory
11. Glivenko’s theorem. Kolmogorov’s theorem
12. Estimation theory
13. Confidence intervals
14. Statistical hypothesis testing

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
Modelling and solving some medium complexity level problems, using the mathematical and economics knowledges.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper 50%; mid-term test 30%; seminar activities 20%.

RECOMMENDED READING:
The Faculty of Exact Sciences and Engineering

DATABASES
Course Code: INFO 201
Type of course: fundamental
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Olteanu Emil, PhD
Seminar tutor: Muntean Maria, PhD
Full time studies

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COURSE AIMS:
- Database design;
- Database normalization;
- Implementing databases, tables, primary and foreign keys and foreign key relationships;
- Modifying structure of tables;
- Adding, modifying and deleting table data;
- Querying databases.

ENTRY REQUIREMENTS: Introduction to Databases.

COURSE CONTENTS:
1. Database Architecture
2. Data models
3. Relational database
4. Relational algebra
5. Relational keys
6. Database normalization
   - The First Normal Boyce-Codd Form (1NF). Steps and examples.
   - The Second Normal Boyce-Codd Form (2NF). Steps and examples.
   - The Third Normal Boyce-Codd Form (3NF). Steps and examples.
7. SQL Select
8. Relational database schemes
9. Conceptual design of databases
   - Logical database design

TEACHING METHODS:
Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:
- Organizing data in databases.
- Querying databases.
- Development of various database related projects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 50%; continuous assessment Laboratory activities portfolio – 50%.

RECOMMENDED READING:
- Terry Halpin, Tony Morgan, Information Modeling and Relational Databases, second edition, Morgan Kaufmann Publishers is an imprint of Elsevier. 30 Corporate Drive, Suite 400, Burlington, MA 01803, USA.
- Mark Levene and George Loizou, A Guided Tour of Relational Databases and Beyond, Springer-Verlag Berlin Heidelberg.
FUNDAMENTAL ALGORITHMS
Course Code: INFO 202
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ovidiu Domșa, PhD
Seminar tutor: Adriana Bîrluțiu, PhD
Full time studies

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COURSE AIMS:
- Develop algorithmic thinking and skills for developing complex algorithms.
- Learning basic tools for developing fundamental algorithms.
- Knowledge of different types of fundamental algorithms and their development methods.
- Use of an advanced programming language for implementing the studied algorithms.

ENTRY REQUIREMENTS:
Imperative and procedural programming
Algorithms and data structures
Graph algorithms

COURSE CONTENTS:
- General principles for algorithm development.
- Complexity of algorithms. Asymptotic analysis of worst case scenario.
- Sorting: HeapSort, QuickSort, RadixSort, Median-Algorithm, Lower Bounds.
- Analysis of sorting and searching algorithms complexity.
- Parallel sorting: enumeration sort, odd-even transposition sort.
- Parallel sorting: bitonic sort, quicksort on a hypercube.
- Binary search trees.
- Graph algorithms: Transitive Closure, Shortest Path Problems, Minimum Spanning Trees.
- Branch&Bound algorithms. Examples of problems solved with the Branch&Bound method.
- NP-complete algorithms.
- Analysis, evaluation, and feed-back.

TEACHING METHODS:
Lecture, conversation, exemplification, problem solving, documentation.

LEARNING OUTCOMES:
- Acquisition of basic and specific knowledge about the concept of fundamental algorithms;
- The ability to identify the applicability of the studied algorithms in real problems;
- Understanding the need of using advanced methods to create efficient algorithms when addressing problems from an specific domain;
- Acquiring advanced knowledge of algorithms complexity and apply efficient methods to solve different practical problems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exams – 50%;
Continuous assessment and laboratory practical works – 50%.

RECOMMENDED READING:
- Adriana Bîrluțiu, Maria Muntean, Ovidiu Domșa, Fundamental Algorithms, Course notes and applications, Seria Didactici, 2015.
COMPUTER_NETWORKS
Course code: INFO 203
Type of course: compulsory
Language of instruction: English
Name of lecturer: Emilian CEUCA, PhD
Full time studies

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**COURSE AIMS:**
* Definition, description and explanation of key concepts, theories, methods specific to the study of Computer Networks;
* Using concepts specific to the field in order to explain the fundamental phenomena specific to the field;
* Application of principles, basic rules for understanding a written / oral or to express in writing/ orally in an appropriate manner, respectively, taking into account all elements involved in the field

**ENTRY REQUIREMENTS:**

**COURSE CONTENTS:**
1. Introduction. Classification of Computer Networks
2. Protocols. Network topologies
3. Standards. The need standardization
4. The ISO-OSI
5. The TCP / IP
6. Comparison of the OSI and TCP
7. The TCP / IP. Illustration of the case. The network protocols and IEEE
8. transport data over a data link
9. network operating systems
10. Subnetworks. design subnets
11. Applications of VLAN
12. Data protection against errors
13. Networks without wires
14 Recap. Presenting a subject exam

**TEACHING METHODS:**
Elicitation, Cooperative learning, Discussion and survey, Team-based learning, Active learning systems, Active listening.

**LEARNING OUTCOMES:**
- Developing some understanding of the role of logic and discourse representation as a tool in describing and of Computer Networks;
- having developed critical reading skills and ability to initiate own research.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**
Combined oral and written examination to verify the quality and correctness of information assimilated. (50%+50%).

**RECOMMENDED READING:**
- Cisco materials available in share folder.
- Emilian CEUCA course materials and presentations;
OBJECT ORIENTED PROGRAMMING
Course code: INFO 204
Type of course: compulsory
Language of instruction: English
Name of lecturer: Corina Rotar, PhD
Full time studies

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COURSE AIMS:
- Develop students' ability to design software that is dedicated to solving medium complexity problems by using object oriented paradigm.
- Deepening the concept of class and object, and gaining the skills to design classes and associated libraries.
- Creating a rigorous and efficient object oriented programming style
- Developing students' ability to effectively manage information by using classes and relations between classes.
- Drawing a coherent documentation on the applications of average-high complexity.

ENTRY REQUIREMENTS:
- Data Structures and Algorithms

COURSE CONTENTS:
1. Object-oriented programming paradigm. Basic concepts.
3. Classes and objects. Data members and methods.
4. Constructors and destructor. Copy constructor
5. Static keyword in classes.
6. friend keyword. Overloading binary operators.
7. Overloading operators (II).
8. Conversions.
10. Inheritance. Multiple inheritance.
11. Virtual methods
12. Polymorphism.

TEACHING METHODS:
- Lecture, Cooperative learning, Discussion and survey, Team-based learning.

LEARNING OUTCOMES:
- Implementation and documentation of the software units in an object oriented programming language and efficiently using the related concepts.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
- Final evaluation (written exam) 60%
- Laboratory activities portfolio -40%

RECOMMENDED READING:
- Thinking in C++, Bruce Eckel
- Peter Muller: Introduction to Object-Oriented Programming Using C++, electronic resources.
DIFFERENTIAL AND PARTIAL DERIVATIVES EQUATIONS
Course Code: INFO 205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Aldea Mihaela, PhD
Seminar tutor: Wainberg Dorin, PhD
Full time studies

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COURSE AIMS:
Presentation with practical methods for solving of ordinary differential equations, systems of differential equations, higher order differential equations and with partial derivatives of order 1 and 2

ENTRY REQUIREMENTS:
Mathematical Analysis

COURSE CONTENTS:
3. Linear differential equations.
5. Exact differential equations; Solutions existence and uniqueness
9. The fundamental matrix of a system of first order linear differential equations with variable coefficients.
10. Systems of first order linear differential equations with constant coefficients. Matrix exponential
11. Autonomous systems

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
Learning the basic techniques of solving differential calculus problems; knowledge and application of theorems, models, their properties and methods of work in the field of differential equations and partial derivatives.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – 50%; continuous assessment – 50%.

RECOMMENDED READING:
MATHEMATICAL SOFTWARE
Course Code: INFO 206
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Nicoleta Breaz, PhD
Seminar tutor: Lect. Adriana Bîrluțiu, PhD
Full time studies

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<td>Class</td>
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<td>Autumn</td>
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COURSE AIMS:
The general aim related to this course consists in getting knowledge which allows to initiate students in the use of mathematical software products, applied in different problems with mathematical component, arising in various fields of science and technique and in general, in the use of computer tools in an interdisciplinary context.

ENTRY REQUIREMENTS:-

COURSE CONTENTS:

I. Mathematical Software Toolboxes - general issues
1. The use of specific software in the solving of mathematical problems
2. Types of mathematical software

II. Microsoft Excel spreadsheet program
1. Editing Excel formula
2. Using of Excel predefined functions
3. Mathematical Excel functions
   3.1. Trigonometrical and mathematical functions
   3.2. Statistical functions
4. Excel statistical charts
   4.1. Creating charts
   4.2. Formatting charts
   4.3. Printing and interpretation of the charts
5. Practical applications in Excel

III. Introduction in MATLAB
1. Working with MATLAB sessions
2. Constants, variables, predefined functions, arithmetical, logical and relational operators
3. Instructions for reading, editing and assigning
4. Commands for ‘script’ m-file
5. Instructions for flow control, branching and efficiency evaluation
6. Functions (procedures) in MATLAB

IV. Mathematical functions in MATLAB
1. Basic functions in Matlab
   1.1. Functions for linear algebra and matriceal calculus
   1.2. Functions for elementary math and trigonometric
   1.3. Functions for data analysis
   1.4. Functions for polynomial calculus
   1.5. Functions for numerical methods
   1.6. Functions for graphics
2. Matlab specialized toolboxes
   2.1. Functions for statistics
   2.2. Functions for regression modeling
   2.3. Functions for curves fitting
   2.4. Functions for optimization
   2.5. Function for equations
3. Applications in Matlab
TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
- Using of some software products as Excel and Matlab to solve problems that requires large and hard calculation and also to simplify the way how the results are returned;
- Developing of software components for interdisciplinary projects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Practical project – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- N.Breaz, A. Bîrluțiu, Mathematical software, theory and applications, Seria Didactică, Univ. “1 Decembrie 1918” Alba Iulia, (in printing)
- Cleve Moler – Numerical Computing in MATLAB, SIAM, 2005
NUMERICAL CALCULUS
Course Code: INFO 209
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Daniel Breaz, PhD
Laboratory tutor: Assis. Ioan-Lucian Popa, PhD

Full time studies

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COURSE AIMS:
Introducing basic concepts and methods of numerical analysis. Initiating students in methods of numerical programming for solving mathematical problems and for start using numerical software. Students have to know the fundamental concepts of numerical analysis and various numerical algorithms. These specific objectives allow modeling and solving complex problems using knowledge of mathematics and informatics.

ENTRY REQUIREMENTS:

COURSE CONTENTS:

1. Elements of approximation theory and matrix analysis
   1.1 Analysis and evaluation of arithmetic expressions
   1.2 Items of errors theory and floating point arithmetic
   1.3 Calculating the determinant and inverse of a matrix

2. Methods and numerical algorithms. Differences calculus
   2.1 Gauss elimination method
   2.2 Total elimination method

3. Functions approximations
   3.1 Cholesky method
   3.2 Onicescu method
   3.3 Iterative methods
   3.4 Successive approximations method
   3.5 Tangent method
   3.6 Secant method

4. Numerical differentation and integration algorithms
   4.1 Bairstrov method
   4.2 Finite differences methods
   4.3 Divided differences methods

5. Numerical algorithms for solving algebraic equations
   5.1 Approximation in mean square
   5.2 Numerical differentiation

6. Items of Symbolic Calculus
   6.1 Quadrature formulas of Gauss and Newton Cotes type
   6.2 Numerical integration using Taylor series
   6.3 Multipas methods

TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
In order to obtain credits for this discipline, the students have to operate with elementary items of numerical analysis and use soft for solving different mathematical problems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Final evaluation – 50%; Laboratory activities – 50%.

RECOMMENDED READING:
- S. Nakamura – Numerical Analysis and Graphic Visualization in MATLAB, Pretice-Hall, 1996
- William Bober, Chi-Tay Tsai, Oren Masory, Numerical and Analytical Methods with MATLAB, CRC Press, 2009
FORMAL LANGUAGES AND AUTOMATION

Course Code: INFO 210
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Boca Maria Loredana, PhD
Seminar tutor: Boca Maria Loredana, PhD

Full time studies

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COURSE AIMS:
- Acquiring fundamental knowledge on the concept of mathematical modeling, the mathematical models, deterministic scheduling and implementation of a computer language;
- Formation of skills necessary to solve complex problems by interpreting expressions and instructions of a programming language.

ENTRY REQUIREMENTS:
- Fundamental knowledge in computer operation.

COURSE CONTENTS:
The course covers the following main topics:
- mathematical principles for formal languages theory
- grammars and formal language
- finite automation accounting
- regular expressions
- grammars and regular expressions
- grammars and independent content language
- compilation theory elements

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
C4.1 Defining of basic concepts and principles of computer science and mathematical theories and models.
C4.2 Interpretation of mathematical and informatics models (formal).
C4.3 Identifying the adequate models and methods to solve real problems.
C4.4 Using simulation to study the behavior patterns made and performance evaluation.
C4.5 Using of formal models in specific applications for various fields.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Projects/Assignments – 60%, continuous assessment – 40%.

RECOMMENDED READING:
- NPTEL >> Computer Science and Engineering >> Theory of Automata, Formal Languages and Computation (Video) >> GRAMMARS AND NATURAL LANGUAGE PROCESSING
WEB TECHNOLOGIES
Course Code: INFO 211
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Cucu Ciprian, PhD
Seminar tutor: Cucu Ciprian, PhD
Full time studies

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COURSE AIMS:
1. Understanding major concepts regarding the World Wide Web, such as the theoretical aspects and practical implications of the client-server model
2. Developing strong web applications using up-to-date practices and tools

ENTRY REQUIREMENTS:
-

COURSE CONTENTS:
A. HTTP (HyperText Transfer Protocol) and the Web Server
B. HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets)
C. Client-side Programming Using JavaScript
D. Server-side Programming Using PHP

TEACHING METHODS:
Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:
Students will be able to understand how things work on the Web from the technology point of view and to create interoperable and functional websites.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – final evaluation – 50%; continuous assessment Laboratory activities portfolio – 50%.

RECOMMENDED READING:
DATABASE MANAGEMENT SYSTEMS
Course Code: INFO 212
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Muntean Maria-Viorela, PhD
Seminar tutor: Muntean Maria-Viorela, PhD
Full time studies

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COURSE AIMS:
- Acquiring knowledge of design and web database management;
- Acquiring knowledge of data organization according to the requirements of web communication, specific query;
- Developing skills for dialogue between web technologies and databases;
- Developing skills in validation databases using specific Web technologies.

ENTRY REQUIREMENTS:
Databases course.

COURSE CONTENTS:
1. INTRODUCTION TO DATABASES
2. CLIENT-SERVER DATABASE STRUCTURES
   2.1 Bi-dimensional databases
   2.2. Redundant data in client-server applications
   2.3. A comparison of client-server databases architectures
3. MODERN APPROACHES IN COLLECTING AND STRUCTURING DATA
   3.1. Introduction to PHP object-oriented programming
   3.2. Introduction to MySQL
   3.3. PHP-MySQL database application development
   3.4. The main MySQL commands
   3.5. High level of application development and administration in DBMS
4. STANDARD TRANSACTIONS IN DBMS APPLICATIONS
5. SERVICE-ORIENTED ARCHITECTURE DESIGN
6. CLASSES AND COMPATIBILITES IN DESIGNING CLIENT-SERVER APPLICATIONS
7. CONFIGURATION OF CLIENT-SERVER APPLICATIONS WITH DBMS SUPPORT
   7.1. Configuration of service-oriented client-server applications
   7.2. Configuration of data mining oriented client-server applications
8. INFORMATION SCALABILITY
   8.1 Information retrieval techniques in client-server applications
   8.2 Information retrieval techniques by using JOIN method
   8.3 Types of JOINS used in knowledge discovery in databases

TEACHING METHODS:
Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:
- The identification of base concept for organizing data in databases.
- The identification and explanation of base models for the organizing and management of data in databases.
- The development of various database related projects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – final evaluation – 50%; continuous assessment Laboratory activities portfolio – 50%.

RECOMMENDED READING:
- Williams E. Hugh; Lane, David – Web Database Applications with PHP and MySQL, O'Reilly and Associates, 2002.
www.w3schools.com
www.php.net
ADVANCED PROGRAMMING TECHNIQUES

Course Code: INFO 213
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Kadar Manuella, PhD
Seminar tutor: Domşa Ovidiu, PhD
Full time studies

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COURSE AIMS:
- General objectives of the course:
  - Advanced programming in Java covers programming for both single system software distribution and across networks/devices. The course provides in depth coverage of object serialization, Java Beans, Servlets, Java Server pages JSP, Java Server Faces JSF, networking, remote objects (RMI), and distributed computing through Jini. The course offers many examples and applications that will be implemented within labs.
- Specific objectives of the course
  - Students will understand the advanced topics in Java programming, they will be in a position to do commercial Java development both for single services and for distributed processes across multiple devices.

ENTRY REQUIREMENTS:
Object Oriented Programming (FI207)
Algorithms and data structures (FI104)
Basic algorithms (FI203)

COURSE CONTENTS:
Course (learning units)
5. Inheritance and class hierarchy. Abstract classes and interfaces. Exception handling
7. Java Graphical User Interface (AWT and Swing). Listening and handling events generated by graphical components. Graphical contexts and drawing area (canvas).
8. Java Graphical User Interface (AWT and Swing). Dialogs and menus.
9. Java and Internet services. WEB programming.
13. Java database connectivity. Database access using JDBC.

Seminars-laboratories
1. Introduction to Netbeans 7.0 integrated development environment. Basics of Java programming language.
2. Java basic statements
4. Java classes and objects. Static methods. Inheritance
5. Method Overriding in Java. Data hiding and encapsulation.
6. Abstract classes and methods in Java
8. Events generated by AWT components
11. Java Swing. Labels and buttons
12. JList. JComboBox. JSpinner.
13. JTree Text Components. JTable. Menus. JtoolBar
14. Individual project presentation based on the knowledge acquired during courses and laboratories.

TEACHING METHODS:
The course is given as a combination of lectures and laboratories. There is a 100% attendance requirement for laboratories. Work in small groups. Compulsory assignments. Instruction is a combination of lectures, laboratories, group work and individual work.

LEARNING OUTCOMES:
Professional competences
C1. Programming in high-level languages
C1.1 The appropriate description of programming paradigms and of specific language mechanisms, as well as the identification of differences between semantic and syntactic aspects.
C1.2 The explaining of existing software applications using different abstraction layers (architecture, packages, classes, methods), correctly using base knowledge.
C1.3 The development of correct source codes and the testing of various components in a known programming language, given a set of design specifications.
C2. Development and maintenance of computer applications
C2.1 The identification of appropriate methodologies for software systems development.
C2.2 The identification and explanation of appropriate mechanisms for software systems specification.
C2.3 The use of methodologies, specification mechanisms and development environments for the development of computer applications.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (60% of the final grade)
Laboratory activities portfolio (40% of the final grade)

RECOMMENDED READING:
• Marty Hall, Core Servlets and JavaServer Pages, http://coreservlets.com
• PELEGRI-LLOPART, Eduardo, Cable, Laurence P. G. - How to be a Good Bean, 1997 by Sun Microsystems Inc., San Antonio Road, Palo Alto, CA.
• BERGSTEN, Hans - JavaServer Faces, Published by O'Reilly Media, Inc., 1005 Gravenstein Highway North, Sebastopol, CA.
• http://www.developer.com/java/data/
• http://www.moreservlets.com/
• http://myfaces.apache.org/
• http://www.java2s.com/
• http://java.sun.com/docs/books/tutorial/getStarted/cupojava/netbeans.html#netbeans
• http://www.netbeans.org/
OPTIMIZATION TECHNIQUES

Course Code: INFO 214
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Aldea Mihaela, PhD
Seminar tutor: Aldea Mihaela, PhD
Full time studies

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COURSE AIMS:
First, discipline aims, learning to analyze and decide logically and rigorously. On the other hand, it contributes to a multidisciplinary preparation of future IT specialists, aiming in this way to familiarize students with the concepts and techniques of mathematical modeling of social and economic phenomena.

ENTRY REQUIREMENTS:
Linear Algebra

COURSE CONTENTS:
1. Solving a linear programming problem by graphical and algebraic methods
2. Simplex method for solving linear programming problems
3. Duality. The dual simplex algorithm
4. Reoptimization of linear programming problems
5. Parametric linear programming
6. Transport problems.
7. Reoptimization of transport problems.
10. Integer linear programming – Gomory methods
12. Bellman method
13. Enumeration and evaluation methods.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
Knowing the mathematical basic elements of optimization algorithms, familiarity with the use of optimization techniques and algorithms to solve problems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – 50%; continuous assessment – 50%.

RECOMMENDED READING:
GEOMETRICAL MODELING AND COMPUTER GRAPHICS
Course code: INFO 301
Type of course: compulsory
Language of instruction: English
Name of lecturer: Emilian CEUCA, PhD
Full time studies

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COURSE AIMS:
• Definition, description and explanation of key concepts, theories, methods specific to the study of Geometrical Modelling And Computer Graphics;
• Using concepts specific to the field in order to explain the fundamental algorithms, technics of image acquisition and processing
• Application of principles, basic rules for using equations and system to perform applications in Computer Graphics

ENTRY REQUIREMENTS:

COURSE CONTENTS:
1. Introduction. General Terms and Concepts;
3. Programming languages and equipment tools. 3D object manipulation;
4. Spatial Transformations, plane coordinate systems and two spherical coordinates.
5. Highlights of Cartesian coordinates attached observer;
6. 2D Transformations;

TEACHING METHODS:
Elicitation, Cooperative learning, Discussion and survey, Team-based learning, Active learning systems, Active listening.

LEARNING OUTCOMES:
• Developing some understanding of the role of logic and discourse representation as a tool in describing and analysing algorithms and data processing for Geometrical Modelling And Computer Graphics;
• Having developed critical reading skills and ability to initiate own research.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Combined oral and written examination to verify the quality and correctness of information assimilated. (50%+50%).

RECOMMENDED READING:
• EMILIAN CEUCA – Geometrical Modelling And Computer Graphics, course materials
• Open CV Library – public internet Library
SYSTEM ANALYSIS AND DESIGN

Course Code: INFO 302
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Hutanu Constantin, PhD
Laboratory tutor: Boca Loredana, PhD
Full time studies

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COURSE AIMS:
* This course explaining of existing software applications using different abstraction layers (architecture, packages, classes, methods), correctly using base knowledge.
* The main objective of this course is the development of communication and collaboration abilities for IT&C solutions and service projects design and the identification and explanation of base computer models that are suitable for the application domain.

ENTRY REQUIREMENTS:
- Algorithms and data structures.
- Computational logics.
- Object-oriented programming.

COURSE CONTENTS:
1. Introduction in system analysis and design
   1.1. Programs, applications, systems
   1.2. Informatic technology professions
   1.3. Organizing the activity within an organization
   1.4. Presentation of abstract data types
2. Program engineering. Soft development paradigms
   2.1. Lyfe cycle of a program
   2.2. Definition of program engineering
   2.3. Clasical life cycle
   2.4. 4th generation techniques. Paradigm combinations. Program engineering.
3. Scheduling software projects.
   3.1. Human factors involved in program developing.
   3.2. Organizing the process of making the program
   3.3. Other scheduling activities. Software project planning.
4. Analysis and design techniques
   4.1. Analysis of requirements
   4.2. Communication techniques
   4.3. Principles of analysis. Analyzing methods classification
   4.4. Defining the requirements. Reviewing the definitions.
5. Reference models in system design
   5.1. Conceptual data model
   5.2. Conceptual data modelling using the E-R model
   5.3. Generalization. Application specific rules.
   5.4. Data modelling steps. Examples
6. Essential processing model
   6.1. Data cycle diagram
   6.2. Modelling data processing in the development cycle of an application
   6.3. DFD examples
6.4. Step-by-step approach in processing models
7. Fundamental elements in system design
   7.1. Fundamentals in design
   7.2. Design steps. Design concepts.
   7.3. Architecture design.
   7.4. Design documentation
8. Logical data design
   8.1. Logical data model. Relational model.
8.3. Transforming E-R diagrams into relations.
8.4. Obtaining the logical data model. Events analysis.
8. Logical data design.
8.1. Logical data model. Relational model.
8.3. Transforming E-R diagrams into relations.
8.4. Obtaining the logical data model. Events analysis.
9. Processing design
9.1. General design decisions
9.2. Implementation models
9.3. General processes design
9.4. Primary processes design
9.5. Tools for processes defining
10. Physical data design
10.1. Physical data design process
10.2. Analysis of data volume and usage
10.3. Data distribution strategies
10.4. Folder organizing. Indexing.
10.5. Integrity requirements
11. Interface design
11.1. Interface design targets/duties
11.2. Manual, batch and online processing
11.3. Designing entry documents and reports
11.4. Human-computer interaction
12. System implementation and testing
12.1. Program specifications
12.2. Testing
12.3. Installing and maintaining systems
12.4. Using and maintaining systems.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
• The use of appropriate criteria and methods for the evaluation of computer applications;
• The development of dedicated computer projects;
• Forming the student ability of analyzing and designing informatics systems: the conception, design, implementation and maintenance of informatics systems and programs, along with the necessary technical documentation;
• Leading IT&C solutions projects, assuring the good functioning, monitoring and developing implemented IT&C solutions, assuring the functionality, monitoring and developing implemented IT&C solutions, training staff to use implemented IT&C solutions, coordination of expert teams;
• Designing projects for IT&C solutions and services, designing/redesigning projects for the most complex system components, coordination of IT&C projects and teams, monitoring the performance of implemented IT&C solutions, training the staff to use IT&C.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam – 50%; continuous assessment – 50%.

RECOMMENDED READING:
• Lungu, I., Sabău, Gh., Velicanu, M. - Sisteme informatiche. Analiză, proiectare și implementare, Ed. Economică. 2003;
• Popescu, Elena; Popescu, Gh., - Elaborarea sistemelor informatiche în contextul informatic actual, Constanța Ovidius University Press, 2001
ARTIFICIAL INTELLIGENCE
Course Code: INFO 304
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan Ileana, PhD
Seminar tutor: Maria Muntean, PhD
Full time studies

Form of instruction | Number of teaching hours per semester | Number of teaching hours per week | Semester | Form of receiving a credit for a course | Number of ECTS credits allocated
---|---|---|---|---|---
Class | 56 | 4 | Autumn | Grade | 6

COURSE AIMS:
- The course is a coherent introduction in Artificial Intelligence area, including theoretical and practical approaches.
- The identification of appropriate models and methods for solving real-life problems.
- The use of methodologies, specification mechanisms and development environments for the development of computer applications.
- The use of computer and mathematical models and tools to solve specific problems in the application field.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
- Introduction. Ai definitions. Short history of ai. Ai components
- Problem solving. Solving problems by searching. Uninformed search strategies. Informed (heuristic) search strategies
- Other problem solving strategies. Constraint satisfaction problems. Adversarial search (games)
- Knowledge representation
- Knowledge representation by rules
- Structured knowledge
- Uncertain knowledge and reasoning (fuzzy)
- Planning and learning in AI systems
- Artificial neural networks (ANN) foundations
- ANNs applications
- Expert Systems foundations
- Intelligent agents and robots.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- The use of methodologies, specification mechanisms and development environments for the development of computer applications.
- The identification and explanation of base computer models that are suitable for the application domain.
- The use of computer and mathematical models and tools to solve specific problems in the application field.
- The identification of appropriate models and methods for solving real-life problems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam - 40%; continuous assessment (laboratory) - 40%, final test - 20%.

RECOMMENDED READING:
- Ioan Ileană, Corina Rotar, Maria Muntean, Inteligență artificială, Editura Aeternitas, 2009.
MULTIMEDIA TECHNIQUES AND TECHNOLOGIES
Course Code: INFO 306
Type of course: elective
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Kadar Manuella, PhD
Seminar tutor: Incze Arpad, PhD

Full time studies

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COURSE AIMS:

General objectives of the course:
- The Multimedia Techniques and Technologies course presents scientific and technical principles of media capture and computer representation. It is focused on methods of operation and application of computer software and systems that enable delivery of multimedia productions and also contains descriptions and examples of methods used for compression of symbolic data, as well as audio, image and video data.
- Data compression is discussed taking into consideration novel ways of data representation in order to take very little storage, with the possibility of reconstruction of the original data from the compressed version. The course offers many examples and applications such as: examples in Matlab, Adobe Flash, Adobe PhotoShop to be solved within the labs.

Specific objectives of the course

By taking this course the students will be able to:
• understand various concepts associated with multimedia technology and computing
• understand the components of multimedia systems
• explain some desirable features for multimedia systems
• explain the basic concepts of multimedia elements’ representation
• implement and discuss various compression techniques
• explain how a compression system works
• analyse the advantages and disadvantages of data compression.

ENTRY REQUIREMENTS: -;

COURSE CONTENTS:
Course (learning units)
1. Introduction to multimedia technology
2. Color model and human vision. Color spaces
3. Data compression. Compression techniques and algorithms
4. Multimedia data compression standards
5. Image and sound
6. Video frames. Video frames digitization and compression
7. Audio data representation and processing. Audio compression
8. Semantic annotation of images
9. Video segmentation
10. Multimedia society - where are we going?

Seminars-laboratories
1. Introduction to MATLAB programming environment
2. MATLAB functions
3. MATLAB arrays
4. MATLAB graphics
5. Image processing using MATLAB
6. Image compression using MATLAB
7. The design and implementation of image compression techniques using MATLAB
8. The design and implementation of audio compression techniques using MATLAB
9. The design and implementation of video compression techniques using MATLAB
10. Project presentation and evaluation.

TEACHING METHODS:
The course is given as a combination of lectures and laboratories. There is a 100% attendance requirement for laboratories. Work in small groups. Compulsory assignments. Instruction is a combination of lectures, laboratories, group work and individual work.

LEARNING OUTCOMES:
Professional competences
C2. Development and maintenance of computer applications
C2.4. Use of appropriate criteria and methods for the evaluation of computer applications.
C2.5. Development of dedicated computer projects.
C3. Use of computer tools in an interdisciplinary context
C3.1. Description of concepts, theories and models used in the application field.
C3.2. Identification and explanation of base computer models that are suitable for the application domain.
C3.3. Use of computer and mathematical models and tools to solve specific problems in the application field.
C3.4. Data and model analysis.
C3.5. Development of software components of interdisciplinary projects.
Transversal competences
CT3. Use of efficient methods and techniques for learning, scientific inquiry and development of the capacities of using knowledge, of adapting to a dynamic society and of communication in English.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (60% of the final grade)
Laboratory activities portfolio (40% of the final grade)

RECOMMENDED READING:
MATHEMATICAL MODELING AND SIMULATION
Course Code: INFO 308
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Nicoleta Breaz, PhD
Seminar tutor: Prof. Nicoleta Breaz, PhD
Full time studies

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COURSE AIMS:
The general aim related to this course consists in getting knowledge which helps the students to use the mathematical concepts together with a specific software to model phenomenon from various fields as medicine, physics, chemistry, economy, sociology, etc.. Thus, through this course, the students acquire not only the knowledge of basics mathematical modeling aided by software products but also, they become open minded regarding the interdisciplinary matter and hence they get competencies in the use of the theoretical basis of computer science and of formal models in solving specific problems from various fields.

ENTRY REQUIREMENTS:
There are no compulsory prerequisites but the following courses are useful:
1. Probability and mathematical statistics
2. Mathematical software
3. Numerical calculus
4. Differential and partial derivatives equations

COURSE CONTENTS:

I. Elements of mathematical modeling and simulation
1. Introduction
2. Process of mathematical modeling
3. Models obtained through the translation of the problem in mathematical language
4. Simulation techniques and random numbers

II. Models based on statistical techniques
1. Simple linear regression model
2. Polynomial regression model
3. Other simple regression models
4. Multiple linear regression models
5. Other multiple regression models
6. Dynamic models

III. Models based on optimization techniques
1. Elements of mathematical programming
2. Transportation problems
3. Problems related to production and stocking
4. Problems of mixtures (dietary optimization, alloy mixture optimization)
5. Problems of cutting-stock
6. Problems from games theory
7. Other optimization problems

IV. Deterministic models based on equations
1. Problems of populations’ dynamic
2. Deterministic models in epidemiology
3. Deterministic models in physics

TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
- Identifying the appropriate models and methods for solving real-life problems;
- Giving the interpretation of mathematical and computer science (formal) models;
- Using the simulation in the study of the behavior of developed models and evaluation of results;
- Embedding the formal models in specific applications in various domains.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Practical project – 50%; continuous assessment – 50%.

RECOMMENDED READING:

- E.A. Bender, An introduction to mathematical modeling techniques, Dover, New York, 2000
- N.Breaz, Mathematical modeling and simulation, theory and applications, Seria Didactică, Univ. “1 Decembrie 1918” Alba Iulia, (in printing)
- Cleve Moler – Numerical Computing in MATLAB, SIAM, 2005
PRACTICE FOR THE DEVELOPMENT OF THE BACHELOR'S THESIS

Course Code: INFO 309
Type of course: Compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Cucu Ciprian, PhD
Seminar tutor: Cucu Ciprian, PhD
Full time studies

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COURSE AIMS:

Understanding main concepts regarding doing research in Computer Science, both in terms of designing and conducting research projects as well as in documenting them appropriately.

ENTRY REQUIREMENTS:

-

COURSE CONTENTS:

A. Defining research for bachelor’s degree
B. Methodologies, literature review and implementing applications
C. Writing the thesis

TEACHING METHODS:

Lecture, Power Point presentations, conversation, exemplification.

LEARNING OUTCOMES:

Students will be able to complete a quality bachelor’s thesis, according to standards.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

Continuous assessment.

RECOMMENDED READING:

MACHINE LEARNING AND PATTERN RECOGNITION
Course Code: INFO 310
Type of course: Optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Adriana Birlutiu, PhD
Laboratory tutor: Adriana Birlutiu, PhD
Full time studies

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COURSE AIMS:
- This course gives an overview of many concepts, techniques, and algorithms in machine learning, beginning with topics such as classification and linear regression and ending up with more recent topics such as ensemble methods, support vector machines, and Bayesian networks.
- The course will give the student the basic ideas and intuition behind modern machine learning methods as well as a bit more formal understanding of how, why, and when they work.

ENTRY REQUIREMENTS:
Artificial intelligence.

COURSE CONTENTS:
- Supervised learning. Unsupervised learning
- Linear regression
- Classification
- Decision trees
- Ensemble methods
- Artificial neural networks
- Bayesian learning
- Support Vector Machines
- Unsupervised learning
- Pattern recognition
- Feature selection

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- identify the type of a learning problem;
- understand the internal structure of a learning algorithm;
- apply a learning algorithm;

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani. *An Introduction to Statistical Learning with Applications in R*. Springer-Verlag, 2013
INTELLIGENT COMPUTATION- BIO-INSPIRED TECHNIQUES
Course code: INFO 312
Type of course: optional
Language of instruction: English/Romanian
Name of lecturer: Corina Rotar, PhD
Full time studies

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COURSE AIMS:
Currently there is a strong interest towards the development of intelligent software applications in various fields such as mobile phones, gaming industry, etc. Intelligent Computation discipline supports training of specialists in this direction, forming strategies and skills to apply intelligent algorithms where traditional methods are not effective.

Objectives:
- Develop the students' ability to design software that is dedicated for solving the difficult problems by exploiting evolutionary algorithms.
- Study of the algorithms that is based on natural paradigms.
- Skills for approaching the complex problems in terms of evolutionary algorithms.
- Analytical study of the advantages and disadvantages of traditional algorithms versus stochastic algorithms for optimization problems.

ENTRY REQUIREMENTS:
- Imperative and Procedural Programming
- Artificial Intelligence

COURSE CONTENTS:
1. Fundamentals of Intelligence Computation
2. Paradigm of Genetic Algorithms
3. Paradigm of Evolutionary Strategies
4. Genetic Programming. Evolutionary programming
5. Artificial Immune Systems
6. Particle Swarm Optimization Technique
7. Ants Colonies. Other natural paradigm
8. Application of evolutionary algorithms in optimization
9. Introduction to fuzzy logic. Fuzzy systems.
10. Introduction in Neural networks
11. Bio-inspired Computing and applications I
12. Bio-inspired Computing and applications II

TEACHING METHODS:
- Lecture, Cooperative learning, Discussion and survey, Team-based learning.

LEARNING OUTCOMES:
- Implementation of an evolutionary algorithm to solve either an optimization or an NP-hard problem.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
- Final project (oral presentation) 100%

RECOMMENDED READING:
ADVANCED NETWORKING TECHNIQUES
Course Code: INFO 314
Type of course: Optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Remus DOBRA, PhD
Seminar tutor: Remus DOBRA, PhD
Full time studies

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COURSE AIMS:
After completing the course, students will be able to:

• Calculate the distortions caused by analog / digital signal in non-uniform quantization conditions and to calculate the delays in communications systems.
• To choose and design a digital communications network
• To program the VPN, SAN, Bluetooth, ZigBee, IEEE 1451, ESP - nodeMCU
• To work with communications protocols

ENTRY REQUIREMENTS:

COURSE CONTENTS:
1. Digital communication elements. VS analog digital communications. Long distance transmission. Types of modulations (amplitude, frequency, digital). Brief introduction of fiber-optic communications
2. The concept of network systems and services. Definitions. Topologies (bus, star, tree, Point-to-point, peer-to-peer, LAN, MAN, WAN
3. Service infrastructures: LAN Local Area Network, VLAN Value Added Network; Core network services: the WLAN Wireless Local Area Network, VLAN- Virtual Local Area Network
5. CAN- Controller Area Network, WAN- Wide Area Network, GSM- Global System for Mobile Communications
7. Applications of networks for sensor systems.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:

• Explaining and interpreting the hardware and software specific structures required in the fields of computer programming, high-level languages and specific CAD techniques for achieving electronic modules, microcontrollers, computer systems architecture, electronic programmable systems.
• programming VPN, SAN, Bluetooth, Zigbee, IEEE 1451
• programming WiFi networks based on ESP-nodeMCU
• using different types of communication protocols

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

• Written report regarding practical work applications

RECOMMENDED READING:

• Jochen H. Schiller, Mobile Communications, Addison Wesley, 2003
• William Stallings, Wireless Communications and Networks, Prentice Hall, 2005
**SPECIAL MATHEMATICS FOR ENGINEERS**
Course Code: EA 1202  
Type of course: compulsory  
Language of instruction: English tutoring available for Erasmus students  
Name of lecturer: Dorin Wainberg, PhD  
Seminar tutor: Dorin Wainberg, PhD  
Full time studies  

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**COURSE AIMS:**  
Mathematics for Engineers is a single semester course introducing the student to a tools used in analyzing a range of problems arising in the modeling of engineering problems. A specified differential equation endeavors to match the known features of the application being modeled, as well as to be able to predict the systems behavior in other circumstances. The learning integrates theory and application using a problem-based approach. This will relieve the student of performing, by hand, many of the detailed calculations needed. This course prepares the student for future learning in relation to problem solving and decision-making; technical competence; teamwork and leadership; and reflection.

**ENTRY REQUIREMENTS:** Linear Algebra, Mathematical Analysis

**COURSE CONTENTS:**  
CAP. I DIFFERENTIAL EQUATIONS  
1. First order differential equations  
2. Differential equations of higher order  
3. Systems of linear differential equations; Systems of linear differential equations with constant coefficients  
4. Partial differential equations of the first order linear; Partial differential equations of the second order - the equations of mathematical physics.

CAP. II ELEMENTS OF THE THEORY OF FIELDS  
5. Scalar field; vector field  
6. Divergence and rotor of a vector field; Hamilton’s operator.

CAP. III FUNCTIONS OF A COMPLEX VARIABLE COMPLEX  
7. Complex numbers. geometrical interpretation  
8. Functions of a complex variable  
9. Derivative of a complex function of a complex variable: Cauchy-Riemann conditions; analytical function  
10. Advanced functions Elementary

CAP. IV PROBABILITY AND STATISTICS  
11. Random variables; Field of probabilities, conditional probabilities  
12. Laws classical probability  
13. Functions distributions, probability density  
14. Representations of statistical distributions

**TEACHING METHODS:**  
Lecture, conversation, exemplification.

**LEARNING OUTCOMES:**  
Modelling and solving some medium complexity level problems, using the mathematical and engineering sciences knowledges.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**  
Written paper 50%; mid-term test 30%; seminar activities 20%.

**RECOMMENDED READING:**  
ELEMENTS OF MECHANICS AND MECHANISMS

Course Code: EA 1206
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Elisabeta Mihaela Ciortea, PhD Eng.
Seminar tutor: Elisabeta Mihaela Ciortea, PhD Eng.

Full time studies

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COURSE AIMS:
- Solving technological problems in the fields of electronics applied.
- The principles and methods underlying the manufacture, tuning, testing and servicing of appliances and equipment in the fields of applied electronics.
- Explanation and interpretation of production processes and maintenance activities of electronic devices, identifying areas for testing and measuring electrical quantities.
- Application of management principles for the organization of technologically production activities, mining and service in the fields of applied electronics.
- Using criteria and methods for evaluating the quality of production and service activities in the fields of applied electronics.

ENTRY REQUIREMENTS:
- Knowing the specifics of the main elements and mechanisms of the main methods used in mechanics.
- The skills training design and implement a concrete mechanical research.
- Knowing the geometric calculation mechanisms, gears.
- Understanding the operating principle of mechanisms, gears, the wheel balancers.
- Measurement of geometric elements of a gear, cam mechanism.
- Analysis and interpretation of the results of various tests.

COURSE CONTENTS:
- Static material point.
- Rigid stand.
- Dynamics of material point.
- Rigid body dynamics and lighting systems.
- Analytical Mechanics.
- The clashes.
- Structure mechanisms.
- Kinematic analysis of planar mechanisms bars.
- Analysis and Synthesis gear mechanisms.
- The movement mechanisms under the action of forces.
- Analysis and synthesis of cam mechanisms.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- Capacity building and attitudes investigation mechanisms realities mechanical composition;
- Forming an open epistemic attitudes and innovative mechanisms of mechanical components.
- Knowledge of geometric calculation mechanisms, gears.
- Understanding the operating principle of mechanisms, gears, the wheel balancers.
- Measurement of geometric elements of a gear, cam mechanism.
- Analysis and interpretation of the results of various tests.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 70%; continuous assessment – 30%.

RECOMMENDED READING:
INFORMATIONS TRANSMISSION AND ENCODING

Course Code: EA 2104
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Boca Maria Loredana, PhD
Seminar tutor: Boca Maria Loredana, PhD
Full time studies

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COURSE AIMS:
- Representation of information acquisition, processing, transmission or storage
- Quantitative measure of information transmission systems raw, with or without loss
- Control error correction or detection
- Main types of binary codes or cyclic type non-binary
- Use of information theory and coding the current standards for storage or transmission

ENTRY REQUIREMENTS:
- Fundamental knowledge in coding theory.

COURSE CONTENTS:
The course covers the following main topics:
1. Course 1. Elements of probability theory and mathematical statistics with applications in information transmission theory. Transmitting information systems (ITS)
3. Course discrete transmission channels. Channel capacity given by the matrix of noise. Channel capacity and signal-band given by Shannon's formula
5. Course channel coding. Theorem II's Shannon (coding of channels with interference).
7. Course cyclical codes: definition and representation, algebraic coding, coding and decoding circuits to achieve.
8. Course 8. Distance and ration code.
9. Course 9 Elements of Galois field theory for cyclic codes. BCH codes
10. Course 10. Convolution: definition and representation compared with block codes, algebraic coding, and implementation of feedback shift registers.
11. Course 11. Decoding convolution codes algorithms
12. Course 12. Differential Pulse code modulation, delta modulation linear, adaptive and others

Laboratory
S1. Information representation codes
S2. Source compression (lossless and loss)
S3. Procedure and Hamming codes
S4. Procedure and BCH codes
S5. Reed-Solomon codes and procedure
S6. Feedback shift register. Applications for encoding and decoding cyclic
S7. Convolution codes

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
C2 Application of basic methods for acquisition and signal processing.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Projects/Assignments –60%; continuous assessment – 40%.
RECOMMENDED READING:

- B. Sklar – *Digital communications*, Prentice Hall, 2001
- D. Salomon – *A guide to data compression methods*, Springer-Verlag, 2002
DIGITAL INTEGRATED CIRCUITS
Course Code: EA 2205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan Ileana, PhD
Seminar tutor: Gheorghe Marc, PhD
Full time studies

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COURSE AIMS:
- Knowing and understanding of the fundamentals of analyzing, designing and producing applications of bipolar and MOS digital integrated circuits (DIC).
- Knowledge of the most important digital integrated circuits starting with logic gates and continuing to memories, CPLD, FPGA.

ENTRY REQUIREMENTS:
Electronic devices.

COURSE CONTENTS:
- Boolean algebra. Logic function minimization.
- Elementary integrated structures. TTL gates
- Other technologic families.
- Logic circuits in unipolar (MOS) technology.
- Combinational logic circuits (CLC).
- CLC synthesis.
- Sequential logic circuits. Introduction
- Counters, registers.
- Memories
- Automata.
- Programmable logic circuits an devices
- Design and implementation considerations.
- Optoelectronic digital integrated circuits.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- Analyzing and constructive design of digital systems using CID.
- Using of specific software for analyzing and designing digital electronic devices.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam - 40%; continuous assessment (laboratory) - 40%, final test - 20%.

RECOMMENDED READING:
ANALOG INTEGRATED CIRCUITS

Course Code: EA 3103
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan Ileana, PhD
Seminar tutor: Gheorghe Marc, PhD
Full time studies

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COURSE AIMS:
- Knowledge of the main principles of analyzing, designing and producing of analog (linear) integrated circuits applications
- Knowing of analysis and functioning of main integrated sub circuits: current shunts and sources, current mirrors, amplification stages, output stages etc.
- Knowing the structure and applications of operational amplifiers.

ENTRY REQUIREMENTS:
Electronic devices, Fundamental electronic circuits.

COURSE CONTENTS:
- Microelectronics, definitions, taxonomies
- Analog integrated circuits technology.
- Analog integrated circuits, types and applications
- Operational amplifiers, parameters, linear and nonlinear applications.
- Sub circuits (current sources and mirrors, active loads, voltage references.
- Elementary amplification stages.
- Output stages (A class, B class, A-B class).
- Frequency behavior and stability of operational amplifiers applications.
- Nonlinear analog integrated circuits.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- Analyzing and constructive design of analog systems using analog integrated circuits.
- Using of specific software for analyzing and designing analog electronic devices.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam - 40%; continuous assessment (laboratory) - 40%, final test - 20%.

RECOMMENDED READING:
The Faculty of Exact Sciences and Engineering

DIGITAL SIGNAL PROCESSING
Course Code: EA3203
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Boca Maria Loredana, PhD
Seminar tutor: Boca Maria Loredana, PhD
Full time studies

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COURSE AIMS:
- Principles of signal processing
- Getting on the types of signals and basic schemes
- Getting on Digital Signal Processing
- Theory of mathematical transformations applied signals
- Getting the signal filtering and aliasing phenomenon.

ENTRY REQUIREMENTS:
- Fundamental knowledge in signals.

COURSE CONTENTS:
The course covers the following main topics:
Course 2 - Channels of communication. Parameters communications environments.
Course 3 - Sampling signals. Dithering signals. The phenomenon of aliasing.
Course 4 - Signal processing audio / video. Separation and synchronizing transmission.
Course 5 - correlation function, autocorrelation, amplitude-frequency spectra, power spectra.
Course 6 - transmission and data processing. Modulation and demodulation parameters.
Lecture 7 - modulation amplitude, phase, frequency, pulse.
Lecture 8 - demodulating modulated signals.
Lecture 9 - signal conversion. ADC.
Lecture 11 - dedicated digital information processing circuits.
Lecture 13 - Procedures for filtering signals. Active filters.
Lecture 14 - Applications of fuzzy logic and neural networks in signal processing.

Laboratory
1. Introduction
2. Signals and systems in discrete time
3. Finite Impulse Response Filters
4. Response Filters Infinite Response
5. The signal conversion. A-D animation, YES. Convention with Univ. Paderborn / Germany
6. Change the sampling rate. Sampling signals in time and frequency domains

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
C2 Application of basic methods for acquisition and signal processing.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Projects/Assignments –60%; continuous assessment – 40%.

RECOMMENDED READING:
- S Salivahanan, A Vallavaraj, C Gnanapriya, Digital Signal Processing, 2000
INDUSTRIAL ELECTRONIC ENGINEERING AND IT
Course Code: EA 3205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Elisabeta Mihaela Ciortea, PhD Eng.
Seminar tutor: Elisabeta Mihaela Ciortea, PhD Eng.
Full time studies

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COURSE AIMS:
- The design and use of hardware and software applications less complex specific applied electronics.
- Applying knowledge, concepts and basic methods: power electronics, automation systems, electrical power management.
- Defining specific elements identifying the devices and electronic circuits in the fields of power electronics, automation systems, energy management, medical electronics, automotive electronics, consumer goods.
- Qualitative and quantitative interpretation of the functioning circuits in the fields of power electronics, automation systems, energy management, medical electronics, automotive electronics, consumer goods; operation analysis in terms of electromagnetic compatibility.
- Development of specifications, installation and operation of equipment in the fields of applied electronics: power electronics, automation systems, energy management, medical electronics, automotive electronics, consumer goods.

ENTRY REQUIREMENTS:
- Using automated systems in manufacturing processes aimed at increasing performance, increasing efficiency in the use of resources (human, material, energy, etc.), improve product quality, eliminate physical work, especially work in hazardous environments (toxic, hazardous or of the accident) and avoiding monotonous and strenuous activities for humans.
- The material presented gather and promote information available on industrial electronics and electric power conversion so that future electronic engineer profile can have immediate access to the knowledge, concepts and methodologies based domain.

COURSE CONTENTS:
- Electronic devices
- Electronic circuits
- Converting alternative tensions
- Convert tensions continue
- Elements of control systems theory
- Electronic stabilizing
- Electronic generators
- Variable applications.
- Inverters, Manure
- Regulators, Stabilizers
- Surveillance and control circuits
- Modeling and control of manufacturing systems
- Petri Networks and Applications, Matlab, Visual Object Net ++
- Colored Petri nets, CPN

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- The manifestation of a positive and responsible attitudes towards continuous training in industrial informatics taken as part of their professional development.
- Compliance with the rules specific prevention and firefighting and labor protection in industrial computing.
- Understanding the importance of correct and efficient tools for documentation and information in the art.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 50%; continuous assessment – 50%.
RECOMMENDED READING:

VIRTUAL INSTRUMENTATION FOR ELECTRONIC SYSTEMS
Course Code: EA 3209
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Marc Gheorghe, PhD
Seminar tutor: Marc Gheorghe, PhD
Full time studies

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COURSE AIMS:
- The main objective is to know, understand and use specific knowledge acquisition, storage, processing and interpretation of signals
- General principles of instrumentation;
- Principles of measurement, interpretation, storage and processing of data;
- Virtual Instrumentation Technologies

ENTRY REQUIREMENTS:
- Fundamental knowledge in electronics.

COURSE CONTENTS:
1. Getting Started
   2. Presentation LabView graphical programming environment
   3. Types of data used in LabView
   4. Structures programs
   5. Structures programs
   6. Mathematical calculations
   7. Mathematical calculations
   8. Functions vector values - matrices
   9. Data type cluster
   10. Representations graphics
   11. File operations
   12. Creating a Sub VI
   13. The "Electronics Workbench Multisim"
   14. The "Electronics Workbench Multisim"

2. TEACHING METHODS:
   Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
- C1.1 Description electronic functionality of devices and circuits and fundamental methods of measuring electrical quantities
- C1.2 Analysis of complex circuits and electronic systems for small / medium in order to design and measure them
- C2.1 Temporal characterization, spectral and statistical signals
- C2.2 Explanation and interpretation methods of acquisition and signal processing
- C2.3 Simulation environments for analysis and signal processing

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Write exam 40%, Projects/Assignments – 40%; continuous assessment – 20%.

RECOMMENDED READING:
- National Instruments Corp – LabVIEW Core 1 Course Manual, Part Number 325290A-01, October 2009 Edition
PROGRAMMABLE ELECTRONIC SYSTEMS  
Course Code: E4101  
Type of course: compulsory  
Language of instruction: English tutoring available for Erasmus students  
Name of lecturer: Marc Gheorghe, PhD  
Seminar tutor: Marc Gheorghe, PhD  
Full time studies  

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COURSE AIMS:  
- Knowledge of programmable electronic devices, development and programming  
- Skills of microprocessor assembly language level, development of PLC programming  

ENTRY REQUIREMENTS:  
- Fundamental knowledge in electronics.

COURSE CONTENTS:  
1. Getting Started  
2. Logic Circuits  
3. Design with Programmable Logic  
4. Microprocessors and Microcontrollers  
5. Structure of a microprocessor  
6. Family of PIC microcontrollers  
7. The family of microcontrollers ATMELE  
8. MPLAB programming package  
9. Digital relays and PLCs (PLC)  
10. Programming in LADDER  
11. FX family PLC Mitsubishi Electric MESLEC  
12. Programming PLC Siemens SIMATIC S7- 1200  
13. Industrial communications protocols  
14. Programming and controlling the frequency converters

TEACHING METHODS:  
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:  
C4.1 Definition of concepts, principles and methods used in the fields of computer programming, high-level languages and specific CAD techniques for achieving electronic modules, microcontrollers, computer systems architecture, electronic programmable graphics hardware reconfigurable architectures  
C4.2 Explanation and interpretation of the structures specific hardware and software requirements in the fields of computer programming, high level languages and specific CAD techniques for achieving electronic modules, microcontrollers, computer systems architecture, electronic programmable graphics hardware reconfigurable architectures  
C4.4 Use appropriate criteria for evaluating performance, including simulation, hardware and software systems dedicated services or activities that use microcontrollers or computers of low to medium complexity

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:  
Write examn 40%, Projects/Assignments –40%; continuous assessment – 20%.

RECOMMENDED READING:  
- Thomas W. Schultz- C and the 8051, Programming for multitasking, Prentice Hall,  
- Intel – Microsystem Components Handbook  
FUNDAMENTALS OF ROBOTICS
Course Code: EA 4102
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Elisabeta Mihaela Ciortea, PhD Eng.
Seminar tutor: Elisabeta Mihaela Ciortea, PhD Eng.
Full time studies

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COURSE AIMS:
- Solving technological problems in the fields of electronics applied.
- The principles and methods underlying the manufacture, tuning, testing and servicing of appliances and equipment in the fields of applied electronics.
- Explanation and interpretation of production processes and maintenance activities of electronic devices, identifying areas for testing and measuring electrical quantities.
- Application of management principles for the organization of technologically production activities, mining and service in the fields of applied electronics.
- Using criteria and methods for evaluating the quality of production and service activities in the fields of applied electronics.
- Designing technology manufacturing and maintenance (specifying the necessary components and operations) of low and medium complexity products in the fields of applied electronics.

ENTRY REQUIREMENTS:
- Proper description paradigm programming language and specific mechanisms and identifying the difference between semantic and syntactic aspects of order.
- Develop appropriate source code and unit testing of components in a programming language known, based on the design specification data.

COURSE CONTENTS:
1. Industrial Robots
   - Definitions, characteristics and classification parameters robots
   - Robots in industrial processes
   - The characteristics of the main types of industrial robots
2. Kinematic and dynamic geometric patterns
   - Coordinate Systems
   - Kinematic Models
   - Position Control
   - Control differential kinematic
   - Dynamic Model
3. Structure of industrial robots
   - Main subassembly to achieve rotation around a vertical axis Oz
   - Guidance system
   - Device grip
   - Information systems of industrial robots
   - Principles and methods of measurement sensors and transducers
   - Sensors and transducers travel
   - Sensors and transducers
   - Sensors and transducers moment
   - Constructive solutions for the location of sensors and transducers systems
4. Operators
   - Hydraulic drive
   - Electric
   - Pneumatic
5. The motion control systems
   - Election issue
   - System performance adjustment
   - The analysis of the typical mechanical configuration of the adjustment
6. Control Systems
- Wired logic
- Logic flexible
- With automatic
- Multiprocessor

7. Information Processing Systems
- Processing System
- The processing of information for recognizing parts

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:

- This discipline is dedicated to knowledge of architecture, industrial and non-industrial applications and programming of robots.
- Information on the application of robots in various fields, industrial (exploration, healthcare ....).
- Presentation of industrial robots: constructive elements, cinematic.
- Knowing the parameters of the industrial robots.
- Developing practical knowledge of computer methods to analyze and program robots.
- Understanding data sheets, commercial leaflets showing industrial robots.
- Knowledge of accessories available industrial robots ability to configure inputs / outputs a robot preparing students for specific applications programming and use of industrial robots, industrial robots effective programming.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 70%; continuous assessment – 30%.

RECOMMENDED READING:
ELECTRONICS AND MEDICAL INFORMATICS

Course Code: EA 4103
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Marc Gheorghe, PhD
Seminar tutor: Marc Gheorghe, PhD
Full time studies

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COURSE AIMS:
Bioelectrical measurements are introduced and magnetic key in vivo, the processing of extracting the noise and extract specific features, and electrical stimulation of tissues, knowledge of basic principles of physiology biosignals, medical signal measurement principles.

ENTRY REQUIREMENTS:
• Fundamental knowledge in electronics.

COURSE CONTENTS:
3. Getting electrophysiology and cellular bio-signs
2. The acquisition of electrophysiological signals
3. Investigation of the cardiovascular system
4. Electrocardiography
5. Investigate the nervous system and muscular
6. Electroencephalography
7. Investigation and treatment of respiratory
8. electrotherapy and Electrochirugie
9. electronic equipment for clinical laboratory
10. The use of laser radiation therapy investigation
11. The use of ultrasound in the investigation and treatment
12. Medical Imaging
13. Techniques investigation by computed tomography
14. magnetic resonance imaging

TEACHING METHODS:
Lecture, conversation, exemplification, exercises.

LEARNING OUTCOMES:
C1.1 Description electronic functionality of devices and circuits and fundamental methods of measuring electrical quantities
C2.1 Characterization temporal, spectral and statistical signals
C2.2 Explanation and interpretation methods of acquisition and signal processing
C5.1 Defining specific elements identifying the areas of electronic devices and circuits: power electronics, automation systems, energy management, medical electronics, automotive electronics, consumer goods
C6.1 Defining principles and methods underlying the manufacture, tuning, testing and servicing of appliances and equipment in the fields of applied electronics

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Write examn 40%, Projects/Assignments –40%; continuous assessment – 20%.

RECOMMENDED READING:
• S.M. Sze, Semiconductor Sensors, John Wiley & Sons, Inc., 1994;
• 3. John G. Webster (editor), John W., Jr Clark, Michael R. Neuman, Medical Instrumentation: Application and Design, John Wiley & Sons, 1997;
ARTIFICIAL INTELLIGENCE
Course Code: EA 4108
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan Ileana, PhD
Seminar tutor: Maria Muntean, PhD
Full time studies

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COURSE AIMS:
- The course is a coherent introduction in Artificial Intelligence area, including theoretical and practical approaches.
- The identification of appropriate models and methods for solving real-life problems.
- The use of methodologies, specification mechanisms and development environments for the development of computer applications.
- The use of computer and mathematical models and tools to solve specific problems in the application field.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
- Introduction. Ai definitions. Short history of ai. Ai components
- Problem solving. Solving problems by searching. Uninformed search strategies. Informed (heuristic) search strategies
- Other problem solving strategies. Constraint satisfaction problems. Adversarial search (games)
- Knowledge representation
- Knowledge representation by rules
- Structured knowledge
- Uncertain knowledge and reasoning (fuzzy)
- Planning and learning in AI systems
- Artificial neural networks (ANN) foundations
- ANNs applications
- Expert Systems foundations
- Intelligent agents and robots.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- The use of methodologies, specification mechanisms and development environments for the development of computer applications.
- The identification and explanation of base computer models that are suitable for the application domain.
- The use of computer and mathematical models and tools to solve specific problems in the application field.
- The identification of appropriate models and methods for solving real-life problems.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam - 40%; continuous assessment (laboratory) - 40%, final test - 20%.

RECOMMENDED READING:
- Ioan Ileană, Corina Rotar, Maria Muntean, Inteligenţă artificială, Editura Aeternitas, 2009.
CHEMISTRY
Course Code: M 104
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Simona Varvara, PhD
Laboratory/seminar tutor: Roxana Bostan, PhD

Full time studies

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COURSE AIMS:
The course attempts to develop the capacity for knowledge and understanding of the basic concepts specific to chemistry and their application in the environmental engineering.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
1. Introduction to chemistry. Fundamentals of chemistry.
7. Solutions. Solution’s concentrations (percentage, molar, normal etc.). Problems
10. Salts hydrolysis.

LAB WORKS AND SEMINARS:
1. Safety rules in the chemistry lab. Regulation in the chemistry laboratory. Operations, equipment and utensils used in the chemistry lab
3. Laboratory solution preparation – practical work
4. Titrated solution. Determination of the solution’s factor
5. Determination of the solution pH
6. Practical determination of soil quality (pH, content of N, P, K, moisture etc.)
7. Qualitative chemical analysis. Methods for detecting cations and anions.
8. Assessment of the laboratory knowledges

TEACHING METHODS:
Lecture, conversation, exemplification, practical laboratory work.

LEARNING OUTCOMES:
1 Explaining the mechanisms, processes and effects of anthropogenic or natural origin which determine and influence the environmental pollution
- Defining the basic concepts needed to apply scientific theories and methodology environment.
- Using scientific knowledge base in defining and explaining specific concepts and environmental engineering
- Application of scientific knowledge to define and explain the specific concepts and environmental engineering
- Qualitative and quantitative analysis of natural phenomena and technological processes to prevent and reduce environmental impact.
2. Identification and compliance with professional ethics and deontology, taking responsibility for decisions and risks
3. Identify roles and responsibilities in a multidisciplinary team and application the techniques and effective work relationships within the team

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A one-hour written examination (60% of the final grade). The examination of the practical abilities acquired in the laboratory (40% of the final grade).
The course is given as a combination of lectures, lab works and seminars. There is a 100% attendance requirement for lab works and seminars.

RECOMMENDED READING:
The Faculty of Exact Sciences and Engineering

TECHNICAL MECHANICS
Course Code: M 110
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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COURSE AIM:
The course presents a unified conception about the concepts related to elements of rigid solid mechanics that studies the balance and movement of bodies, based on some simplifying assumptions, namely: the bodies are considered rigid without the possibility of deformation; by their properties, these bodies represent the ideal mechanical models;

COURSE CONTENTS:
1. Introductory elements of technical mechanics. Rigid solid mechanics;
2. Statics of material point
3. Free material point. Material point subjected to bonds
4. Statics of rigid solid
5. Forces couples
6. Ideal bonds of rigid solid
7. Kinematics of material point
8. Kinematics of rigid solid
9. Dynamics
10. Dynamics of material point
11. Dynamics of rigid solid

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- Understanding and knowing the technical mechanics that presents the mechanics general framework, the main concepts and notions this discipline is based on;
- Understanding and knowing the Statics which representing the mechanics part that deals with the study of equivalent strength systems and with the balance conditions;
- Understanding and knowing the Kinematics which is the part of theoretical mechanics that studies the movement of material systems without considering the system’s forces and masses;
- Understanding and knowing the Dynamics which is the part of mechanics that studies the movement of material systems taking into account the forces;

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 70%, Verification during the semester- 30%.

RECOMMENDED READING:
- Valcovici, V., Balan, St., Voinea., - Mecanica Teoretica
- Buzdugan, Gh. Rezistenţa materialelor, Didactic and Pedagogic Publishing House, Bucharest, 1984
- Buzdugan, Gh., et. al., Rezistenţa materialelor: Aplicaţii, Romanian Academy Publishing House, Bucharest, 1991
- Popa D., Mecanica Tehnica, Seria Didactica, Universitatea „1 Decembrie 1918 “, Alba Iulia, 2010
The Faculty of Exact Sciences and Engineering

ENVIRONMENTAL CHEMISTRY
Course code: M112
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Maria, PhD
Full time studies

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COURSE AIMS:
Students will learn to understand specific concepts in the field of environmental chemistry.

COURSE CONTENTS:
1. Fundamentals of Environmental Chemistry
2. Pollution types and sources.
3. Environmental cycles of elements (oxygen, carbon, nitrogen, sulfur) and water.
4. Atmospheric chemistry and Air pollution
5. Soil Chemistry and Pollution
6. Aquatic chemistry and Water pollution

TEACHING METHODS:
Lecture, Discussions, Exemplification

LEARNING OUTCOMES:
- Familiarize students with the various divisions of the environment
- Explain the gaseous components of the environment and the chemistry responsible for the observed variation, processes such as; ozone depletion, greenhouse effect, global warming.
- Understanding of the organic and inorganic chemical processes controlling the chemical composition of the aquatic environment and the fate of pollutants in the aquatic environment.
- Familiarize students with the main constituents of soils and the way they are formed. Introduce some important characteristics of soils, their classification and the various ways in which soils are polluted.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 60%, Verification during the semester (project, practical activities) - 40%.

RECOMMENDED READING:
- Popa, M, Bostan, R. Varvara, S., Environmental Chemistry – practical activities, Alba Iulia, 2008;
ATMOSPHERIC PHYSICS
Course Code: M113
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Mihai Teopent Corches, PhD
Seminar tutor: Mihai Teopent Corches, PhD
Full time studies

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COURSE AIMS:
The overall objective of the course:
- Developing scientific thinking, acquiring the skills needed to observe environmental phenomena and to solve specific problems correctly;
Specific objectives:
- Acquiring the skills needed to effectively use information sources, developing individual study skills and teamwork skills;
ENTRY REQUIREMENTS:
- Physics

COURSE CONTENTS:
The course covers the following main topics:
- Atmospheric composition;
- Static atmosphere;
- Thermodynamic processes in the atmosphere;
- Solar thermal radiation and Earth-atmosphere system;
- Sun and solar constant;
- Short wavelength radiation in the atmosphere;
- Earth and atmospheric radiation. Radiation balance;
- The transport of heat into the atmosphere;
- The thermal regime of the atmosphere;
- The water cycle in the Earth-atmosphere system;
- Air movement;
- The hydrodynamic cycle;
- Liquid precipitation
- Snow
- Evapotranspiration;
The seminar covers the following main topics:
- Components of the atmosphere;
- Water vapor in the atmosphere;
- Atmospheric pressure - atmospheric pressure measuring instruments. Air pressure variation with altitude;
- Atmospheric humidity. Determining relative humidity of the atmosphere. Methods and instruments for measuring relative humidity and precipitation;
- Air movement. Methods and instruments for measuring wind speed and direction;
- Air temperature. Tools to determine and record the air temperature;

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
Professional Skills
Knowing and appropriate using the specific concepts of this domain;
Explaining, modeling and interpreting the physical phenomena and processes that occur in the atmosphere;
Knowing the experimental methods used to study Atmospheric physics

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (75% of the final grade)
Carrying out practical work. (25% of the final grade)
RECOMMENDED READING:

- *Abdel Hannachi, 2012, Climate Variability - Some Aspects, Challenges and Prospects*
The Faculty of Exact Sciences and Engineering

ANALYTICAL CHEMISTRY AND INSTRUMENTAL ANALYSIS
Course Code: M 203
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Simona Varvara, PhD
Laboratory tutor: Roxana Bostan, PhD
Full time studies

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COURSE AIMS:
- Acquiring and understanding the basics of analytical chemistry and instrumental analysis in order to apply them in environmental issues.
- Developing the students’ scientific thinking and cognitive skills in order to find correct solution to specific problems related to environmental engineering.

ENTRY REQUIREMENTS:
Chemistry, Physics

COURSE CONTENTS:
1. Introduction to analytical chemistry.
2. Overview of titrimetry. Acid–Base titration curves. Quantitative and qualitative applications
3. Titrations based on oxidation-reduction reactions. Redox titration curves. Redox indicators. Quantitative applications to the analysis of the environmental samples
5. Titrations based on complexation reactions. Complexon. Complexometric titration curves. Quantitative applications to the analysis of the environmental samples
6. Gravimetric analysis. Applications to the analysis of the environmental samples
7. Overview of spectroscopic methods of analysis
8-9. Ultraviolet-Visible Spectrophotometry (UV-VIS) – principles, instrumentation, applications to the analysis of the environmental samples.
10-11. Atomic Absorption Spectroscopy (AAS) – principles, instrumentation, applications to the analysis of the environmental samples.
12. Emission Absorption Spectroscopy (EAS) - principles, instrumentation, applications to the analysis of the environmental samples.
13. X-ray spectrometry - principle, instrumentation, applications to the analysis of the environmental samples.

LAB WORKS:
1. Safety rules in the laboratory. Rules in the chemistry laboratory. Processing results of chemical analysis
3. Titrations based on complexation reactions. Determination of Mg\(^{2+}\) and of the water hardness.
4. Titrations based on redox reactions. Standardization of KMnO\(_4\). Determination of Cu\(^{2+}\) from by iodometry.
5. Spectrophotometric determination of iron from liquid samples (UV-VIS absorption spectrum, the calibration curve method).
6. Quantitative chemical analysis by X-ray spectrometry. Determination of the heavy metals from wastewaters.
7. Assessment of the laboratory knowledges

TEACHING METHODS:
Lecture, conversation, exemplification, practical laboratory work.

LEARNING OUTCOMES:
1. Characterization and interpretation of environmental factors by analysing physico-chemical and biotic characteristics.
   - Description of environmental factors and their interaction with natural phenomena and man-made that affect the quality
   - Interpretation of the mechanisms by which natural and anthropogenic factors leads to environmental deterioration
   - Configuring methodologies that enable completion of a full investigation process environmental samples
   - Using appropriate methods of analysis to characterize the environmental factors.
2. Identification and compliance with professional ethics and deontology, taking responsibility for decisions and risks.
3. Identify roles and responsibilities in a multidisciplinary team and apply the techniques and effective work relationships within the team

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

- A one-hour written examination (60% of the final grade).
- The examination of the practical abilities acquired in the laboratory (40% of the final grade).

The course is given as a combination of lectures and lab works. There is a 100% attendance requirement for lab works.

RECOMMENDED READING:

- S. Petrozzi, Practical Instrumental Analysis: Methods, Quality Assurance and Laboratory Management, Wiley, 2012
- D. A. Skoog, F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, 2006
MATERIALS STRENGTH
Course Code: M 204
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

<table>
<thead>
<tr>
<th>Form of instruction</th>
<th>Number of teaching hours per semester</th>
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<th>Semester</th>
<th>Form of receiving a credit for a course</th>
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<td>Autumn</td>
<td>Grade</td>
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COURSE AIM:
The course presents a unified conception about the deformable solid mechanics problems. It should be taken into account that, under the action of forces, the bodies deform according to certain rules. The Materials Strength course studies the efforts (internal forces) occurring in elements, and their deformations under the action of external forces, taking into account the physical and mechanical properties of bodies;

COURSE CONTENTS:
1. Deformable solid mechanics. Concepts of materials strength. The subject of materials strength;
2. Effort, stress, displacement;
3. Centric stretching and compression. Definition; examples;
4. Shearing elements. The shearing of the section-reduced parts;
5. Elements needed for bending;
6. Straight bars torsion;
7. Straight bars buckling;
8. Compound stresses;
9. Flat surfaces geometric features;

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- Understanding and knowing the introductory elements of deformable solid mechanics, strength of materials concepts, object resistance of materials, effort, stress, displacement, centric stretching and compression, shearing elements, the shearing of the section-reduced parts required for bending, straight bars torsion and buckling, compound stresses, flat surfaces geometric features;
- applying the resistance coefficient method and monitoring the seepage of dams detour;

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 70%, Verification during the semester- 30%.

RECOMMENDED READING:
- Buzdugan, Gh. Rezistenţa materialelor, Didactic and Pedagogic Publishing House, Bucharest, 1984
- Buzdugan, Gh. et. al., Rezistenţa materialelor. Aplicaţii, Romanian Academy Publishing House, Bucharest, 1991
- Silaghi – Perju, D., Rezistenţa materialelor, Politehnica Publishing House, 2004
- Valcovici, V., Balan, St., R. Voinea, M., Mecanica Teoretica
- Popa D., Rezistenta Materialelor, Seria Didactica, Universitatea „1 Decembrie 1918 ”, Alba Iulia, 2010
FLUID MECHANICS
Course Code: M 205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ildiko Tulbure, PhD
Seminar tutor: Ildiko Tulbure, PhD
Full time studies

<table>
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<td>Autumn</td>
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COURSE AIMS:

General aim:
- Knowing and understanding of basic concepts, theories and methods of Fluid Mechanics, their correct usage for describing environmental pollution processes as well as environmental protection ones.

Specific aims:
- Delivering theoretical and methodological basic notions related to Fluid Mechanics;
- Students customisation to the specific terminology and expressions of Fluid Mechanics;
- Presenting general notions related to laminar and turbulent flows;
- Explaining modelling methods of dynamic fluid systems.
- Understanding basic notions related to Fluid Mechanics, which will be used for describing specific phenomena regarding environmental pollution and environmental protection

ENTRY REQUIREMENTS:
Physics, Mathematics, Mechanics

COURSE CONTENTS:
- Introduction, goals and objectives of this course;
- Physical properties of fluids;
- Fluid Statics;
- Fluid kinematics;
- Ideal fluid dynamics;
- Principle of linear momentum and of angular momentum;
- Real fluid dynamics;
- Basics of turbulent flows;
- Pipe flows without pressure losses;
- Pipe flows with pressure losses;
- Mass and heat transfer in fluids;
- Characteristic numbers used for analysing fluid-dynamic processes
- Fluid-dynamic models used for describing environmental pollution phenomena
- Conclusions related to the relevance of fluid mechanics in environmental engineering

TEACHING METHODS:
Giving lectures, presenting real case studies, explaining industrial processes based on fluids, conversation, exemplification.

LEARNING OUTCOMES:
- usage of basic fluid mechanics notions in solving environmental pollution problems;
- gaining basic notions for further analysing and recess the environmental pollution and protection field;
- good expertise retrieval and systematic knowledge on the basis of deeper insights within the study of environmental pollution and protection subjects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Oral examination – 60%; continuous assessment by preparing reports and delivering results of practical work in the laboratory – 30%; implication in solving problems during seminars – 10 %

RECOMMENDED READING:
- Tulbure, I.: Mecanica fluidelor. Didactica, University ”1 Decembrie 1918” Alba Iulia, 2014
TRANSFER PHENOMENA AND UNIT OPERATIONS
Course Code: M 209
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ildiko Tulbure, PhD
Seminar tutor: Ildiko Tulbure, PhD
Full time studies

<table>
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COURSE AIMS:
General aim:
- Knowing and understanding of basic concepts, theories and methods related to the analysis of transfer phenomena and unit operations as well as their correct usage for describing specific processes regarding environmental pollution and environmental protection.

Specific aims:
- Conveyance of theoretical and methodological basic notions related to transfer phenomena and unit operations;
- Students customisation to the specific terminology used in mass and heat transfer phenomena and unit operations;
- Acquisition of basic notions used for understanding of specific aspects approached in future courses as well as in the future professional life;
- Presenting general calculation methods of processes related to impulse, mass and heat transfer in pipe flows and in plane flows;
- Presenting some thermodynamic systems used in environmental engineering;
- Understanding the usage way of transfer phenomena used in describing processes in environmental engineering.
- Gaining the competencies to successfully solve a complex problem regarding impulse, heat or mass transfer in air and liquid flows in pipeline networks.

ENTRY REQUIREMENTS:
Physics, Mathematics, Chemistry, Fluid Mechanics

COURSE CONTENTS:
- Introduction, goals and objectives of this course;
- Transfer phenomena and unit operations – their analysis and application;
- Momentum transfer;
- Energy transfer;
- Mass transfer;
- Operations of momentum transfer;
- Operations of energy transfer;
- Operations of mass transfer;
- Similitude theory and dimensional analysis;
- Examples;
- Conclusions and applications in treating specific environmental pollution issues and environmental engineering matters.

TEACHING METHODS:
Giving lectures, presenting real case studies, explaining industrial processes based on momentum, energy and mass transfer, conversation, exemplification.

LEARNING OUTCOMES:
- explaining basic natural or anthropic mechanisms, processes and effects which are determining and influencing the environmental pollution;
- handling and solutioning specific environmental problems for assuring a sustainable development;
- characterising the state of environmental factors by analysing the characteristic physical, chemical and biotical parameters.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Oral examination – 60%; continuous assessment by preparing reports and delivering results of practical work in the laboratory – 20%; implication in solving problems during seminars – 20%
RECOMMENDED READING:

- Tulbure, I., 2015: *Fenomene de transfer si operatii unitare*, lecture slides, Univ. "1 Decembrie 1918", Alba Iulia
- Prigogine, I., Stengers; I. 1990: *Dialog mit der Natur*, Editură Piper, München
- Leca, A; Mladin, E., 1998 - *Transfer de căldură și masa. O abordare inginerescă*, Editură Tehnică, București
HYDRAULICS
Course Code: M 213
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ildiko Tulbure, PhD
Seminar tutor: Ildiko Tulbure, PhD
Full time studies

<table>
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COURSE AIMS:
General aim:
- Knowing and understanding of basic concepts, theories and methods of Hydraulics, their correct usage for describing specific processes regarding pipe flows, water pipeline networks as well as regarding water pollution and installations for water protection.

Specific aims:
- Delivering theoretical and methodological basic notions related to hydraulic systems and water pipeline networks;
- Students customisation to the specific terminology used in Hydraulics;
- Presenting general calculation and modelling methods of laminar and turbulent pipe flows in hydraulic systems;
- Presenting some hydraulic systems used in environmental engineering;
- Understanding the usage way and the operating method of pipeline networks and of hydraulic systems;
- Gaining the competencies to apply hydraulic notions into the practice for solving concrete problems related to water pollution;
- Gaining the competencies to successfully solve a complexe problem regarding liquid flow in pipeline networks and cleaning polluted water.

ENTRY REQUIREMENTS:
Physics, Mathematics, Fluid Mechanics

COURSE CONTENTS:
- Introduction, goals and objectives of this course;
- Physical properties of liquids;
- Pressure variation in liquid flow;
- Ideal liquid flow, without pressure losses;
- Pressure losses in pipeline networks;
- Real liquid flow, with pressure losses;
- Laminar pipe flow with pressure losses;
- Pipe flows without and with pressure losses;
- Turbulent pipe flow with pressure losses;
- Diagram of Nikuradse for laminar and turbulent pipeline flows;
- Steady-state flow in pipeline networks;
- Types of pipeline networks;
- Main principles for designing pipeline networks
- Conclusions regarding the relevance of hydraulics in environmental engineering

TEACHING METHODS:
Giving lectures, presenting real case studies, explaining industrial processes based on fluids, conversation, exemplification.

LEARNING OUTCOMES:
- usage of basic hydraulic notions in solving environmental pollution problems;
- gaining basic notions for further analysing and designing pipeline networks;
- good expertise retrieval and systematic knowledge on the basis of deeper insights within the study of environmental pollution and protection subjects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Oral examination – 60%; continuous assessment by preparing reports and delivering results of practical work in the laboratory – 25%; implication in solving problems during seminars – 15%
RECOMMENDED READING:

- Tulbure, I.: *Mecanica fluidelor*. Didactica, University ”1 Decembrie 1918” Alba Iulia, 2014
- Iamandi, C., ş.a., *Hidraulica instalaţiilor*. Editura Tehnică, București 2002
THERMODYNAMICS AND TRANSFER PHENOMENA
Course Code: M 214
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ildiko Tulbure, PhD
Seminar tutor: Ildiko Tulbure, PhD
Full time studies

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COURSE AIMS:

General aim:
- Knowing and understanding of basic concepts, theories and methods of Thermodynamics, their correct usage for describing specific processes regarding heat transfer in liquid flows and pipeline networks as well as regarding heat transfer in environmental pollution and in specific installations for environmental protection.

Specific aims:
- Delivering theoretical and methodological basic notions related to thermodynamic systems used for heat transfer;
- Students customisation to the specific terminology used in Thermodynamics;
- Presenting general calculation methods of processes related to heat transfer in pipe flows and in plane flows;
- Presenting some thermodynamic systems used in environmental engineering;
- Understanding the usage way of thermodynamic systems for heat transfer;
- Gaining the competencies to apply thermodynamic notions into the practice for solving concrete problems related to environmental protection;
- Gaining the competencies to successfully solve a complexe problem regarding heat transfer in air and liquid flows in pipeline networks.

ENTRY REQUIREMENTS:
Physics, Mathematics, Fluid Mechanics

COURSE CONTENTS:
- Introduction, goals and objectives of this course;
- Thermodynamic states and processes, thermodynamic state parameters;
- Thermodynamic systems;
- Real gas, perfect gas;
- First law of thermodynamics;
- Perfect gas state transformation;
- Second law of thermodynamics;
- Exergy and anergy. Entropy. Entropy law. Entropic charts;
- Fuels combustion;
- Steams and humid air;
- Mass transfer. Examples;
- Heat transfer. Examples;
- Conclusions and applications in modelling of environmental pollution and in environmental engineering

TEACHING METHODS:
Giving lectures, presenting real case studies, explaining industrial processes based on heat transfer, conversation, exemplification.

LEARNING OUTCOMES:
- usage of basic thermodynamic notions in solving environmental pollution problems;
- gaining basic notions for further analysing and designing thermodynamic processes;
- good expertise retrieval and systematic knowledge on the basis of deeper insights within the study of environmental pollution and protection subjects.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Oral examination – 60%; continuous assessment by preparing reports and delivering results of practical work in the laboratory – 20%; implication in solving problems during seminars – 20%
RECOMMENDED READING:

- Tulbure, I., 2016: *Thermodynamics and transfer phenomena*, Lecture slides, UAB.
- Jădăneanț, M., Ionel, I. ș.a., 2001: *Termotehnică și mașini termice în experimente*, Ed. Politehnica, Timișoara
- Popa, B., Mercea, V., 1982: *Termotehnică*, Editura Tehnica, București
- Jischa, M., F., 1982: *Konvektiver Impuls-, Wärme- und Stoffaustausch (Schimb convectiv de impuls, caldura si materie)*. Editura Vieweg, Wiesbaden
- Leca, A; Mladin, E., 1998 - *Transfer de căldură și masa. O abordare inginerească*, Editura Tehnică, București
TOPOGRAPHY
Course Code: M 215
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: George Voicu, PhD
Full time studies

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COURSE AIMS:
The program has established the structure of a course of general surveying and cadastral endpoints of course referring to the proper preparation of a plan topographical and thematic plans in areas such as agriculture, construction, etc., which are documents always preceded by surveying and geodetic, and finally the preparation of topographic maps or plans. Also on the work they are drawn topographical cadastral documentation underlying the development of environmental plans and risk plans.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
Course contents:
1. The aim of the course. Earth's shape and size. Systems and axes. Measurement units.
2. Benchmarking, extension of alignments and angle measurement - methods
3. Direct and indirect measurement of distances - equipment
4. Indirect measurement distances
5. Topographic triangulation networks - general
6. Guidelines and calculating the coordinates
7. Traverse, erasure, reporting points
8. Getting altimetry and compiling profiles
9. Introduction to the land registry and cadastral legislation
10. Cadastre general administrative demarcation of territories
11. Categories of use and the numbering of cadastral
12. Land Registry
13. Specialty cadastre
14. Cadastral documentation

Laboratory contents:
1. Getting the topography safety
2. Units. The materialization of topographic points
3. Apparatus terrain
4. Measurement of horizontal and vertical angles
5. Measuring Distances
6. Calculation orientation, side, and coordinates
7. Poligonaţia, raising details planimetric and altimetry
8. Drawing up topographical plans and profiles
9. Calculation surfaces
10. The delimitation of administrative territories
11. Cadastral plans, cadastral categories of use and the numbering
12. Acts property
13. Cadastre specialty
14. Supporting laboratory work

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C6. Introduction of best technologies in implementing environmental strategies and plans in accordance with the law

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Exam at least 2 test subjects - oral / written examination and Partial test (60% of the final grade)
Test of the lab - practical (40% of the final grade)
RECOMMENDED READING:

- Deaconescu, C. - Topografie și desen tehnic, Editura Didactică Pedagogică, București, 1979;
- Dima, N. și a. - Topografie minieră, Editura Corvin, Deva, 1996;
- Dima, N. și a. – Topografie generală și elemente de topografie minieră, Editura Universitas, Petroșani, 2005;
- Leu, I.N. și a. - Topografie și Cadastru, Editura Universul, București, 2000;
- Mihăilă, M., și a. - Cadastru general și publicitatea imobiliară, Editura Ceres, București, 1995;
- Olaru, Gh., și a. - Cadastru funciar, Editura Ceres, București, 1978;
- Oprea, L.; Tudorașcu, M. – Cadastru general, Seria Didactica, Universitatea “1 Decembrie 1918” Alba Iulia, 2013;
- Oprea, L. - Cadastru – Îndrumător de proiect și practică cadastrală, Editura Aeternitas, Alba Iulia, 2009;
- Pădure, I.; Kovacs L. - Topografie Generală, Editura Risoprint, Cluj Napoca, 2005;
INFO-GRAPHICS
Course Code: M 301
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Ioan IENCIU, PhD
Seminar tutor: George Voicu, PhD
Full time studies

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<td>Autumn</td>
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COURSE AIMS:
• The general objective of discipline is the implementation of a routine regarding computer-aided graphics. In order, to cover all topics, we chose to work with complementary themes applied to deepen the topics treated in the course.

ENTRY REQUIREMENTS:
-

COURSE CONTENTS:
1. General concepts of graphical data processing;
2. Raster and vector images;
3. Surfer - software;
4. Vextractor - software;
5. AutoCAD - General remarks;
6. AutoCAD - Creating and editing objects;
7. AutoCAD - dimensioning objects;
8. AutoCAD - the georeferencing of raster topographic plans;
9. AutoCAD - „Topograph” application;
10. AutoCAD - „TopoLT” application;
11. AutoCAD - „Sirot” application;
12. AutoCAD - drafting and plotting plans and maps.

Laboratory contents:
1. Notion of Safety in laboratory;
2. Vextractor – software: raster management, vectorization raster data, Export data;
3. Surfer – software: Graphic Mode Achieving Work, 2D models, 3D models, exporting data;
4. AutoCAD: Overview, settings, Import data, management work, creating layers objects, properties of objects, toolbars, drawing plans, georeferencing raster image, plotting works.
5. AutoCAD - „Topograph” application; AutoCAD - „TopoLT” application; AutoCAD - „Sirot” application; Test of the lab.

TEACHING METHODS:
Instruction is a combination of lectures, conversation and theoretical and practical examples

LEARNING OUTCOMES:
C5. Using TIC in environmental engineering problems

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Colloquy at least 2 test subjects - written examination (60% of the final grade)
Test of the lab - practical (40% of the final grade)

RECOMMENDED READING:
• Ienciu, I.; Oprea, L. - Prelucrarea automată a datelor anatitice și grafice din topografie și cadastru, Editura Aeternitas, Alba-Iulia, 2009;
• Ienciu, I.; Oprea, L. – Infografică pentru topografie și cadastru, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2009;
• Ienciu, I. - Exploatarea programelor topografice, Seria Didactica, Universitatea „1 Decembrie 1918”, Alba-Iulia, 2006;
• Ienciu, I. - Optimizarea rețelelor geodezice în cadastru, Editura Risoprint, Cluj-Napoca, 2006;
• Ienciu, I.; Răşteiu, M.; Wainberg, D. - Suport informatic de digitizare a datelor din topografie și cadastru, Editura Aeternitas, Alba Iulia, 2003;
• *** - Manualul inginerului geodez, Volumul II, Editura tehnică București, 1985;
- Manualul inginerului geodez, Volumul III, Editura tehnică București, 1985;
- Surfer, Help;
- Vextractor, Help;
- AutoCAD, Help;
- Aplicația TopoLT, Help;
- Aplicația Topograph, Help.
The Faculty of Exact Sciences and Engineering

GIS APPLIED IN ENVIRONMENTAL ENGINEERING
Course Code: M 303
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Tudor Borşan, PhD Eng
Seminar tutor: Tudor Borşan, PhD Eng
Full time studies

<table>
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<td>Autumn</td>
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COURSE AIMS:
- Knowing, understanding and a correct using of fundamental ideas concerning concepts specific to GIS.

ENTRY REQUIREMENTS:
Cartography; Geomorphology; CAD techniques.

COURSE CONTENTS:
The course covers the following main topics:
- Introduction and theoretical issues in GIS;
- Areas of GIS applicability;
- GIS components;
- GIS functions;
- Spatial data structures. Internal representation of vector layers. Internal encoding of a raster;
- Databases;
- Spatial data acquisition;
- Data conversions. Data import. Import from other GIS software. Import from CAD software;
- Data structures. Designing a database for attribute data;
- Acquiring and integrating data;
- Attribute and spatial queries;
- Building surface models;
- Exploratory data analysis;
- Maps and digital cartography. Thematic mapping techniques.

The seminar covers the following main topics:
- Preparation of a GIS project;
- GIS products;
- ArcGis Desktop’s modules;
- Conversion of analog cartographic products;
- Building new shapefile;
- Building new geodatabase;
- Map rectification, georeferencing and digitizing;
- The digitizing process. Digitizing regimes;
- Using symbols and creating annotations in GIS;
- Integrating and manipulating attribute data;
- Attribute and spatial queries;
- Building surface models;
- Spatial analysis;
- Thematic mapping techniques.

TEACHING METHODS:
Conversation, exemplification.

LEARNING OUTCOMES:
- Using GIS enhances students' ability to think critically about analyzing data.
- Using GIS promotes students' ability to use numbers and numeric skills, and to use tools that facilitate processing and transferring information.;
- This technology enables students to visualize spatial patterns, linkages, and relationships. GIS is used not only in geography courses, but in environmental studies, earth science, history, mathematics, chemistry, biology, language arts, and other subjects.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

- A two-hour written examination (75% of the final grade)
- Carrying out practical work. (25% of the final grade)

RECOMMENDED READING:

- GIS by ESRI – Michael Minami, Using Arc Map, Environmental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
- GIS by ESRI – ***, Editing in Arc Map, Environmental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
- GIS by ESRI – Aleta Vienneau, Using Arc Catalog, Environmental Systems Research Institute, Inc., 380 New York Street, Redlands, CA 92373-8100, USA;
TECHNOLOGIES FOR ENVIRONMENTAL PROTECTION  
Course Code: M 308  
Type of course: compulsory  
Language of instruction: English tutoring available for Erasmus students  
Name of lecturer: Ildiko Tulbure, PhD  
Seminar tutor: Ildiko Tulbure, PhD  
Full time studies

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<td>Class</td>
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**COURSE AIMS:**

General aim
- Knowing, understanding and correct usage of diverse basic notions, concepts and methods related to environmental engineering as well as clarifying the necessity of considering ecological aspects when different economic activities are planned to be carried out, so that their environmental impact should be as small as possible.

Specific aims:
- Presenting the theoretical and methodological basic notions related to environmental engineering;
- Students customisation to the specific environmental engineering terminology;
- Presenting general notions related to plants and devices used for environmental protection;
- Explaining designing methods of different plants used for environmental protection;
- Understanding basic notions related to environmental engineering.

**ENTRY REQUIREMENTS:**
Physics, Chemistry, General Ecology and Environmental Protection, Analysis and Synthesis of Technological Processes

**COURSE CONTENTS:**
- Introduction, goals and objectives of this course;
- Basics regarding environmental pollution and protection;
- General notions regarding technologies for environmental protection;
- Basics notions and concepts related to technologies for environmental protection;
- Crisis of ecosphere health status;
- Ecological toxicity;
- Ecological risk assessment;
- Technologies for air protection;
- Technologies for water protection;
- Technologies for soil protection;
- Biotechnologies for air, water and soil protection;
- The concept of sustainable development and its operationalisation;
- Waste management and recycling;
- Conclusions related to ecology relevance.

**TEACHING METHODS:**
Giving lectures, presenting and debating real case studies, conversation, exemplification of concrete situations regarding technologies for environmental protection.

**LEARNING OUTCOMES:**
- usage of basic knowledge regarding technologies for environmental protection in solving concrete pollution problems;
- gaining basic notions for further analysing and recess the environmental pollution and installations for environmental protection;
- good expertise retrieval and systematic knowledge on the basis of deeper insights within the study of environmental engineering subjects.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**
Oral examination – 40%; project work – 40%; - continuous assessment by preparing reports and delivering results of practical work in the laboratory – 20%
RECOMMENDED READING:

- Tulbure, I.: *Technologies for Environmental Protection*, Lecture slides, UAB, 2015
- Tulbure, I., 2013: *Technikbewertung (Technology Assessment)*, Lecture, Clausthal University of Technology, Germany
- Tulbure, I., 1997: *Zustandsbeschreibung und Dynamik umweltrelevanter Systeme*. UT Clausthal; Ed. Papierflieger, Germany, CUTEC+series, Nr. 25
- Negulescu, M. s.a.: *Protecția mediului înconjurător*. Editura Tehnică, București, 1995
- Club of Rome: http://www.clubofrome.org
WASTEWATER TREATMENT AND RECOVERY I
Course Code: M 311
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Simona Varvara, PhD
Seminar tutor: Roxana Bostan, PhD
Full time studies

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COURSE AIMS:
- Developing the ability of the students to capitalize the practical knowledge of chemistry, biotechnology, biology and engineering and to apply them in the technological practice and control.
- Acquiring basic knowledge on urban wastewaters and on the mechanical and biological methods used for their treatment.

ENTRY REQUIREMENTS:
Chemistry, Analytical Chemistry and Instrumental Analysis, Mechanics, Hydraulics

COURSE CONTENTS:
1. Basic concepts on water pollution. The sources of water pollution.
4. Physical, chemical and bacteriological properties of the wastewater.
7-8. Physical processes involved in the urban wastewater treatment. Mechanical urban wastewater treatment
10-12. Biological treatment of urban wastewater
13-14. Equipment used in the biological step of urban wastewater treatment

LAB WORKS:
1. Laboratory safety rules. Water management - principles and European regulations. Categories and water quality technical conditions - types of indicators and methods of determination. Collecting, preserving and transporting water samples to determine quality indicators
3. Determination of urban wastewater’s chemical oxygen demand, CBO5 and CCO-Cr.
4. Determination of urban wastewater’s turbidity and fix residue.
5. Determination of toxic metal ions from urban wastewaters by X-ray spectrometry.
6. Visit to wastewater treatment plant in Alba Iulia.
7. Assessment of the laboratory knowledge

TEACHING METHODS:
Lecture, conversation, exemplification, laboratory work.

LEARNING OUTCOMES:
1. Management and resolution of specific environmental issues for sustainable development
   - Description and application of concepts, theories and practical methods/technologies for determining environmental quality status
   - Qualitative and quantitative evaluation of natural phenomena and human activities affecting the quality of the environment
   - Identifying the best technical and technological solutions to implement professional projects of environmental engineering
2. Introducing the best technologies in the implementation of environmental strategies and plans in accordance with the law
   - Identification of accurate information about the best technologies available in the field
   - Identification and implementation of technical solutions to solve problems related to environmental engineering
   - Developing process analysis and technological projects in order to reduce environmental impact.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

A one-hour written examination (60% of the final grade). The examination of the practical abilities acquired in the laboratory (40% of the final grade).

The course is given as a combination of lectures, lab works and seminars. There is a 100% attendance requirement for lab works and seminars.

RECOMMENDED READING:

HYDRO-TECHNICAL DESIGNS OF CONSTRUCTIONS AND FACILITIES

Course Code: M 313
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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**COURSE AIM:**
Developing the capacity for knowing and understanding the basic hydro-technical facilities concepts.

**COURSE CONTENTS:**
1. General considerations;
2. Execution of earthworks in the drainage channels and collectors;
3. Dams of local materials;
4. Water leakage through and under earth dams;
5. Floods prevention and control;
6. Channel processes;
7. Accumulation works to mitigate flood waves;
8. Calculation of the gravity dams;
9. Setting the body and the comber of the rock-fill dams;
10. Hydraulic energy and power.

**TEACHING METHODS:**
Lecture, conversation, exemplification.

**LEARNING OUTCOMES**
- Understanding and knowing the basics of design, construction and operation of hydro-technical facilities and structures;
- Knowing and understanding the types of hydro-technical facilities and structures;
- Developing the skills for design, construction and operation of hydro-technical facilities and structures;
- Knowing and understanding the calculation method of the gravity dams and of their design;
- Developing skills for determining the loads acting on the arch dams;
- Developing the ability to check the stability of the dam seepage;
- Understanding and calculating the seepage under dams,
- Applying the resistance coefficient method and monitoring the seepage of dams detour.

**LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:**
Written test examination - 40%, Verification during the semester- 60%.

**RECOMMENDED READING:**
WASTEWATER TREATMENT AND RECOVERY II
Course Code: M 403
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Simona Varvara, PhD
Seminar tutor: Roxana Bostan, PhD
Full time studies

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COURSE AIMS:
- Developing the ability of the students to capitalize the practical knowledge of chemistry, biotechnology, biology and engineering and to apply them in the technological practice and control.
- Acquiring basic knowledge on urban wastewaters and on the mechanical and biological methods used for their treatment.

ENTRY REQUIREMENTS:
Chemistry, Analytical Chemistry and Instrumental Analysis, Mechanics, Hydraulics

COURSE CONTENTS:
2-3. Wastewaters coagulation and flocculation methods
4. Overview on advanced treatment technologies for urban wastewater. Nutrients removal from municipal effluents
10. Filtration, ultrafiltration, osmosis, reverse osmosis, air-stripping electrodialysis
11. Water sterilization

LAB WORKS:
1. Laboratory safety rules. The use of various chemical and natural coagulants for wastewater turbidity removal using a Jar test equipment
2. Determination of phosphorous from wastewaters by UV-VIS spectrometry. Removal of phosphorous from wastewaters
3. Determination of ammonium from wastewaters by UV-VIS spectrometry. Removal of ammonium from wastewaters using natural and modified zeolites
4. The use of natural sorbents for the removal of heavy metals from wastewaters
5. Removal of nickel and chromium from wastewaters by electrocoagulation
6. Study visit to sludge treatment plant in Alba Iulia
7. Assessment of the laboratory knowledge

TEACHING METHODS:
Lecture, conversation, exemplification, laboratory work.

LEARNING OUTCOMES:
1. Management and resolution of specific environmental issues for sustainable development
   - Qualitative and quantitative evaluation of natural phenomena and human activities affecting the quality of the environment
   - Identifying the best technical and technological solutions to implement professional projects of environmental engineering
2. Introducing the best technologies in the implementation of environmental strategies and plans in accordance with the legislation
   - Identification and implementation of technical solutions to solve problems related to environmental engineering
   - Developing process analysis and technological projects in order to reduce environmental impact.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:

A one-hour written examination (60% of the final grade). The examination of the practical abilities acquired in the laboratory (40% of the final grade).

The course is given as a combination of lectures and lab works. There is a 100% attendance requirement for lab works.

RECOMMENDED READING:

ENVIRONMENTAL IMPACT ASSESSMENT
Course Code: M 405
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Mihai Teopent Corches, PhD
Seminar tutor: Mihai Teopent Corches, PhD
Full time studies

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COURSE AIMS:
The overall objective of the course:
The objective of the course is to understand the process of assessing human impact on the environment and to develop the skills needed to prepare environmental impact assessment studies, to acquire knowledge of the environmental assessment applicable law, to learn the methods and practical procedures used for assessing the impact of various economic activities on the environment (matrices, checklists, cost-benefit analysis), as well as to construct graphical representations of the impact and to draw maps using GIS technology.

Specific objectives:
- Teaching the specific legislation and environmental impact assessment methods;
- Presenting the concepts, techniques and specific procedures used in environmental impact assessment;
- Training of practical skills needed to use noise measurement instruments and air pollutants dispersion modeling software - AERMOD;
- Preparing an environmental impact assessment study within project classes

ENTRY REQUIREMENTS:

COURSE CONTENTS:
The course covers the following main topics:
- Introduction to environmental impact assessment;
- Procedural stages of environmental impact assessment;
- Public participation in environmental impact assessment for plans and programs
- Environmental balance;
- Environmental Impact Assessment study;
- Assessment of plans and projects significantly affecting Natura 2000 sites
- Site report for IPPC environmental authorization
- Environmental risk assessment
- Methods of Environmental Impact Assessment
- Implementation phase of the Environmental Impact Assessment
- Legal aspects of the Environmental Impact Assessment

The seminar covers the following main topics:
- Environmental monitoring
- Methodology for Environmental Impact Assessment
- Health Impact Assessment
- Methodology for assessment of plans and projects significantly affecting Natura 2000 sites
- Qualitative determination of the environmental factors;
- Measures to reduce environmental impact;
- Methodology for environmental impact assessment for plans and programs.

TEACHING METHODS:
Lectures and seminars (The course is given as a combination of lectures and seminars.)

LEARNING OUTCOMES:
- Proper identification of all potential environmental effects of implementing a certain project
- Ability to establish proper measures for reducing the environmental effects of a specific project
- Ability to use instruments for measuring environmental noise
- Interpretation of environmental quality indicators in relation to the maximum admitted limits regulated by the relevant legislation
- Ability to establish a proper environmental monitoring program
- Ability to use GIS software for mapping the environmental impact of pollutants.
LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (80% of the final grade)
Carrying out practical work / project writing. (20% of the final grade)

RECOMMENDED READING:
- Guidance on EIA Scoping, 2001, European Commission;
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment, 2013, European Commission;
- Strategic Environmental Assessment Better Practice Guide - methodological guidance for strategic thinking in SEA, 2012, Maria do Rosário Partidário, Lisbon;
FOOD SAFETY
Course code: M 406
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Maria, PhD

Full time studies

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COURSE AIMS:
This course will introduce the discipline and profession of food science through an overview of food composition, commodities, food quality and deterioration, food preservation, and product development.

COURSE CONTENTS:
1. Nature, aim and range of commodity science - commodity science as an interdisciplinary science
2. Division of commodity science - industrial and food commodity sciences
3. Commodities – properties and classifications
4. Quality of commodities - quality properties, factors determining quality, research, evaluation and control of quality
5. Microorganisms in food products - influence on quality characteristics of food products, classification, morphology and physiology of microorganisms.
7. Normalization and certification - normalization and certification systems in the European Union, norms - structure, classification and numbering, normalization organizations

TEACHING METHODS:
Lecture, Discussions, Exemplification

LEARNING OUTCOMES:
- Better understand the field and processes involved with food science
- Recognize and identify basic characteristics of the chemical and physical properties of food.
- Recognize the types of microbial risks that may be present in foods
- Knowing the characterizing factors related to the primary food components carbohydrates, proteins, fats and sugar/sweeteners, etc.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 60%, Verification during the semester (project, practical activities) - 40%.

RECOMMENDED READING:
- Popa, M., Food safety and quality, Seria Didactica, Alba Iulia, 2012;
LAND MANAGEMENT

Course Code: M 408
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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COURSE AIM:
Knowing the basics of the purpose and importance of spatial organizing and planning;

COURSE CONTENTS:
1. Geographical area. Organization, planning and sustainable development of the geographical area. General aspects;
2. Rural area;
3. Agricultural area - agricultural ecosystem;
4. Green area;
5. Urban area.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- The ability to understand and apply the current Romanian legal framework and to align to the EU principles and directions
- Developing skills and aptitudes for optimal exploitation of natural and economic potential, organizing integrated energy transfer networks, information, goods, people, building an advanced technological infrastructure of the territory, development of settlements, equitable distribution of industrial sites and of social and cultural facilities.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 60%, Verification during the semester- 40%.

RECOMMENDED READING:
- Candea, M., Bran, F., Cimpoeru, I., Organizarea, amenajare si dezvoltarea durabila a spatului geografic – University Publishing House, Bucharest, 2006
- Motica, R., Trailescu, A., Drept funciar amenajarea teritoriului si protectia mediului.
- Bold, I., Organizarea teritoriului, Mirton Publishing House, Bucharest, 1999
- Popa Cristin Nicolae, Rolul administraţiei publice în procesul de urbanizare, Doctoral dissertation, “Babeş-Bolyai” University, Cluj-Napoca, 2002
- Popa D., Organizarea si Planificarea Teritoriului, Seria Didactica, Universitatea „I Decembrie 1918 ”, Alba Iulia, 2011
ENVIRONMENTAL MANAGEMENT AND ECOLOGICAL RESTORATION
Course Code: M 410
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Mihai Teopent Corches, PhD
Seminar tutor: Mihai Teopent Corches, PhD
Full time studies

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COURSE AIMS:
The overall objective of the course:
To familiarize students with the main concepts, approaches, methods and techniques used in environmental management
Specific objectives:
- To learn specific concepts used in environmental management;
- To know the components of environmental management, its functions and the main mechanisms and tools used;
- To understand the role and importance of environmental management in organizations taking account of globalization;
- To develop the ability to design and draft an environmental policy and an environmental strategy;
- To develop the ability to synthesize and select the information necessary for making decisions on choosing and implementing an environmental management system.
- To create and develop the ability to analyze and propose solutions to improve the environmental management system in relation to legislation changes.

ENTRY REQUIREMENTS:
-

COURSE CONTENTS:
The course covers the following main topics:
- Ecology, environmental protection, sustainable development, management;
- Environmental Management System elements of an environmental management system;
- Environmental performance evaluation;
- Environmental audit;
- Life Cycle Assessment;
- Environmental labels and declarations;
- Ecological restoration;
- Protected areas management and reconstruction of degraded ecosystems;
- Exemplification of rehabilitation of degraded lands and possibilities of using these lands
- Exemplification of a rehabilitation study for waste rock dumps and tailings ponds from the mining industry;

The seminar covers the following main topics:
- Study of the regulations on environmental management; EMAS
- Study of the regulations on environmental management, ISO 14001
- Requirements for EMS;
- Integration of management systems within the organization. Synergy with quality management system and with other management systems;
- Analysis of the concept of continuous improvement of the environmental management system;
- Project management for the implementation of an environmental management system (presenting reports on the actions needed to implement an EMS in different organizations);
- Collecting the data required for environmental planning (thematic questionnaires, survey method);
- Interpreting the official and scientific data necessary in environmental studies. Case studies on corporate social responsibility.

TEACHING METHODS:
Lectures and seminars (The course is given as a combination of lectures and seminars.)

LEARNING OUTCOMES:
Professional Skills
- To master the specialized terminology used in environmental management;
The Faculty of Exact Sciences and Engineering

- To demonstrate ability to use appropriate concepts of environmental management; To prepare projects for the analysis of the interaction between economic processes and natural and social environment;
- To apply methods, techniques and management tools for developing, implementing, monitoring and reviewing the organization's strategies and policies taking into account environmental management requirements.
- To prepare projects for the implementation of organizational strategies and policies taking into account environmental issues.
- To use methods and criteria for evaluating the organizational strategies and policies in relation to the environment.
- To adopt and implement decisions for small complexity organizations (on the whole or for a component). To develop and implement studies / papers on decision making in organizations.
- To use standard criteria and methods for assessing the decision making process in organizations in relation to the environment.
- To develop and implement studies / papers on decision making in organizations. To interpret the basic concepts and methods necessary for managerial decision making in lower complexity organizations (on the whole or for a component).
- To use domain-specific knowledge, to explain indicators that characterize the relation between organization and environment.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (80% of the final grade)
Carrying out practical work. (20% of the final grade)

RECOMMENDED READING:
- Christopher J. Barrow, 1999, Environmental Management: Principles and Practice;
- Santosh Sarkar, 2010, Environmental Management;
- Bruce Mitchell, 2001, Resource & Environmental Management (2nd Edition);
ELECTROCHEMISTRY AND CORROSION
Course Code: M 411
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Simona Varvara, PhD
Laboratory tutor: Simona Varvara, PhD
Full time studies

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COURSE AIMS:
- Acquiring and understanding the basic concepts of electrochemistry in order to apply them for solving environmental issues.
- Acquiring theoretical knowledge and practical skills required to investigate metal corrosion phenomena and to identify technological measures to prevent the corrosion.
- Developing the students’ scientific thinking and cognitive skills in order to find correct solution to specific problems related to environmental engineering.

ENTRY REQUIREMENTS:
Chemistry, Physics

COURSE CONTENTS:
5. Applications of electrode reactions. Electrochemical energy conversion.
7. Electrolysis. The laws of electrolysis. Applications
12. Environmental implications in electrochemistry. Electrochemical remediation methods used in the environmental protection
13-14. Electrochemical sensors used in the environmental monitoring

LAB WORKS AND SEMINARS
1. Laboratory safety rules. Influence of concentration on the conductance of electrolyte solutions. Problems
2. Determining the standard potential of the electrode. Problems
3. Ion-selective electrodes. Determination of Cd^{2+} ions from wastewaters using a Cd-sensitive ion selective electrode
5. Determining the corrosion potential and corrosion rate of aluminum and steel
6. Determining the Cu^{2+}, Cd^{2+} and Pb^{2+} from wastewater samples by stripping voltammetry.
7. Presenting reports. Assessment of the laboratory knowledges

TEACHING METHODS:
Lecture, conversation, exemplification, practical laboratory work.

LEARNING OUTCOMES:
1. Assessment of the environmental degradation;
   - Understanding the basic concepts of interdependence between the pollution factors and their direct effects on the environment
   - Identifying interdependence between the pollution factors and their direct effects on the environment
   - Evaluation the environmental monitoring programs
   - Developing special chapters in sustainable development projects that take into account the environmental impact
2. Identification and compliance with professional ethics and deontology, taking responsibility for decisions and risks
3. Identify roles and responsibilities in a multidisciplinary team and application the techniques and effective work relationships within the team

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A one-hour written examination (60% of the final grade).
The examination of the practical abilities acquired in the lab (40% of the final grade).
The course is given as a combination of lectures, lab works and seminars. There is a 100% attendance requirement for lab works and seminars.

RECOMMENDED READING:
COURSE AIMS:

The overall objective of the course:
The aim of this course is to make students familiar with advanced knowledge of waste management problems.

Specific objectives:
- To learn specific concepts used in waste management field;
- To understand the role and importance of waste management field in organizations;
- To develop the ability to understand problems of building, operation and reclamation of landfills, collection centers, sorting lines and other facilities for waste management;
- To develop the ability to synthesize and select the innovative solutions in waste management, using new techniques and technologies.

ENTRY REQUIREMENTS:

COURSE CONTENTS:

The course covers the following main topics:
- Waste management concepts.
- Waste type and sources, factors that affects the waste composition.
- The options and logistics of waste collection.
- Waste disposal.
- Waste separation and sorting technique.
- Methods of reusing waste.
- Waste recycling technologies.

The seminar covers the following main topics:
- Waste management introduction.
- European and related legislation.
- Integrated waste management.
- Biological waste utilization
- Design of landfill recultivation, technical and biological recultivation, integration in the landscape.
- Hazardous waste, waste records, collection, sorting, transport. Dangerous waste removal techniques and technologies.
- Hazardous waste recycling.

The project covers the following main topics:
- Preparing a waste management plan.

TEACHING METHODS:

Lectures and seminars (The course is given as a combination of lectures and seminars.)

LEARNING OUTCOMES:

Professional Skills

- The overall aim is to give deeper knowledge in the problems and possibilities of waste management from a national and global perspective. Both industrial and municipal solid waste issues will be discussed. The course will employ a holistic view on solutions as well as technical aspects.
- After a passed course the student should be able to:
  - Define and explain important concepts in the field of solid waste management, such as waste hierarchy, waste prevention, recirculation, municipal solid waste etc.
  - Suggest and describe suitable technical solutions for biological and thermal treatment. The student should also be able to discuss the drawbacks and prerequisites for a chosen solution.
- Describe the construction and operation of a modern landfill according to the demands of the EU directive.
- Discuss social aspects connected to handling and recirculation of solid waste from a local as well as global perspective.
- Analyse and describe the potential as a secondary raw material, and thereby associated problems and possibilities in a sustainable society.
- Describe, analyse and discuss the connection between waste and consumption on a national and global level.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
A two-hour written examination (60% of the final grade)
Carrying out practical work. (40% of the final grade)

RECOMMENDED READING:
- Popa, M., *Metode si tehnici moderne de determinare a poluării mediului cu metale grele*. Editura Casa Cărţii de Știință, Cluj - Napoca, 2005
- Vasile Oros, Camelia Drăghici, *Managementul deşeurilor*, Brașov, 2002;
The Faculty of Exact Sciences and Engineering

REHABILITATION AND PROTECTION TECHNOLOGIES FOR BUILDINGS AND PROTECTED AREAS

Course Code: M 415
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Popa Dorin Victor, PhD
Seminar tutor: Popa Dorin Victor, PhD
Full time studies

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COURSE AIM:
Developing the capacity for knowing and understanding the basic concepts related to general notions of heritage and buildings rehabilitation and protection technologies;

COURSE CONTENTS:
1. General considerations;
2. The movement of water through soil
3. Highlighting the factors influencing the emergence and development of over-moisture phenomenon in the masonry and / or concrete elements;
4. Migration of the capillary water in the ground towards foundations and walls;
5. Degradation of structural elements in the presence of moisture;
6. Methods for cleaning up the masonry foundations and walls.

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES
- the ability to establish the degradation causes of the structural elements in the presence of moisture
- understanding and knowing the basics of correlating different factors that favour the capillary rise
- knowing and understanding the methods of masonry foundations’ and walls’ drainage
- the ability to understand the mechanism of capillary rise in the building elements
- developing the ability to apply in practice but also to track the modern technologies of cultural heritage rehabilitation and protection;

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written test examination - 50%, Verification during the semester- 50%.

RECOMMENDED READING:
- Popa, D., Contribuții la tehnica si practica asanării fundațiilor si peretilor pentru constructii istorice si social culturale, Casa Cartii de Stiinta Publishing House, Cluj-Napoca, 2007
- Popa, D., Studiu privind cauzele și efectele în umidificarea construcțiilor, Analele Universității, Tom X, ISSN- 1582-5450, Oradea, 2001, p. 380-384;
- Manoliu, I., Fundații și procedee de fundare, Didactic and Pedagogic Publishing House, Bucharest, 1977;
- Program Leonardo da Vinci, Umiditatea în elementele de zidărie – Modul de curs, Technical University of Cluj – Napoca;
- Silași, P., Raportul dintre pânzele de apă subterană, umezirea și uscarea construcțiilor, Construcții no. 4 – 5, 1988;
- Popa, A., Popa, D., Cauzele apariției fenomenelor de igrasie și soluții de reabilitare, Al 6-lea Simp. Stiințific – Structuri portante, istorice, Cluj Napoca, 2002, p.78-82;
# COURSE CATALOGUE 2016-2017

**Field:** COMPUTER SCIENCE  
**Programme:** Master’s Degree Programme in Advanced Programming and Databases  
**Length of studies:** 2 years (4 semesters)  
**Number of ECTS Credits:** 120 +20 for the M.Sc. Thesis  
**Languages of teaching:** Romanian (English tutoring available for Erasmus students)  
**Form of education:** Full-time

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**COURSE CATALOGUE 2016-2017**

**Field:** Geodetic Engineering  
**Programme:** Master's Degree Programme in Information Systems in Surveying and Property Management  
**Length of studies:** 2 years (4 semesters),  
**Total number of ECTS credits:** 120  
**Languages of teaching:** Romanian (English/French available for Erasmus students)  
**Form of education:** Full-time

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# COURSE CATALOGUE 2016-2017

**Field:** Environmental Engineering  
**Programme:** M.Sc. In Evaluation, Monitoring and Environmetal Audit  
**Length of studies:** 2 years (4 semesters)  
**Number of ECTS Credits:** 120  
**Languages of teaching:** Romanian (English/French available for Erasmus students)  
**Form of education:** Full-time

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COURSE CATALOGUE 2016-2017

Field: Electronic Engineering and Telecommunications
Programme: M.Sc. In Advanced Intelligent Electronic Systems
Length of studies: 2 years (4 semesters)
Number of ECTS Credits: 120
Languages of teaching: Romanian (English/French available for Erasmus students)
Form of education: Full-time

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SYLLABUS

SPECIAL MATHEMATICS 1
Course Code: SICMI 14
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Daniel Breaz, PhD
Full time studies

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COURSE AIMS:
After going through the course, students will acquire skills in using different interpolation methods using MATLAB software in achieving specific problems of geodesy.

ENTRY REQUIREMENTS:

COURSE CONTENTS:
1. Least squares functions approximation
2. Least squares failure
3. Polynomials and matching data in MATLAB
4. Polynomial interpolation
5. Lagrange, Hermite interpolation
6. Calculation of polynomial interpolation efficient
7. Aitken type methods
8. Spline interpolation. Linear spline, Cubic spline interpolation.
9. Uniform approximation, Bernstein polynomials
10. Applications in MATLAB: 1D interpolation, interpolation by least squares, interpolation Hermite. Using functions: interp1, splines, pchip
11. Applications in MATLAB: 2D and 3D interpolation. Using functions: interp2, interp3
12. Applications in MATLAB: 2D and 3D interpolation. Using functions: interpn, ndgrid
13. Applications in MATLAB: 2D and 3D interpolation. Using functions: meshgrid, griddata

TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
In order to obtain credits for this discipline the students have to:
- Know the basics on the approximation by least squares, linear interpolation;
- Can determine the interpolation error expression;
- Can achieve concrete interpolation problem 1D, 2D and 3D using MATLAB
- Form their skills to plot different surfaces processed using MATLAB specific functions, such as: interp2, interp3, interpn

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Final evaluation – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- The Mathworks Inc., Version 7
REAL ESTATE MANAGEMENT  
Course Code: SICMI 34  
Type of course: compulsory  
Language of instruction: English tutoring available for Erasmus students  
Name of lecturer: Begov Ungur Andreea, PhD Eng.  
Seminar tutor: Begov Ungur Andreea, Lecturer PhD Eng.  
Full time studies

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COURSE AIMS:  
- knowing, understanding and a correct using of fundamental ideas concerning concepts specific to Real estate management;  
- knowing of basic problems and concepts that Real estate management is operating;  
- knowing the ways of organizing, structuring and data modeling specific to Real estate management.

ENTRY REQUIREMENTS:  
Cadastral management, Real estate cadastre, Real estate evaluation

COURSE CONTENTS:  
1. Generalities.  
2. Basic concepts of real estate management.  
3. The concept of analysis and real estate management.  
4. Forms of activity organization on works to introduction and maintenance of real estate cadastre.  
5. Identification and classification of types of geodetic, topographic, photogrammetric and cartographic executed to introduction and maintenance of real estate cadastre.  
6. Parameters used in programming and organizing the work of real estate cadastre.  
9. Phases and structure of the investment project.  
10. The analysis of investment project in real estate.  
11. Real estate management in the construction process.  
12. The management of the real estate portfolio.

TEACHING METHODS:  
Lecture, conversation, exemplification.

LEARNING OUTCOMES:  
- to accustom students with terminology, methods, equipment and instruments specific of this discipline;  
- to give students the basics concepts needed to achieve a work of real estate management in accordance with current legislation;  
- understanding of issues they will encounter in their future profession.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:  
Written exam – 60%; Portfolio of practical work – 40%.

RECOMMENDED READING:  
- Achim M.I., Palamariu M. – Managementul lucrărilor de geodezie şi cadastru, Editura Aeternitas, Alba iulia, 2009;  
- Consiliul facultaţii de Geodezie Bucureşti - Măsurători terestre fundamente, Ed. MATRIX ROM, Bucureşti, 2002;  
- Constantinescu D.A. – Management, Colecţia Naţională, Bucureşti 2002;  
- Palamariu M. – Managementul lucrărilor de cadastru, Seria Didactica, Alba Iulia, 2005;  
- Pădure L., Ungur A. – Cadastre de specialitate, Editura Risoprint, Cluj Napoca, 2006;  
- Proca G. - Managementul lucrărilor de cadastru, Editura MATRIX ROM, Bucureşti, 2000;  
- *** - Normele de muncă unificate pe economie pentru lucrări geodezice, topo-fotogrammetrice şi cartografice (lucrări de măsurători terestre) O - 1987;  
- *** - Norme de timp pentru operaţiile necesare realizării lucrărilor şi prestării serviciilor de specialitate în cadrul Centrului Naţional de Geodezie, cartografie, Fotogrammetrie şi Teledeteceţie, Bucureşti, 2007
OBJECT-ORIENTED DATABASES
Course Code: MI 303
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Adriana Birlutiu, PhD
Seminar tutor: Adriana Birlutiu, PhD
Full time studies

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COURSE AIMS:
- This course introduces fundamental concepts and implementation of object oriented database systems with focus on data distribution, query processing, transaction processing, concurrency control and recovery.

ENTRY REQUIREMENTS:
- Databases.

COURSE CONTENTS:
- Introduction, Concepts and Definitions
- Normalization Techniques
- Data Mining and Data warehouse
- Transaction Processing
- Concurrency Control
- Distributed Databases
- Database Security
- Temporal database
- Oracle system architecture
- Updating an Oracle database
- PL/SQL Language
- Oracle Utilities
- Oracle From Builder

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
- Apply normalization techniques.
- Understand how transactions are processed in a database.
- Discuss/explain the concepts of Distributed Databases and Data Warehousing.
- Discuss/explain some database security issues.
- Tune and Optimize some Database Applications.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written exam – 50%; continuous assessment – 50%.

RECOMMENDED READING:
- J.D. Ullman Principles of Data and Knowledge Base Systems, Volume 1, Computer Science Press.
- J. Widom and J. D. Ullman, A First Course in Database Systems, Prentice-Hall.
AUDIT OF INFORMATION SYSTEMS
Course Code: MI 208.1
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Elisabeta Mihaela Ciortea, PhD Eng.
Seminar tutor: Elisabeta Mihaela Ciortea, PhD Eng.
Full time studies

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COURSE AIMS:
- Evaluation stage of development, implementation and use of information technology infrastructure and specific instruments and communication in the framework of the e-tendering for the provision of electronic public procurement, for public institutions and businesses.
- Making recommendations to accelerate the extension of this electronic service.
- Defining and proposing measures for auditing information systems.

ENTRY REQUIREMENTS:
- Identifying and proposing solutions to ensure protection of information systems in the unit where they work.
- Ensuring full audit systems they evaluated.
- Defining concepts of security and protection systems.

COURSE CONTENTS:

Head. 1 The context of development of IT audit internally and internationally.
1.1 Socio-economic context. Strategies and policies for the information society.
1.2 IT Governance
1.3 Legislative and regulatory IT.
1.4 Current status on the auditing systems domestically and internationally.

Head. 2 Standards for IT audit
2.1 Institutions, standards and guidelines,
2.2 The INTOSAI auditing,
2.3 International Standards on Auditing ISA,
2.4 The document Sarbanes - Oxley.
2.5 IIA Standards
2.6 COSO.
2.7 Changes in vision IT audit standards EUROSAI - ITWG.
2.8 This framework COBIT.
2.9 Val IT Framework working.

2.10 Risk IT Framework Working
2.11 Standard IDO / IEC 27001 - Information security management systems.

Head. 3 IT Risks
3.1 Key components of risk governance domain.
3.2 Problems associated with the use of IT systems audit / IS.
3.3 Issues with significant impact on audit risk.
3.4 Model of IT risk management.
3.5 Risks arising from the existence of computerized environment.
3.6 Risks associated with IT service delivery.

Concrete analysis
I. Information Systems Audit
- Application domain
- Reference documents applicable to the audit IS / IT.
- General objectives and specific audit objectives IT / IS
- Evaluation Criteria generic
- Determining the nature and extent of audit procedures
- Review of IT controls in financial audits
II. Steps audit systems
- Planning the audit.
- Conduct audit.
- Develop audit report of findings and recorded.
- Review of audit systems.

III. Evaluation of financial and accounting information systems.
- Background information on system IT / IS the audited entity.
- General IT controls.
- Assessment of the application and risk assessment.

IV. The procedural framework for evaluating systems.
- Background information on the IT systems of the audited entity.
- Environmental assessment of IT controls - general IT controls.
- Analysis of application controls and risk assessment.

V. Checklists, models and questionnaires
VI. Legislation Information Society

TEACHING METHODS:
Lecture, conversation, exemplification.

LEARNING OUTCOMES:
After completing the course the student must possess:
- Basic audit systems;
- Know all aspects of management information systems;
- Properly define and full vulnerability of a system.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Written paper – interpretative essay – 50%; continuous assessment – 50%.

RECOMMENDED READING:
MATHEMATICAL MODELING OF ELECTRONIC ENGINEERING SYSTEMS
Course Code: SEIA 101
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Prof. Daniel Breaz, PhD
Laboratory tutor: Assis. Ioan-Lucian Popa, PhD
Full time studies

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COURSE AIMS:
Using methods of modeling, simulation, identification and analysis processes, computer aided design techniques. Application development and implementation of algorithms and management structures automatic electronic systems modeling.
Work with mathematical fundamentals, engineering:
- use of theories to explain the structures and specific tools and mainframe systems
- theoretical substantiation features designed systems

ENTRY REQUIREMENTS:

COURSE CONTENTS:
1. Elements of applied mathematics in systems theory. Basic elements of operational calculation, Fourier transformation.
2. Systems Theory and Automatic Control
4. Mathematical modeling. Transfer functions
5. Analysis of linear systems. Stationary errors. Systems of higher order than 2
6. Stability of continuous linear systems
7. Stability in frequency domain.
8. Sampling Systems
9. Numerical control systems

TEACHING METHODS:
Lecture, discussion, exemplification.

LEARNING OUTCOMES:
In order to obtain credits for this discipline, the students have to:
- Use applications fundamental concepts of analysis and synthesis of linear systems
- Use some methods of designing control systems
- development of software

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Final evaluation – 50%; Laboratory activities – 50%.

RECOMMENDED READING:
- Dorf, R.C., Bishop, R.H., Modern Control Systems, Pearson – Prentice Hall, Tenth Ed., 2005
COURSE AIMS:
- Objectives of the course refers to the technical knowledge concerning the configuring, commissioning and operation of modern drive systems with small and medium power.
- The course focuses especially on the adjustable drives from the technological side in a modern plant.

ENTRY REQUIREMENTS:
Programming the numerical automatic systems and integrated electronic systems

COURSE CONTENTS:
- I. Advanced drive systems - 4:00h (structures and concepts, Technical data, information and energy, Control loops).
- II. Electric micromotors - 4:00h (Electrical DC and AC single phase Machines; Brushed and brushless Motors; Hydraulic and pneumatic actuators)
- III. Structure of advanced drive - 4h (Components of the control scheme; Components of signaling and protection scheme, Components of the power scheme; Diagnosis and repair of critical driving system)
- IV. Common types of engines -4h (synchronous and asynchronous Motors; Linear motors and high torque motors; Compact high speed asynchronous / synchronous engines; Integrated brushless motors and gears)
- V. Compact Electrical Drives– 4h (Technical and functional characteristics; Environment configuration and design; Aspects of safety and reliability in operation)
- VI. Programming environment of flexible electrical drives - 4h (IndraWork - tool for design, programming and commissioning; Interfaces for the development of other industrial applications)
- VII. Industry specific standard concerning the modern drives – 4h (Flexible interface Open Core; Modern drive testing; Specific technical prescriptions)

TEACHING METHODS:
Technical presentation and meeting with experimental exemplification.

LEARNING OUTCOMES:
- understand electrical drives issues in international terminology;
- know advanced topologies for linear and rotary drive;
- know the modern concepts for modeling and simulation;
- configure and debug advanced electric smart drive.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
theoretical – 60%; experimental – 40%.

RECOMMENDED READING:
- Ghe. Andronescu Comenzi numerice in actionari electrice EdMatrixRom Buc. 2015
- C. Ilas, V. Bostan Utilizarea prosesoarelor DSP in comanda numerica a motoarelor asincrone Ed.MatrixRom Buc. 2015
- R. Beloiu Actionari electrice cu logica cablata. Pornirea motoarelor asincrone trifazate, Bucuresti 2015
POWER ELECTRONIC MODULES
Course Code: SEIA 105_2
Type of course: optional
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Adrian Tulbure, Prof.PhD
Seminar tutor: Adrian Tulbure, Prof.PhD
Full time studies

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COURSE AIMS:
Objectives of the course refers to the technical knowledge on the interface between power grid and electrical motor. These circuits are part of modern small and smart electric drive systems. The course focuses on the operating power circuits from the technological chain in a modern plant.

ENTRY REQUIREMENTS:
Embedded programming and power electronics

COURSE CONTENTS:
- I. Modern systems for electricity conversion (Structures and concepts of the converters, Technical characteristics of power modules, Energy consumption, Application areas)
- II. Power modules from open loop ac-ac converters (Power and control dedicated circuits, Open loop power converter architecture, The u / f operating mode, Design aspects, Selection and commissioning)
- III. Power modules from closed loop ac-ac converters (Power and control circuits, Closed loop power converter architecture, The SVC (sensorless) and FIRE (sensor) operating mode, Design aspects, Selection and commissioning)
- IV. Power modules from dc-ac converters (Inverters architecture, Operation and programming procedure, Design aspects, Selection and commissioning)
- V. Intelligent power modules IPM (Technical and functional characteristics, Configuration and design environment; Safety and reliability in operation)
- VI. Accessories for power converters (Control panels, Connections and communication ports, Active and passive filters, Braking and dispersal resistors)
- VII. Programming environments of converters (IndraWork Platform Engineering, IndraWork Operation Platform, Open core flexible interface, Industrial Standards specific to modern electrical drives)

TEACHING METHODS:
Technical presentation and experimental meeting.

LEARNING OUTCOMES:
- Understand international terminology in the field of power electronics;
- Know relevant power electronics and control topologies for industrial use,
- Know the modern concepts of modeling-simulation with self-developed or imported models.

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
Theoretical – 60%; experimental – 40%.

RECOMMENDED READING:
TECHNICAL REQUIREMENTS AND STANDARDS FOR INDUSTRIAL UNS

Course Code: SEIA 205
Type of course: compulsory
Language of instruction: English tutoring available for Erasmus students
Name of lecturer: Adrian Tulbure, Prof.PhD
Seminar tutor: Manuela Kadar, Assoc.Prof.PhD
Full time studies

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COURSE AIMS:
- The course begins with synthesis, presentation and description of specific rules and standards for industrial companies.
- Documents presented focuses primarily on computerization and automation of the production technologies.
- The second goal is to integrate intelligent plant, characterized by adaptability, efficiency and enhanced ergonomics, into the adding value process and business development.

ENTRY REQUIREMENTS:
Technical drawing and advanced diagnostic and control systems

COURSE CONTENTS:
- I. The stages of industrial development (industrial revolution, modern factory fractal / virtual, integration of suppliers, staff and beneficiary in the future plant)
- II. Industry 4.0 concept (Industry 4.0 Structure and elements - as components of Smart Factory (SF)
- III. Industry 4.0 Structure and features (modern human-machine interfaces, physical system-component base networks, Identification and repair of critical manufacturing system)
- IV. SR EN ISO 50001: 2011 audit procedure (Particular requirements and overall system power management, Energy Policy and Planning (analysis, reference level, absolute and specific indicators of energy performance, energy targets, Action plans of efficient energy management)
- V. Implementation and operation ISO 50001 (Communication, control and documentation of energy-intensive processes, Design, monitoring and evaluation of compliance with legal requirements, Conformities, corrective and preventive action)
- VI. Standard CISPR 25 (special radio disturbance) in modern plants (Experimental methods and statistical procedures for assessment the electromagnetic radiation in closed blocks, perturbations generated by industrial environments: energy distribution networks, computer networks, production flows, heat engines)
- VII. Electromagnetic compatibility systems (ITC wired installations, Compatibility of fixed and mobile installations, Classical and specific measurement procedures)
- VIII. ISO / TS 16949 automotive industry specific (Certification System IATF (International Automotive Task Force) Management of the production chain, Product manufacturing, testing, analysis and process improvement measures)
- IX. ISO 11354-1: 2011, specific advanced automation technologies and applications - requirements to achieve interoperability at all levels undertaking structural and ISO 14258: 1998 Industrial Automation Systems
- XI. Reassessment topics discussed themes and setting. Clarification of critical points. Future developments of standardization.

TEACHING METHODS:
Technical presentation and meeting with experimental exemplification.

LEARNING OUTCOMES:
- Knowledge of the used techniques in internal and external technical audits
- Understanding the connection between market and enterprise models
- Knowledge of the principles of efficiency and flexible production process

LEARNING OUTCOMES VERIFICATION AND ASSESSMENT CRITERIA:
theoretical – 60%; experimental – 40%.
RECOMMENDED READING:

- ISO 11354-1:2011 Advanced automation technologies and their applications -- Requirements for establishing manufacturing enterprise process interoperability
- http: www.iso.org/iso/catalogue_detail.htm?csnumber=50417