The main language of instruction at Coimbra Institute of Engineering is Portuguese. However, some courses from degree and master degree can be offered in English and/or with a tutorial support in English.

The ECTS catalogue includes subject contents in English Language. Students can choose subjects from this Catalogue to the study plan proposal (Learning Agreement) to be analyzed carefully by the Departmental Coordinators and to be adjusted, after student’s arrival, if necessary.

This ECTS catalogue contains information which is valid for this academic year. ISEC reserves the right to adjust the courses offered during the academic year and is not responsible for typings errors or printing mistakes.

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ednativi@isec.pt
# Code 6091550 – Bachelor Sustainable City Management Course

<table>
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<tr>
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# Course Unit

**GEOMATICS**

## Specialization(s)

---

## Subject type

**Research Area**

Interdisciplinary

## Year

1st

## Semester

2nd

## ECTS

5

### Working Hours

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### Total of Working Hours

130

## Lecturer

### Activity Type

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### Responsible(s) Lecturer(s)

Maria Margarida Coelho e Silva

## Goals

- Learn and apply concepts related to acquisition, management, analysis and representation of geospatial information.
- Learn basic concepts of cartography, geodesy, topographic support and global satellite navigation systems.
- Understand and apply geography information systems technology.

## Skills

Understand the theoretical and practical concepts of cartography and topography to acquire, edit, interpret and analyse spatial information. Use of computerised resources for geographic information.
Program Contents

1- Cartography and geodesy concepts

2- Positioning techniques
2.2 Positioning systems and satellite navigation. GPS system applications.
2.3 Brief concepts of satellite imaging and aerial photography.

3- Geographic Information Systems
Data editing and coordinate conversion between different spatial referencing systems. Spatial data models: vector model and raster model. Maps creation. Introduction to spatial analysis.

Bibliography

- BOLSTAD, Paul, (2003), "GIS fundamentals: a first text on Geographic Information Systems"
- Gonçalves, José A.; Madeira, Sérgio; Sousa, J. João, (2008), "Topografia Conceitos e Aplicações", Lidel
- MATOS, João Luís de (2001), "Fundamentos de informação geográfica", Lidel,
- Paul A. Longley. [et al.] (2001), "Geographic information systems and science" John Wiley & Sons, Ltd

Evaluation Method

50% Exam + 50% Practical work

Date
21.01.2019

Signature from the lecturer responsible for the course

[Signature]
Course Unit: STRENGTH OF MATERIALS
Specialization(s): STRUCTURAL MECHANICS

Subject type: Engineering Sciences
Research Area: Civil Engineering

Year: 1st Semester: 2nd
ECTS: 5

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Total of Working Hours: 130

Lecturer

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<td>Hugo Sérgio Sousa Costa</td>
<td>PhD</td>
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<td>Victor José Dias de Almeida Magalhães</td>
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Responsible(s) Lecturer(s): Hugo Sérgio Sousa Costa

Goals

To learn the theoretical-practical and technological bases, for the understanding: of the fundamentals of the mechanical behavior of deformable solids, interpreting the stress and deformation states, resulting from the internal forces; design and execution of new structures and reinforcement of existing ones, knowing the fundamental concepts design and safety.

Skills

Generic skills: capacity for apprehension, analysis and synthesis; ability to solve problems and apply knowledge and adapt to new situations; ability to carry out autonomous and group work and learning autonomy; ability to predict and perform judgments and discuss technological issues; development of the critical sense.

Specific competences: to know the theoretical-practical and technological bases, related to the design and execution of structures of several materials; to know the cause-effect relation for the understanding of the state of the internal stresses in the structural elements, caused by the actions and forces; acquire knowledge to understand the design criteria and to prevent, recognize, diagnose and intervene in structural pathologies.
Program Contents

1. Basic principles and notions:
   - Sustainable vs. traditional structural materials.
   - Notions of stress and principle of equivalence.
   - Concepts and mechanical properties of materials: linear elasticity, constitutive law, mechanical strengths, shrinkage, creep, thermal dimensional variation.
   - Concept of security and design criteria.

2. Normal stresses
   - Tension and compression of linear parts; stresses and deformations; thermal effects; concepts and applications.
   - Linear elastic bending, deviated and combined bending, bending in hybrid elements, made of different materials; normal stresses and deformations.
   - Instantaneous and time dependent flexural deformation in statically determined structures/elements.

3. Shear stresses
   - Direct shear into joints.
   - Shear force; slip force and shear stresses by shear force; stress distribution in several sections;
   - Uniform torsion; torsional stresses and deformations; stress distribution in several sections.

4. Instability
   - Notion of instability and main parameters.
   - Buckling of compressed elements.
   - Instability by lateral bending-torsion.

Bibliography


Access Conditions and Attendance Excuse

Not applicable

Conditions for Exam Admission

Not applicable

Evaluation Method

Teaching methodologies: Exposition of concepts with incentive to student participation, in debate, in the exemplification of the themes and in the technological identification of the phenomena / problems that cause pathologies or failures, focusing on their physical interpretation and on the technological details of behavior; students will solve problems individually or in groups; experimental demonstration of concepts in the laboratory; performing group work, by research or laboratory experiences, focused on sustainable materials and solutions, complemented with the respective presentation and discussion in class; in the different approaches and methodologies, it will be explored autonomous and team learning skills, development of research and writing skills, communication skills and critical argumentation.
Assessment: Final written exam (normal, resource and special seasons), quoted for 14 values, and; the accomplishment of a group work (research and / or experimental), which includes the development, presentation and discussion, quoted for 6 values. The approval requires that the student obtain a minimum of 9.5 values (in 20 values) in the total of the two components.

Conditions for Results Improvement

In accordance with the general rules

Date

21/01/2019

Signature from the lecturer responsible for the course
Program Contents

Course Unit: SOILS AND ROCKS

Specialization(s):

Subject type: Research Area

Civil Engineering

Year: 1st Semester: 2nd ECTS

Working Hours

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Total of Working Hours: 130

Licenciatura – BSc in Sustainable City Management

Instituto Superior de Engenharia de Coimbra

www.isec.pt

Goals

To know theoretical and practical concepts in geotechnics and main methods of in situ investigations and using them to solve problems on structures and geotechnical works.

Skills

Generic skills: ability for acquisition and application of knowledge and for solving problems; ability for self-learning and for working in team.

Specific skills: knowledge of different types of rocks and soils, to carry out basic soil tests.

Program Contents


Bibliography


Access Conditions and Attendance Excuse

Conditions for Exam Admission

Evaluation Method

Performance of three tests or final exam. Performance of research assignment and laboratory tests. Continuous assessment consisting of three written tests: maximum total rating of 20 points; the final test will be held on the day and time of the final exam of the normal season. Evaluation through final exams: maximum total of 20 rating points. Research assignment: mandatory; oral presentation and defense; maximum rating of 4 points. Laboratory tests: mandatory; maximum rating of 1 point. Final grade:
- Grade of the exam or the tests when less than 10 points;
- Sum of 75% of the exam or the tests grade with the grades of the research assignment and the laboratory tests.

Conditions for Results Improvement

Date

21.01.2019

Signature from the lecturer responsible for the course

[Signature]
Course Unit: MECHANICS OF STRUCTURES

Specialization(s): STRUCTURAL MECHANIC AND STRUCTURES

Subject type: Research Area

Civil Engineering

Year: 1º Semester: 2º ECTS: 5.0

Working Hours: Unaccompanied Working Hours

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Total of Working Hours: 130

Lecturer

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Goals

Revision and knowledge of basis about the constitution of a structure, basis of design and safety checking and structural reliability. To know the structural basis of structural design and the way of the loads, their effects of such internal forces and displacements and deformations; Physical and experimental understanding the concepts of rigidity and flexibility.

Information of structural calculation methods and concepts for creating and evaluating structural models (simple programs, calculation models, testing).

Skills

Generic skills: Application of knowledge to solve practical problems and increase the understanding of the construction in urban spaces; improve the capacity to make decisions; increase the capacity to communicate and discuss structural problems; develop the ability of selflearning.

Specific skills: Provide to the students the bases of structural analysis; understand the basis for design and rehabilitate structures.

Program Contents

1. Introduction: Principles of conception, design and structural analysis. Checking the safety and reliability of structures.

Creation and evaluation of structural models by models and educational models.

2. Basis for calculations: Understanding of the behaviour of structures and the concept practice of rigidity and flexibility.

Basis of evaluation of effects (efforts, diagrams and displacements).

3. Research on structural design: collection of examples of structural works, construction materials and structural systems (concrete, steel, mild steel, wood, acrylic, glass, aluminum, etc.). Interpretation by design of models and evaluation of behavior. Visit the works and built for recognition of concepts and preview of damage effects in practical cases.

4. Freeware programs for the automatic desing (Ftool) and for the creation of models of structures (Sketchup) and viewing examples with professional programs.
Bibliography
- Research sites in the area of sustainability, recycling and construction
- Notes prepared by teachers and others, in consultation with web and Moodle.

Access Conditions and Attendance Excuse
Not applicable

Conditions for Exam Admission
Students may perform tests of discipline, if they are properly registered on academic services, and with the name registered on the sheet of classifications.

Evaluation Method
In the classes the exposition method is used to present the theoretical and practical subjects. During the presentation, the students will be surveyed to maintain an active participation in the class. The students will be encouraged to understand the scientific-technical practical problems, and will be encouraged to solve exercises in group and individually. Also, there will be sessions to clarify doubts either in resolution of exercises or in the interpretation of theoretical subjects.

The evaluation of students will be made by the written exam (AEE) to perform on the defined institutional dates and the presentation of individual work of personal study and research about contents (TEP). The student can suggest work or evidence of extra evaluation with work of training and informative topics (TIP), according to indication and teaching instruction (realization and test of scale model of structures with descriptive poster presentation or documents with resolution of problems). It is also considered the frequency of attendance at lessons (AFA).
- Work of Personal Study (TEP): Written documents with work realized, presentation and discussion. The work must be performed individually or in groups (maximum of 3 students). The classification will have the maximum of 5 values.
- Work of training and informative topics (TIP): (optional) Produce a practice works (scale model of structures with descriptive poster presentation or documents with resolution of problems), and presentation and exhibition of their experimental work. The classification will have the maximum of 5 values.
- Evaluation by attendance at lessons (AFA): This classification will have the maximum of 1 value, being defined and weighted according to the number of lesson.
- Evaluation by written exam (AEE): in the date to perform on the defined institutional maps of exams. If the student chooses not to wish to account for any frequency evaluation component, the written exam will be quoted for 20 values. The approval requires obtaining at least 9.5 values of 20 values defined by total obtained in each components (AEE+AFA+TEP+TIP)

Conditions for Results Improvement
It is expected to carry out special character evaluations of students with request additional test or special tests. This exams can be defined by indication of the academic services. The teacher may suggest that these tests are in the form of written exam, oral exam or for presentation and defense of works that can be done.

Date
20 de janeiro 2019

Signature from the lecturer responsible for the course

[Signature]
Licenciatura em Gestão Sustentável das Cidades
Ano Lectivo 2018/2019

Ficha de Unidade Curricular

Unidade Curricular

ECONOMIA

Ramo(s)

Área Científica Eng. e Gestão Industrial

Natureza Curricular

Obrigatória

Ano 1º Semestre 2º ECTS 5.0

Horas de Contacto

Tipo de Actividade Horas Semanais Total de Horas Horas de Trabalho não Acompanhado Tipo de Actividade Total de Horas

Teórico 2 28 Estudo 46,5

Teórico-Prático 2 28 Trabalhos / Trabalhos de Grupo 24

Prático / Laboratorial Orientação Tutória

Projecto

Total de Horas de Trabalho 56 Avaliação 3,5

Outra

74

Docentes

Tipo de Actividade Nome Habilitações Categoria

Teórico Ricardo Ferraz Pós-Doutoramento Mestrado/Especialista Professor Adjunto

Teórico-Prático Ivan Simões

Prático e Laboratorial

Orientação Tutória

Projecto

Docente Responsável

Ricardo Ferraz

Objectivos

• Transmitir um conjunto de informação fulcral no campo da Economia. Mais concretamente, pretende-se que os discentes:

• Desenvolvam conhecimentos e capacidades na área da Economia mediante a compreensão dos seus princípios fundamentais;

• Apliquem os conceitos teóricos de Economia ao mundo real, criando a capacidade de analisar do ponto de vista da ciência económica problemas reais;

• Consigam ter a capacidade para resolver problemas concretos, não só enquanto consumidores, mas também na óptica do produtor/vendedor;

• Adquiram conhecimentos suficientes para participar em debates em torno da ciência económica conseguindo sustentar e fundamentar as suas próprias posições;

• Possam conhecer a realidade das economias portuguesa e mundial através da análise a um conjunto de indicadores;

• Compreendam a importância das actividades económicas no contexto das cidades;

• Desenvolvam um pouco o seu lado criativo e empreendedor.
Competências

• Os estudantes aprenderão a:
  • Conhecer a Ciência Económica e os seus postulados;
  • Compreender as decisões racionais dos consumidores e dos produtores;
  • Conhecer e diferenciar os vários tipos de mercado;
  • Interpretar as actividades do Estado;
  • Conhecer a realidade da economia portuguesa e a evolução da economia mundial;
  • Compreender a importância dos conceitos de economia urbana e de economia circular;
  • Capacidade para analisar um conjunto de indicadores económicos fundamentais;
  • Capacidade para interpretar textos simples de economia e de entender a linguagem económica e de participar em debates.

Conteúdos Programáticos

o Introdução à ciência económica;
o O problema económico e as suas soluções;
o A cruz marshalliana (procura e oferta)
o Teorias do consumidor e do produtor
do Teoria do comércio internacional
o As principais formas de mercado
o A Actividade económica
o A importância empreendedorismo para a actividade económica
o Os conceitos de economia urbana e economia circular
o A evolução do papel económico do Estado.
o Breves noções de política económica.
o As funções e as características da moeda.

Para além de uma abordagem de carácter mais teórico serão também realizados exercícios práticos de Economia e discutidos textos na sala de aula, bem como, um seminário com um orador convidado.

Bibliografia

• "Princípios de Economia Política". J. C. das Neves, Verbo, 2011.
• "Introdução à Política Económica". J. Généreux, 1995.
• "Economia Urbana". A. Vale e Vasconcellos. RES, 1984
Condições de Obtenção e Dispensa de Frequência
As previstas na legislação em vigor. Aconselha-se os alunos a acompanharem sistematicamente as aulas, como condição indispensável ao aproveitamento escolar e à correta compreensão das matérias.

Condições de Acesso a Exame
Nos termos da regulamentação vigente na instituição.
Metodologia de Avaliação

Opção 1 - Regime Geral de Avaliação:

Consiste em realizar na íntegra o exame final:

Nota Final = Nota do Exame.

Ou

Opção 2 - Regime de Avaliação Contínua*:

Consiste na realização de trabalhos individuais e na realização de aulas uma parte do exame final. A nota final será assim calculada:

Nota final = 0,4 x (nota dos trabalhos individuais) + 0,6 x (Nota do exame).

* O Regime de Avaliação Contínua exige o cumprimento das seguintes regras:

- Exige-se uma assiduidade mínima de 70% nas aulas práticas;
- Exige-se uma nota mínima de 7,0 valores no exame (em 20 valores). Caso a nota mínima de 7,0 valores não seja atingida, então a nota final do aluno corresponderá apenas à nota obtida no exame;
- Os trabalhos individuais consistem em apresentações nas aulas sobre textos de economia e na elaboração de um relatório sobre uma conferência (último deverá ser entregue, no limite, até às últimas aulas);
- Os trabalhos individuais sobre textos de economia serão apresentados, analisados e comentados nas próprias aulas. As notas dos trabalhos individuais sobre textos serão iguais a 0,0 valores em caso de falta do aluno;

Condições de Melhoria de Classificação

As previstas na legislação em vigor.

Data
21-01-2019

Assinatura do Docente Responsável pela Unidade Curricular
Licenciatura – Bsc  Gestão Sustentável das Cidades
Licenciatura – Bsc  Sustainable City Management

Academic Year: 2018/2019

Program Contents

Course Unit  APPLIED MATHEMATICS II (915507)
Specialization (s)  COMMON FORMATION

Subject type  Mathematics  Research Area  Basic Sciences

Year られる Semester 2

Working Hours
Activity Type  Working Hours Per Week  Total Hours
Theoretical Lectures  3.5  49
Theoretical-Practical Lectures
Practical-Laboratory Lectures
Tutorial Orientation
Project

Unaccompanied Working Hours
Activity Type  Total Hours
Study  77.5
Works / Group Works
Project
Evaluation
Additional  2.5

Total of Working Hours  130

Lecturer
Activity Type  Name  Qualifications  Category
Theoretical Lectures
Theoretical-Practical Lectures
Practical-Laboratory Lectures
Tutorial Orientation
Project
João Ricardo de Oliveira Branco  PHD  Adj. Professor

Responsibles Lecturer(s)  João Ricardo de Oliveira Branco

Goals
- Develop ability to define and analyze mathematical problems, choose the most effective solving methods, interpret and analyze results.
- Provide basic knowledge of Linear Algebra.
- Identify, understand and solve problems involving matrix calculus.
- Perform basic concepts or theory of errors.
- Apply concepts related to the numerical resolution of linear systems, nonlinear equations, polynomial interpolation and definite integrals.
- Understand the limitations of analytical techniques and develop the capacity to use numerical methods.

Skills
- Identify and solve problems involving linear systems and matrix calculus.
- Identify and use numerical methods to solve mathematical problems involving linear systems, nonlinear equations, interpolation and integration.
- Use mathematical software to interpret and solve problems.
Program Contents

1. Matrices.
   - Definitions.
   - Operations and properties.
2. Systems of linear equations.
   - Definitions.
   - Operations with matrices and properties: matrices condensation and characteristic.
   - Classification and resolution of systems of linear equations:
     i) Direct methods: Gauss elimination;
     ii) Iterative methods: Jacobi and Gauss-Seidel.
   - Applications.
3. Theory of errors (brief remarks).
   - Introduction.
   - Definitions.
4. Roots of nonlinear equations.
   - Introduction.
   - Location of roots: graphical method and Bolzano’s theorem.
   - Bisection and Newton’s methods: iterative rules, error and stopping criteria.
   - Computational aspects.
   - Applications.
5. Polynomial interpolation.
   - Introduction.
   - Uniqueness of the interpolating polynomial.
   - Interpolating polynomial using Lagrange and Newton’s forms.
   - Interpolation error.
   - Computational aspects.
   - Applications.
   - Introduction.
   - Trapezoidal and Simpson’s rules.
   - Numerical integration error.
   - Computational implementation using Matlab.

Bibliography
- Anton, H., Elementary Linear Algebra, John Willey & Sons, Inc, 2000;
- Branco, J. R., Matemática Aplicada I e I I - Folhas de exercícios, Licenciatura em Gestão Sustentável das Cidades, ISEC, 2018/2019;
- Branco, J. R., Métodos Numéricos - Tutoriais para Matlab, ISEC, 2018/2019;
- Fidalgo, C., Álgebra Linear, Instituto Superior de Engenharia de Coimbra;
- Graham, A., Matrix Theory and Applications for Engineers, Ellis Horwood Limited, 1979;
- James, G., Modern Engineering Mathematics, Prentice Hall, 2000;
- Nicholson, W., Elementary Linear Algebra with Applications, PWS Publishing Company, 1986;
- Rodrigues, J. A., Métodos Numéricos - Introdução, Aplicação e Programação, Edições Sílabo, 1ª edição, 2003;
- Santos, F. M., Fundamentos de Análise Numérica, Edições Sílabo, 1ª edição, 2002.

Access Conditions and Attendance Excuse
Not applicable.

Conditions for Exam Admission
Any student enrolled at this curricular unit has access to an examination.

Evaluation Method
Evaluation can be done during the semester (distributed assessment) or by exam. The option for distributed assessment has to be done until regular season exam. Any student enrolled at this curricular unit can take the appeal season exam.

i) The result of distributed assessment will be given by the summation of the results of two tests. Test 1 will evaluate the subjects related to chapters 1 and 2 and will be quoted for 8 values. Test 2 will evaluate the subjects related to chapters 3 to 6 and will be quoted for 12 values. Student will be approved if final result, rounded, is greater or equal than 10 values (out of 20) and the result of each test is greater or equal than 40%.The test results will only be available after the student opts for this evaluation method.

ii) On evaluation by exam, student will be approved if result, rounded, is greater or equal than 10 values (out of 20).

Conditions for Results Improvement
According to “REACTA - Regulamento de Avaliação de Conhecimentos e Transição de Ano dos Estudantes das Licenciaturas do Instituto Superior de Engenharia de Coimbra”.

Date
2019/01/21

Signature from the lecturer responsible for the course
**Course Unit**  
GEOMATICS

**Specialization(s)**

**Subject type**  
Research Area

**Year**  
1st

**Semester**  
2nd

**Interdisciplinary**

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**Total of Working Hours**  
130

**Lecturer**

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<td>Alexandra Maria Galvão Ribeiro a</td>
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**Responsible(s) Lecturer(s)**  
Maria Margarida Coelho e Silva

**Goals**
- Learn and apply concepts related to acquisition, management, analysis and representation of geospatial information.
- Learn basic concepts of cartography, geodesy, topographic support and global satellite navigation systems.
- Understand and apply geography information systems technology.

**Skills**
Understand the theoretical and practical concepts of cartography and topography to acquire, edit, interpret and analyse spatial information. Use of computerised resources for geographic information.
Program Contents

1- Cartography and geodesy concepts

2- Positioning techniques
2.2 Positioning systems and satellite navigation. GPS system applications.
2.3 Brief concepts of satellite imaging and aerial photography.

3- Geographic Information Systems
Data editing and coordinate conversion between different spatial referencing systems. Spatial data models: vector model and raster model. Maps creation. Introduction to spatial analysis.

Bibliography

- Gonçalves, José A.; Madeira, Sérgio; Sousa, J. João, (2008), “Topografia Conceitos e Aplicações”, Lidel
- MATOS, João Luís de (2001), “Fundamentos de informação geográfica”, Lidel,

Evaluation Method

50% Exam + 50% Practical work

Date
21.01.2019

Signature from the lecturer responsible for the course

[Signature]

Marjanide Coelho e Silva
Course Unit: STRENGTH OF MATERIALS
Specialization(s): STRUCTURAL MECHANICS

Subject type: Engineering Sciences  
Research Area: Civil Engineering

Year: 1st  
Semester: 2nd  
ECTS: 5

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Total of Working Hours: 130

Lecturer

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<td>Victor José Dias de Almeida Magalhães</td>
<td>MSc</td>
<td>Assistant Prof.</td>
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Responsible(s) Lecturer (s): Hugo Sérgio Sousa Costa

Goals

To learn the theoretical-practical and technological bases, for the understanding: of the fundamentals of the mechanical behavior of deformable solids, interpreting the stress and deformation states, resulting from the internal forces; design and execution of new structures and reinforcement of existing ones, knowing the fundamental concepts design and safety.

Skills

Generic skills: capacity for apprehension, analysis and synthesis; ability to solve problems and apply knowledge and adapt to new situations; ability to carry out autonomous and group work and learning autonomy; ability to predict and perform judgments and discuss technological issues; development of the critical sense.

Specific competences: to know the theoretical-practical and technological bases, related to the design and execution of structures of several materials; to know the cause-effect relation for the understanding of the state of the internal stresses in the structural elements, caused by the actions and forces; acquire knowledge to understand the design criteria and to prevent, recognize, diagnose and intervene in structural pathologies.
Program Contents

1. Basic principles and notions:
   - Sustainable vs. traditional structural materials.
   - Notions of stress and principle of equivalence.
   - Concepts and mechanical properties of materials: linear elasticity, constitutive law, mechanical strengths, shrinkage, creep, thermal dimensional variation.
   - Concept of security and design criteria.

2. Normal stresses
   - Tension and compression of linear parts; stresses and deformations; thermal effects; concepts and applications.
   - Linear elastic bending, deviated and combined bending, bending in hybrid elements, made of different materials; normal stresses and deformations.
   - Instantaneous and time dependent flexural deformation in statically determined structures/elements.

3. Shear stresses
   - Direct shear into joints.
   - Shear force; slip force and shear stresses by shear force; stress distribution in several sections;
   - Uniform torsion; torsional stresses and deformations; stress distribution in several sections.

4. Instability.
   - Notion of instability and main parameters.
   - Buckling of compressed elements.
   - Instability by lateral bending-torsion.

Bibliography


Access Conditions and Attendance Excuse

Not applicable

Conditions for Exam Admission

Not applicable

Evaluation Method

Teaching methodologies: Exposition of concepts with incentive to student participation, in debate, in the exemplification of the themes and in the technological identification of the phenomena / problems that cause pathologies or failures, focusing on their physical interpretation and on the technological details of behavior; students will solve problems individually or in groups; experimental demonstration of concepts in the laboratory; performing group work, by research or laboratory experiences, focused on sustainable materials and solutions, complemented with the respective presentation and discussion in class; in the different approaches and methodologies, it will be explored autonomous and team learning skills, development of research and writing skills, communication skills and critical argumentation.

Assessment: Final written exam (normal, resource and special seasons), quoted for 14 values, and; the accomplishment of a group work (research and / or experimental), which includes the development, presentation and discussion, quoted for 6 values. The approval requires that the student obtain a minimum of 9.5 values (in 20 values) in the total of the two components.

Conditions for Results Improvement

In accordance with the general rules

Date

21/01/2019

Signature from the lecturer responsible for the course

[Signature]
Licenciatura – BSc in Sustainable City Management

Academic Year: 2018/2019

Program Contents

Course Unit: SOILS AND ROCKS

Specialization(s): Civil Engineering

Year: 1st Semester: 2nd

ECTS:

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Total of Working Hours: 130

Lecturer

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Responsible(s) Lecturer(s): Carlos Manuel da Cruz Moreira

Goals

To know theoretical and practical concepts in geotechnics and main methods of in situ investigations and using them to solve problems on structures and geotechnical works.

Skills

Generic skills: ability for acquisition and application of knowledge and for solving problems; ability for self-learning and for working in team.
Specific skills: knowledge of different types of rocks and soils, to carry out basic soil tests.

Program Contents


Bibliography


Access Conditions and Attendance Excuse

Conditions for Exam Admission

Evaluation Method

Performance of three tests or final exam. Performance of research assignment and laboratory tests. Continuous assessment consisting of three written tests: maximum total rating of 20 points; the final test will be held on the day and time of the final exam of the normal season. Evaluation through final exams: maximum total of 20 rating points. Research assignment: mandatory; oral presentation and defense; maximum rating of 4 points. Laboratory tests: mandatory; maximum rating of 1 point. Final grade:
- Grade of the exam or the tests when less than 10 points;
- Sum of 75% of the exam or the tests grade with the grades of the research assignment and the laboratory tests.

Conditions for Results Improvement

Date
21.01.2019

Signature from the lecturer responsible for the course

______________________________
Course Unit: MECHANICS OF STRUCTURES

Specialization(s): STRUCTURAL MECHANIC AND STRUCTURES

Subject type: Research Area

Type: Civil Engineering

Year: 1st Semester: 2nd

ECTS: 5.0

Working Hours

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Lecturer: João Paulo Martins Gouveia

Activity Type: Theoretical Lectures, Theoretical-Practical Lectures, Practical-Laboratory Lectures, Tutorial Orientation, Project

Goals

Revision and knowledge of basis about the constitution of a structure, basis of design and safety checking and structural reliability. To know the structural basis of structural design and the path of the loads, their effects of such internal forces and displacements and deformations; Physical and experimental understanding the concepts of rigidity and flexibility.

Information of structural calculation methods and concepts for creating and evaluating structural models (simple programs, calculation models, testing).

Skills

Generic skills: Application of knowledge to solve practical problems and increase the understanding of the construction in urban spaces; improve the capacity to make decisions; increase the capacity to communicate and discuss structural problems; develop the ability of selflearning.

Specific skills: Provide to the students the bases of structural analysis; understand the basis for design and rehabilitate structures.

Program Contents


2. Basis for calculations: Understanding of the behaviour of structures and the concept practice of rigidity and flexibility. Basis of evaluation of effects (efforts, diagrams and displacements).

3. Research on structural design: collection of examples of structural works, construction materials and structural systems (concrete, steel, mild steel, wood, acrylic, glass, aluminum, etc.). Interpretation by design of models and evaluation of behavior. Visit the works and built for recognition of concepts and preview of damage effects in practical cases.

4. Freeware programs for the automatic desing (Ftool) and for the creation of models of structures (Sketchup) and viewing examples with professional programs
Bibliography
- Research sites in the area of sustainability, recycling and construction
- Notes prepared by teachers and others, in consultation with web and Moodle.

Access Conditions and Attendance Excuse
Not applicable

Conditions for Exam Admission
Students may perform tests of discipline, if they are properly registered on academic services, and with the name registered on the sheet of classifications

Evaluation Method
In the classes the exposition method is used to present the theoretical and practical subjects. During the presentation, the students will be surveyed to maintain an active participation in the class. The students will be encouraged to understand the scientific-technical practical problems, and will be encouraged to solve exercises in group and individually. Also, there will be sessions to clarify doubts either in resolution of exercises or in the interpretation of theoretical subjects.

The evaluation of students will be made by the written exam (AEE) to perform on the defined institutional dates and the presentation of individual work of personal study and research about contents (TEP). The student can suggest work or evidence of extra evaluation with work of training and informative topics (TIP), according to indication and teaching instruction (realization and test of scale model of structures with descriptive poster presentation or documents with resolution of problems). It is also considered the frequency of attendance at lessons (AFA).

- Work of Personal Study (TEP): Written documents with work realized, presentation and discussion. The work must be performed individually or in groups (maximum of 3 students). The classification will have the maximum of 5 values.
- Work of training and informative topics (TIP): (optional) Produce a practice works (scale model of structures with descriptive poster presentation or documents with resolution of problems), and presentation and exhibition of their experimental work. The classification will have the maximum of 5 values.
- Evaluation by attendance at lessons (AFA): This classification will have the maximum of 1 value, being defined and weighted according to the number of lesson
- Evaluation by written exam (AEE): in the date to perform on the defined institutional maps of exams. If the student chooses not to wish to account for any frequency evaluation component, the written exam will be quoted for 20 values. The approval requires obtaining at least 9.5 values of 20 values defined by total obtained in each component (AEE+AFA+TEP+TIP)

Conditions for Results Improvement
It is expected to carry out special character evaluations of students with request additional test or special tests. This exams can be defined by indication of the academic services. The teacher may suggest that these tests are in the form of written exam, oral exam or for presentation and defense of works that can be done.

Date
20 de janeiro 2019

Signature from the lecturer responsible for the course
Ficha de Unidade Curricular

Unidade Curricular: ECONOMIA

Ramo(s): 
Área Científica: Eng. e Gestão Industrial

Natureza Curricular: Obrigatória

Ano: 1º Semestre: 2º

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Total de Horas de Trabalho: 56

Docentes

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</table>

Docente Responsável: Ricardo Ferraz

Objectivos

- Transmitir um conjunto de informação fulcral no campo da Economia. Mais concretamente, pretende-se que os discentes:
  - Desenvolvam conhecimentos e capacidades na área da Economia mediante a compreensão dos seus princípios fundamentais;
  - Apliquem os conceitos teóricos de Economia ao mundo real, criando a capacidade de analisar do ponto de vista da ciência económica problemas reais;
  - Consigam ter a capacidade para resolver problemas concretos, não só enquanto consumidores, mas também na óptica do produtor/vendedor;
  - Adquiram conhecimentos suficientes para participar em debates em torno da ciência económica conseguindo sustentar e fundamentar as suas próprias posições;
  - Possam conhecer a realidade das economias portuguesa e mundial através da análise a um conjunto de indicadores;
  - Compreendam a importância das actividades económicas no contexto das cidades;
  - Desenvolvam um pouco o seu lado criativo e empreendedor.
Competências

• Os estudantes aprenderão a:
  • Conhecer a Ciência Económica e os seus postulados;
  • Compreender as decisões racionais dos consumidores e dos produtores;
  • Conhecer e diferenciar os vários tipos de mercado;
  • Interpretar as actividades do Estado;
  • Conhecer a realidade da economia portuguesa e a evolução da economia mundial;
  • Compreender a importância dos conceitos de economia urbana e de economia circular;
  • Capacidade para analisar um conjunto de indicadores económicos fundamentais;
  • Capacidade para interpretar textos simples de economia e de entender a linguagem económica e de participar em debates.

Conteúdos Programáticos

o Introdução à ciência económica;
o O problema económico e as suas soluções;
o A cruz Marshalliana (procura e oferta)
o Teorias do consumidor e do produtor
o Teoria do comércio internacional
o As principais formas de mercado
o A Actividade económica
o A importância empreendedorismo para a actividade económica
o Os conceitos de economia urbana e economia circular
o A evolução do papel económico do Estado.
o Breves noções de política económica.
o As funções e as características da moeda.

Para além de uma abordagem de carácter mais teórico serão também realizados exercícios práticos de Economia e discutidos textos na sala de aula, bem como, um seminário com um orador convidado.

Bibliografia

• "Princípios de Economia Política". J. C. das Neves, Verbo, 2011.
• "Introdução à Política Económica". J. Généreux, 1995.
• "Economia Urbana". A. Vale e Vasconcellos. RES, 1984
• "Introdução à Economia". J.S. Andrade, Minerva, 1998.
• "Economia Circular como fator de resiliência e competitividade na região de Lisboa e Vale do Tejo". CCDRLVT, 2018.
• "Portal do Instituto Nacional de Estatística (INE)": https://www.ne.pt/
• "Gabinete de Estatísticas da União Europeia (Eurostat)”: http://ec.europa.eu/eurostat
• "Organisation for Economic Co-Operation and Development (OECD) stat": http://stats.oecd.org/
• "Banco de Portugal” Estatísticas: https://www.bportugal.pt/page/estatisticas.
• "Pordata (Base de dados – Fundação Francisco Manuel dos Santos)”: https://www.pordata.pt/

Condições de Obtenção e Dispensa de Frequência
As previstas na legislação em vigor. Aconselha-se os alunos a acompanhamem sistematicamente as aulas, como condição indispensável ao aproveitamento escolar e à correta compreensão das matérias.

Condições de Acesso a Exame
Nos termos da regulamentação vigente na instituição.
Metodologia de Avaliação

Opção 1 - Regime Geral de Avaliação:

Consiste em realizar na íntegra o exame final:

Nota Final = Nota do Exame.

Ou

Opção 2 - Regime de Avaliação Contínua*:

Consiste na realização de trabalhos individuais e na realização de aulas uma parte do exame final. A nota final será assim calculada:

Nota final = 0,4 x (nota dos trabalhos individuais) + 0,6 x (Nota do exame).

* O Regime de Avaliação Contínua exige o cumprimento das seguintes regras:

- Exige-se uma assiduidade mínima de 70% nas aulas práticas;
- Exige-se uma nota mínima de 7,0 valores no exame (em 20 valores). Caso a nota mínima de 7,0 valores não seja atingida, então a nota final do aluno corresponderá apenas à nota obtida no exame;
- Os trabalhos individuais consistem em apresentações nas aulas sobre textos de economia e na elaboração de um relatório sobre uma conferência (último deverá ser entregue, no limite, até à última aula);
- Os trabalhos individuais sobre textos de economia serão apresentados, analisados e comentados nas próprias aulas. As notas dos trabalhos individuais sobre textos serão igual a 0,0 valores em caso de falta do aluno;

Condições de Melhoria de Classificação

As previstas na legislação em vigor.

Data
21-01-2019

Assinatura do Docente Responsável pela Unidade Curricular
**Course Unit**  
APPLIED MATHEMATICS II (915507)

**Specialization(s)**  
COMMON FORMATION

**Subject type**  
Mathematics

**Research Area**  
Basic Sciences

**Year**  
1º

**Semester**  
2º

**ECTS**  
5

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**Total of Working Hours**  
130

**Lecturer**

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**Goals**

- Develop ability to define and analyze mathematical problems, choose the most effective solving methods, interpret and analyze results.
- Provide basic knowledge of Linear Algebra.
- Identify, understand and solve problems involving matrix calculus.
- Perform basic concepts or theory of errors.
- Apply concepts related to the numerical resolution of linear systems, nonlinear equations, polynomial interpolation and definite integrals.
- Understand the limitations of analytical techniques and develop the capacity to use numerical methods.

**Skills**

- Identify and solve problems involving linear systems and matrix calculus.
- Identify and use numerical methods to solve mathematical problems involving linear systems, nonlinear equations, interpolation and integration.
- Use mathematical software to interpret and solve problems.
Program Contents

1. Matrices.
   - Definitions.
   - Operations and properties.
2. Systems of linear equations.
   - Definitions.
   - Operations with matrices and properties: matrices condensation and characteristic.
   - Classification and resolution of systems of linear equations:
     i) Direct methods: Gauss elimination;
     ii) Iterative methods: Jacobi and Gauss-Seidel.
   - Applications.
3. Theory of errors (brief remarks).
   - Introduction.
   - Definitions.
4. Roots of nonlinear equations.
   - Introduction.
   - Location of roots: graphical method and Bolzano’s theorem.
   - Bisection and Newton’s methods: iterative rules, error and stopping criteria.
   - Computational aspects.
   - Applications.
5. Polynomial interpolation.
   - Introduction.
   - Uniqueness of the interpolating polynomial.
   - Interpolating polynomial using Lagrange and Newton’s forms.
   - Interpolation error.
   - Computational aspects.
   - Applications.
   - Introduction.
   - Trapezoidal and Simpson’s rules.
   - Numerical integration error.
   - Computational implementation using Matlab.

Bibliography
- Branco, J. R., Matemática Aplicada II - Folhas de exercícios, Licenciatura em Gestão Sustentável das Cidades, ISEC, 2018/2019;
- Branco, J. R., Métodos Numéricos - Tutoriais para Matlab, ISEC, 2018/2019;
- Fidalgo, C., Álgebra Linear, Instituto Superior de Engenharia de Coimbra;
- Graham, A., Matrix Theory and Applications for Engineers, Ellis Horwood Limited, 1979;
- James, G., Modern Engineering Mathematics, Prentice Hall, 2000;
- Nicholson, W., Elementary Linear Algebra with Applications, PWS Publishing Company, 1986;
- Rodrigues, J. A., Métodos Numéricos - Introdução, Aplicação e Programação, Edições Sílabo, 1ª edição, 2003;
- Santos, F. M., Fundamentos de Análise Numérica, Edições Sílabo, 1ª edição, 2002.

Access Conditions and Attendance Excuse

Not applicable.

Conditions for Exam Admission
Any student enrolled at this curricular unit has access to an examination.

Evaluation Method
Evaluation can be done during the semester (distributed assessment) or by exam. The option for distributed assessment has to be done until regular season exam. Any student enrolled at this curricular unit can take the appeal season exam.

   i) The result of distributed assessment will be given by the summation of the results of two tests. Test 1 will evaluate the subjects related to chapters 1 and 2 and will be quoted for 8 values. Test 2 will evaluate the subjects related to chapters 3 to 6 and will be quoted for 12 values. Student will be approved if final result, rounded, is greater or equal than 10 values (out of 20) and the result of each test is greater or equal than 40%. The test results will only be available after the student opts for this evaluation method.

   ii) On evaluation by exam, student will be approved if result, rounded, is greater or equal than 10 values (out of 20).

Conditions for Results Improvement
According to "REACTA - Regulamento de Avaliação de Conhecimentos e Transição de Ano dos Estudantes das Licenciaturas do Instituto Superior de Engenharia de Coimbra".

Date
2019/01/21

Signature from the lecturer responsible for the course

[Signature]
## Program Contents

### Course Unit
- **GEOMATICS**

### Specialization(s)
- None

### Subject type
- **Research Area**
  - Interdisciplinary

### Year
- **1st**

### Semester
- **2nd**

### ECTS
- **5**

### Working Hours

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### Total of Working Hours
- **130**

### Lecturer

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<td>Alexandra Maria Galvão Ribeiro a</td>
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<td>Maria Margarida Coelho e Silva</td>
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### Responsible(s) Lecturer(s)
- Maria Margarida Coelho e Silva

### Goals
- Learn and apply concepts related to acquisition, management, analysis and representation of geospatial information.
- Learn basic concepts of cartography, geodesy, topographic support and global satellite navigation systems.
- Understand and apply geography information systems technology.

### Skills
- Understand the theoretical and practical concepts of cartography and topography to acquire, edit, interpret and analyse spatial information. Use of computerised resources for geographic information.
Program Contents

1- Cartography and geodesy concepts

2- Positioning techniques
   2.2 Positioning systems and satellite navigation. GPS system applications.
   2.3 Brief concepts of satellite imaging and aerial photography.

3- Geographic Information Systems
   Data editing and coordinate conversion between different spatial referencing systems. Spatial data models: vector model and raster model. Maps creation. Introduction to spatial analysis.

Bibliography

- BOLSTAD, Paul, (2003), "GIS fundamentals: a first text on Geographic Information Systems"
- Gonçalves, José A.; Madeira, Sérgio; Sousa, J. João, (2008), "Topografia Conceitos e Aplicações", Lidel
- MATOS, João Luís de (2001), "Fundamentos de informação geográfica", Lidel,
- Paul A. Longley. [et al.] (2001), "Geographic information systems and science" John Wiley & Sons, Ltd

Evaluation Method

50% Exam + 50% Practical work

Date
21.01.2019

Signature from the lecturer responsible for the course

[Signature]

Im-13-68_A1
Course Unit: STRENGTH OF MATERIALS
Specialization(s): STRUCTURAL MECHANICS

Subject type: Engineering Sciences
Research Area: Civil Engineering

Year: 1st
Semester: 2nd
ECTS: 5

Working Hours

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Total of Working Hours: 130

Lecturer

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Responsible(s) Lecturer(s): Hugo Sérgio Sousa Costa

Goals

To learn the theoretical-practical and technological bases, for the understanding: of the fundamentals of the mechanical behavior of deformable solids, interpreting the stress and deformation states, resulting from the internal forces; design and execution of new structures and reinforcement of existing ones, knowing the fundamental concepts design and safety.

Skills

Generic skills: capacity for apprehension, analysis and synthesis; ability to solve problems and apply knowledge and adapt to new situations; ability to carry out autonomous and group work and learning autonomy; ability to predict and perform judgments and discuss technological issues; development of the critical sense.
Specific competences: to know the theoretical-practical and technological bases, related to the design and execution of structures of several materials; to know the cause-effect relation for the understanding of the state of the internal stresses in the structural elements, caused by the actions and forces; acquire knowledge to understand the design criteria and to prevent, recognize, diagnose and intervene in structural pathologies.
Program Contents

1. Basic principles and notions:
   - Sustainable vs. traditional structural materials.
   - Concepts and mechanical properties of materials: linear elasticity, constitutive law, mechanical strengths, shrinkage, creep, thermal dimensional variation.
   - Concept of security and design criteria.

2. Normal stresses
   - Tension and compression of linear parts; stresses and deformations; thermal effects; concepts and applications.
   - Linear elastic bending, deviated and combined bending, bending in hybrid elements, made of different materials; normal stresses and deformations.
   - Instantaneous and time dependent flexural deformation in statically determined structures/elements.

3. Shear stresses
   - Direct shear into joints.
   - Shear force; slip force and shear stresses by shear force; stress distribution in several sections;
   - Uniform torsion; torsional stresses and deformations; stress distribution in several sections.

4. Instability.
   - Notion of instability and main parameters.
   - Buckling of compressed elements.
   - Instability by lateral bending-torsion.

Bibliography


Access Conditions and Attendance Excuse

Not applicable

Conditions for Exam Admission

Not applicable

Evaluation Method

Teaching methodologies: Exposition of concepts with incentive to student participation, in debate, in the exemplification of the themes and in the technological identification of the phenomena / problems that cause pathologies or failures, focusing on their physical interpretation and on the technological details of behavior; students will solve problems individually or in groups; experimental demonstration of concepts in the laboratory; performing group work, by research or laboratory experiences, focused on sustainable materials and solutions, complemented with the respective presentation and discussion in class; in the different approaches and methodologies, it will be explored autonomous and team learning skills, development of research and writing skills, communication skills and critical argumentation.

Assessment: Final written exam (normal, resource and special seasons), quoted for 14 values, and; the accomplishment of a group work (research and / or experimental), which includes the development, presentation and discussion, quoted for 6 values. The approval requires that the student obtain a minimum of 9.5 values (in 20 values) in the total of the two components.

Conditions for Results Improvement

In accordance with the general rules

Date: 21/01/2019

Signature from the lecturer responsible for the course: [Signature]
Licenciatura – BSc in Sustainable City Management

Academic Year: 2018/2019

Program Contents

Course Unit

SOILS AND ROCKS

Specialization (s)

Research Area

Civil Engineering

Year 1st Semester 2nd

ECTS

Working Hours

Unaccompanied Working Hours

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Total of Working Hours

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Lecturer

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Responsible(s) Lecturer(s)

Carlos Manuel da Cruz Moreira

Goals

To know theoretical and practical concepts in geotechnics and main methods of in situ investigations and using them to solve problems on structures and geotechnical works.

Skills

Generic skills: ability for acquisition and application of knowledge and for solving problems; ability for self-learning and for working in team.

Specific skills: knowledge of different types of rocks and soils, to carry out basic soil tests.

Program Contents


Bibliography

Access Conditions and Attendance Excuse

Conditions for Exam Admission

Evaluation Method
Performance of three tests or final exam. Performance of research assignment and laboratory tests. Continuous assessment consisting of three written tests: maximum total rating of 20 points; the final test will be held on the day and time of the final exam of the normal season. Evaluation through final exams: maximum total of 20 rating points. Research assignment: mandatory; oral presentation and defense; maximum rating of 4 points. Laboratory tests: mandatory; maximum rating of 1 point. Final grade:
- Grade of the exam or the tests when less than 10 points;
- Sum of 75% of the exam or the tests grade with the grades of the research assignment and the laboratory tests.

Conditions for Results Improvement

Date
21.01.2019

Signature from the lecturer responsible for the course

Signature of Teacher:______________________
Course Unit: MECHANICS OF STRUCTURES
Specialization(s): STRUCTURAL MECHANICS AND STRUCTURES
Subject type: Research Area
Civil Engineering

Year 1st Semester 2nd Semester ECTS 5.0
Working Hours Unaccompanied Working Hours
Activity Type Working Hours Per Week Total Hours Activity Type Total Hours
Theoretical Lectures 3.5 49 Study 49
Theoretical-Practical Lectures 4.5 69 Works / Group Works 21
Practical-Laboratory Lectures 0.5 7 Project 4
Tutorial Orientation 0.5 7 Evaluation Additional
Project 0.5 7

Total of Working Hours 130

Lecturer
Activity Type Name Qualifications Category
Theoretical Lectures João Paulo Martins Gouveia Master Prof. Adj.
Theoretical-Practical Lectures João Paulo Martins Gouveia Master Prof. Adj.
Practical-Laboratory Lectures
Tutorial Orientation João Paulo Martins Gouveia Master
Project João Paulo Martins Gouveia

Goals
Revision and knowledge of the basis about the constitution of a structure, basis of design and safety checking and structural reliability. To know the structural basis of structural design and the path of the loads, their effects of such internal forces and displacements and deformations; Physical and experimental understanding the concepts of rigidity and flexibility. Information of structural calculation methods and concepts for creating and evaluating structural models (simple programs, calculation models, testing).

Skills
Generic skills: Application of knowledge to solve practical problems and increase the understanding of the construction in urban spaces; improve the capacity to make decisions; increase the capacity to communicate and discuss structural problems; develop the ability of selflearning.
Specific skills: Provide to the students the bases of structural analysis; understand the basis for design and rehabilitate structures.

Program Contents
2. Basis for calculations: Understanding of the behaviour of structures and the concept practice of rigidity and flexibility. Basis of evaluation of effects (efforts, diagrams and displacements).
3. Research on structural design: collection of examples of structural works, construction materials and structural systems (concrete, steel, mild steel, wood, acrylic, glass, aluminum, etc.). Interpretation by design of models and evaluation of behavior. Visit the works and built for recognition of concepts and preview of damage effects in practical cases.
4. Freeware programs for the automatic designing (Ftool) and for the creation of models of structures (Sketchup) and viewing examples with professional programs
Bibliography
- Research sites in the area of sustainability, recycling and construction
- Notes prepared by teachers and others, in consultation with web and Moodle.

Access Conditions and Attendance Excuse
Not applicable

Conditions for Exam Admission
Students may perform tests of discipline, if they are properly registered on academic services, and with the name registered on the sheet of classifications

Evaluation Method
In the classes the exposition method is used to present the theoretical and practical subjects. During the presentation, the students will be surveyed to maintain an active participation in the class. The students will be encouraged to understand the scientific-technical practical problems, and will be encouraged to solve exercises in group and individually. Also, there will be sessions to clarify doubts either in resolution of exercises or in the interpretation of theoretical subjects.

The evaluation of students will be made by the written exam (AEE) to perform on the defined institutional dates and the presentation of individual work of personal study and research about contents (TEP). The student can suggest work or evidence of extra evaluation with work of training and informative topics (TIP), according to indication and teaching instruction (realization and test of scale model of structures with descriptive poster presentation or documents with resolution of problems). It is also considered the frequency of attendance at lessons (AFA).
- Work of Personal Study (TEP): Written documents with work realized, presentation and discussion. The work must be performed individually or in groups (maximum of 3 students). The classification will have the maximum of 5 values.
- Work of training and informative topics (TIP): (optional) Produce a practice works (scale model of structures with descriptive poster presentation or documents with resolution of problems), and presentation and exhibition of their experimental work. The classification will have the maximum of 5 values.
- Evaluation by attendance at lessons (AFA): This classification will have the maximum of 1 value, being defined and weighted according to the number of lesson.
- Evaluation by written exam (AEE): in the date to perform on the defined institutional maps of exams. If the student chooses not to wish to account for any frequency evaluation component, the written exam will be quoted for 20 values. The approval requires obtaining at least 9.5 values of 20 values defined by total obtained in each components (AEE+AFA+TEP+TIP)

Conditions for Results Improvement
It is expected to carry out special character evaluations of students with request additional test or special tests. This exams can be defined by indication of the academic services. The teacher may suggest that these tests are in the form of written exam, oral exam or for presentation and defense of works that can be done.

Date

Signature from the lecturer responsible for the course

20 de janeiro 2019

[Signature]
Ficha de Unidade Curricular

Unidade Curricular: ECONOMIA

Ramo(s): Obrigatória

Área Científica: Eng. e Gestão Industrial

Ano: 1º  Semestre: 2º

Horas de Contacto

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Total de Horas de Trabalho: 56

Horas de Trabalho não Acompanhado

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Total de Horas de Trabalho não Acompanhado: 74

Docentes

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<tr>
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<td>Pós-Doutoramento Mestrado/Especlista</td>
<td>Professor Adjunto Convidado</td>
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Docente Responsável: Ricardo Ferraz

Objectivos

- Transmitir um conjunto de informação fulcral no campo da Economia. Mais concretamente, pretende-se que os discentes:
  - Desenvolvam conhecimentos e capacidades na área da Economia mediante a compreensão dos seus princípios fundamentais;
  - Apliquem os conceitos teóricos de Economia ao mundo real, criando a capacidade de analisar do ponto de vista da ciência económica problemas reais;
  - Consigam ter a capacidade para resolver problemas concretos, não só enquanto consumidores, mas também na óptica do produtor/vendedor;
  - Adquiram conhecimentos suficientes para participar em debates em torno da ciência económica conseguindo sustentar e fundamentar as suas próprias posições;
  - Possam conhecer a realidade das economias portuguesa e mundial através da análise a um conjunto de indicadores;
  - Compreendam a importância das actividades económicas no contexto das cidades;
  - Desenvolvam um pouco o seu lado criativo e empreendedor.
Competências

- Os estudantes aprenderão a:
  - Conhecer a Ciência Económica e os seus postulados;
  - Compreender as decisões racionais dos consumidores e dos produtores;
  - Conhecer e diferenciar os vários tipos de mercado;
  - Interpretar as actividades do Estado;
  - Conhecer a realidade da economia portuguesa e a evolução da economia mundial;
  - Compreender a importância dos conceitos de economia urbana e de economia circular;
  - Capacidade para analisar um conjunto de indicadores económicos fundamentais;
  - Capacidade para interpretar textos simples de economia e de entender a linguagem económica e de participar em debates.

Conteúdos Programáticos

- Introdução à ciência económica;
- O problema económico e as suas soluções;
- A cruz marshalliana (procura e oferta)
- Teorias do consumidor e do produtor
- Teoria do comércio internacional
- As principais formas de mercado
- A Actividade económica
- A importância empreendedorismo para a actividade económica
- Os conceitos de economia urbana e economia circular
- A evolução do papel económico do Estado.
- Breves noções de política económica.
- As funções e as características da moeda.

Para além de uma abordagem de carácter mais teórico serão também realizados exercícios práticos de Economia e discutidos textos na sala de aula, bem como, um seminário com um orador convidado.

Bibliografia

- "Economia Urbana". A. Vale e Vasconcellos. RES, 1984
Condições de Obtenção e Dispensa de Frequência

As previstas na legislação em vigor. Aconselha-se os alunos a acompanarem sistematicamente as aulas, como condição indispensável ao aproveitamento escolar e à correta compreensão das matérias.

Condições de Acesso a Exame

Nos termos da regulamentação vigente na instituição.
Metodologia de Avaliação

Opção 1 - Regime Geral de Avaliação:

Consiste em realizar na íntegra o exame final:

Nota Final = Nota do Exame.

Ou

Opção 2 - Regime de Avaliação Contínua*:

Consiste na realização de trabalhos individuais e na realização de aulas uma parte do exame final. A nota final será assim calculada:

Nota final = 0,4 x (nota dos trabalhos individuais) + 0,6 x (Nota do exame).

* O Regime de Avaliação Contínua exige o cumprimento das seguintes regras:

- Exige-se uma assiduidade mínima de 70% nas aulas práticas;
- Exige-se uma nota mínima de 7,0 valores no exame (em 20 valores). Caso a nota mínima de 7,0 valores não seja atingida, então a nota final do aluno corresponderá apenas à nota obtida no exame;
- Os trabalhos individuais consistem em apresentações nas aulas sobre textos de economia e na elaboração de um relatório sobre uma conferência (último deverá ser entregue, no limite, até à última aula);
- Os trabalhos individuais sobre textos de economia serão apresentados, analisados e comentados nas próprias aulas. As notas dos trabalhos individuais sobre textos serão igual a 0,0 valores em caso de falta do aluno;

Condições de Melhoria de Classificação

As previstas na legislação em vigor.

---

Data
21-01-2019

Assinatura do Docente Responsável pela Unidade Curricular
Licenciatura – BSc  Gestão Sustentável das Cidades
Licenciatura – BSc  Sustainable City Management

Academic Year: 2018/2019

Program Contents

Course Unit  APPLIED MATHEMATICS II (915507)
Specialization(s)  COMMON FORMATION

Subject type  Mathematics  Research Area  Basic Sciences

Year  1º  Semester  2º  ECTS  5

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Total of Working Hours  130

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Lecturer

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Responsible(s) Lecturer(s)  João Ricardo de Oliveira Branco

Goals

- Develop ability to define and analyze mathematical problems, choose the most effective solving methods, interpret and analyze results.
- Provide basic knowledge of Linear Algebra.
- Identify, understand and solve problems involving matrix calculus.
- Perform basic concepts or theory of errors.
- Apply concepts related to the numerical resolution of linear systems, nonlinear equations, polynomial interpolation and definite integrals.
- Understand the limitations of analytical techniques and develop the capacity to use numerical methods.

Skills

- Identify and solve problems involving linear systems and matrix calculus.
- Identify and use numerical methods to solve mathematical problems involving linear systems, nonlinear equations, interpolation and integration.
- Use mathematical software to interpret and solve problems.
Program Contents

1. Matrices.
   - Definitions.
   - Operations and properties.
2. Systems of linear equations.
   - Definitions.
   - Operations with matrices and properties: matrices condensation and characteristic.
   - Classification and resolution of systems of linear equations:
     i) Direct methods: Gauss elimination;
     ii) Iterative methods: Jacobi and Gauss-Seidel.
   - Applications.
3. Theory of errors (brief remarks).
   - Introduction.
   - Definitions.
4. Roots of nonlinear equations.
   - Introduction.
   - Location of roots: graphical method and Bolzano’s theorem.
   - Bisection and Newton’s methods: iterative rules, error and stopping criteria.
   - Computational aspects.
   - Applications.
5. Polynomial interpolation.
   - Introduction.
   - Uniqueness of the interpolating polynomial.
   - Interpolating polynomial using Lagrange and Newton’s forms.
   - Interpolation error.
   - Computational aspects.
   - Applications.
   - Introduction.
   - Trapezoidal and Simpson’s rules.
   - Numerical integration error.
   - Computational implementation using Matlab.

Bibliography
- Anton, H., Elementary Linear Algebra, John Willey & Sons, Inc, 2000;
- Branco, J. R., Matemática Aplicada II - Folhas de exercícios, Licenciatura em Gestão Sustentável das Cidades, ISEC, 2018/2019;
- Branco, J. R., Métodos Numéricos - Tutoriais para Matlab, ISEC, 2018/2019;
- Fidalgo, C., Álgebra Linear, Instituto Superior de Engenharia de Coimbra;
- Graham, A., Matrix Theory and Applications for Engineers, Ellis Horwood Limited, 1979;
- James, G., Modern Engineering Mathematics, Prentice Hall, 2000;
- Nicholson, W., Elementary Linear Algebra with Applications, PWS Publishing Company, 1986;
- Rodrigues, J. A., Métodos Numéricos - Introdução, Aplicação e Programação, Edições Sílabo, 1ªedición, 2003;
- Santos, F. M., Fundamentos de Análise Numérica, Edições Sílabo, 1ªedición, 2002.

Access Conditions and Attendance Excuse
Not applicable.

Conditions for Exam Admission
Any student enrolled at this curricular unit has access to an examination.

Evaluation Method
Evaluation can be done during the semester (distributed assessment) or by exam. The option for distributed assessment has to be done until regular season exam. Any student enrolled at this curricular unit can take the appeal season exam.

i) The result of distributed assessment will be given by the summation of the results of two tests. Test 1 will evaluate the subjects related to chapters 1 and 2 and will be quoted for 8 values. Test 2 will evaluate the subjects related to chapters 3 to 6 and will be quoted for 12 values. Student will be approved if final result, rounded, is greater or equal than 10 values (out of 20) and the result of each test is greater or equal than 40%. The test results will only be available after the student opts for this evaluation method.

ii) On evaluation by exam, student will be approved if result, rounded, is greater or equal than 10 values (out of 20).

Conditions for Results Improvement
According to "REACTA - Regulamento de Avaliação de Conhecimentos e Transição de Ano dos Estudantes das Licenciaturas do Instituto Superior de Engenharia de Coimbra".

Date
2019/01/21

Signature from the lecturer responsible for the course

Page 2 of 2
Licenciatura em Gestão Sustentável das Cidades
Degree in Sustainable City Management – BSc

Academic Year: 2018/19

Program Contents

Course Unit: GEOMATICS

Subject type
Research Area
Interdisciplinary

Year: 1st
Semester: 2nd
ECTS: 5

Working Hours
Unaccompanied Working Hours

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Total of Working Hours: 130

Lecturer

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 Responsible(s) Lecturer(s): Maria Margarida Coelho e Silva

Goals
- Learn and apply concepts related to acquisition, management, analysis and representation of geospatial information.
- Learn basic concepts of cartography, geodesy, topographic support and global satellite navigation systems.
- Understand and apply geography information systems technology.

Skills
Understand the theoretical and practical concepts of cartography and topography to acquire, edit, interpret and analyse spatial information. Use of computerised resources for geographic information.
Program Contents

1- Cartography and geodesy concepts

2- Positioning techniques
   2.2 Positioning systems and satellite navigation. GPS system applications.  
   2.3 Brief concepts of satellite imaging and aerial photography.

3- Geographic Information Systems
   Data editing and coordinate conversion between different spatial referencing systems. Spatial data models: vector model and raster model. Maps creation. Introduction to spatial analysis.

Bibliography

- BOLSTAD, Paul, (2003), "GIS fundamentals: a first text on Geographic Information Systems"
- Gonçalves, José A.; Madeira, Sérgio; Sousa, J. João, (2008), "Topografia Conceitos e Aplicações", Lidel
- MATOS, João Luís de (2001), "Fundamentos de informação geográfica", Lidel
- Paul A. Longley. [et al.] (2001), "Geographic information systems and science" John Wiley & Sons, Ltd

Evaluation Method

50% Exam + 50% Practical work

Date
21.01.2019

Signature from the lecturer responsible for the course

[Signature]

Maria João Coelho e Silva
### Program Contents

**Course Unit**  
STRENGTH OF MATERIALS  

**Specialization(s)**  
STRUCTURAL MECHANICS

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**Specialization(s):** STRUCTURAL MECHANICS  
**Research Area:** Civil Engineering  
**Academic Year:** 2018/2019

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**Total of Working Hours:** 130

**Lecturer**  
Name | Qualifications | Category
---|----------------|-------
Hugo Sérgio Sousa Costa | PhD | Assistant Prof.
Victor José Dias de Almeida Magalhães | MSc | Assistant Prof.

**Responsible(s) Lecturer(s):** Hugo Sérgio Sousa Costa

**Goals**

To learn the theoretical-practical and technological bases, for the understanding: of the fundamentals of the mechanical behavior of deformable solids, interpreting the stress and deformation states, resulting from the internal forces; design and execution of new structures and reinforcement of existing ones, knowing the fundamental concepts design and safety.

**Skills**

Generic skills: capacity for apprehension, analysis and synthesis; ability to solve problems and apply knowledge and adapt to new situations; ability to carry out autonomous and group work and learning autonomy; ability to predict and perform judgments and discuss technological issues; development of the critical sense.  
Specific competences: to know the theoretical-practical and technological bases, related to the design and execution of structures of several materials; to know the cause-effect relation for the understanding of the state of the internal stresses in the structural elements, caused by the actions and forces; acquire knowledge to understand the design criteria and to prevent, recognize, diagnose and intervene in structural pathologies.
Program Contents

1. Basic principles and notions:
   - Sustainable vs. traditional structural materials.
   - Notions of stress and principle of equivalence.
   - Concepts and mechanical properties of materials: linear elasticity, constitutive law, mechanical strengths, shrinkage, creep, thermal dimensional variation.
   - Concept of security and design criteria.

2. Normal stresses
   - Tension and compression of linear parts; stresses and deformations; thermal effects; concepts and applications.
   - Linear elastic bending, deviated and combined bending, bending in hybrid elements, made of different materials; normal stresses and deformations.
   - Instantaneous and time dependent flexural deformation in statically determined structures/elements.

3. Shear stresses
   - Direct shear into joints.
   - Shear force; slip force and shear stresses by shear force; stress distribution in several sections;
   - Uniform torsion; torsional stresses and deformations; stress distribution in several sections.

4. Instability.
   - Notion of instability and main parameters.
   - Instability by lateral bending-torsion.

Bibliography


Access Conditions and Attendance Excuse

Not applicable

Conditions for Exam Admission

Not applicable

Evaluation Method

Teaching methodologies: Exposition of concepts with incentive to student participation, in debate, in the exemplification of the themes and in the technological identification of the phenomena / problems that cause pathologies or failures, focusing on their physical interpretation and on the technological details of behavior; students will solve problems individually or in groups; experimental demonstration of concepts in the laboratory; performing group work, by research or laboratory experiences, focused on sustainable materials and solutions, complemented with the respective presentation and discussion in class; in the different approaches and methodologies, it will be explored autonomous and team learning skills, development of research and writing skills, communication skills and critical argumentation.

Assessment: Final written exam (normal, resource and special seasons), quoted for 14 values, and; the accomplishment of a group work (research and / or experimental), which includes the development, presentation and discussion, quoted for 6 values. The approval requires that the student obtain a minimum of 9.5 values (in 20 values) in the total of the two components.

Conditions for Results Improvement

In accordance with the general rules

Date Signature from the lecturer responsible for the course

21/01/2019

Signature: [Signature]
# Program Contents

## Course Unit

### SOILS AND ROCKS

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**Total of Working Hours**: 130

## Lecturer

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<tr>
<td>Tutorial Orientation</td>
<td>Carlos Manuel da Cruz Moreira</td>
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</table>

### Responsible Lecturer(s)

| Carlos Manuel da Cruz Moreira |

## Goals

To know theoretical and practical concepts in geotechnics and main methods of in situ investigations and using them to solve problems on structures and geotechnical works.

## Skills

**Generic skills**: ability for acquisition and application of knowledge and for solving problems; ability for self-learning and for working in team.

**Specific skills**: knowledge of different types of rocks and soils, to carry out basic soil tests.

## Program Contents


Bibliography


Access Conditions and Attendance Excuse

Conditions for Exam Admission

Evaluation Method

Performance of three tests or final exam. Performance of research assignment and laboratory tests. Continuous assessment consisting of three written tests: maximum total rating of 20 points; the final test will be held on the day and time of the final exam of the normal season. Evaluation through final exams: maximum total of 20 rating points. Research assignment: mandatory; oral presentation and defense; maximum rating of 4 points. Laboratory tests: mandatory; maximum rating of 1 point. Final grade:

- Grade of the exam or the tests when less than 10 points;
- Sum of 75% of the exam or the tests grade with the grades of the research assignment and the laboratory tests.

Conditions for Results Improvement

Date

21.01.2019

Signature from the lecturer responsible for the course
Course Unit: MECHANICS OF STRUCTURES

Specialization (s): STRUCTURAL MECHANIC AND STRUCTURES

Subject type: Research Area

Civil Engineering

Year: 1<sup>st</sup> Semester: 2<sup>nd</sup> ECTS: 5.0

Working Hours: 130

Activity Type: Working Hours Per Week, Total Hours, Activity Type, Total Hours

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<td>Project</td>
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Goal:
Revision and knowledge of basis about the constitution of a structure, basis of design and safety checking and structural reliability. To know the structural basis of structural design and the path of the loads, their effects of such internal forces and displacements and deformations; physical and experimental understanding the concepts of rigidity and flexibility. Information of structural calculation methods and concepts for creating and evaluating structural models (simple programs, calculation models, testing).

Skills:
Generic skills: Application of knowledge to solve practical problems and increase the understanding of the construction in urban spaces; improve the capacity to make decisions; increase the capacity to communicate and discuss structural problems; develop the ability of selflearning.
Specific skills: Provide to the students the bases of structural analysis; understand the basis for design and rehabilitate structures.

Program Contents:
2. Basis for calculations: Understanding of the behaviour of structures and the concept practice of rigidity and flexibility. Basis of evaluation of effects (efforts, diagrams and displacements).
3. Research on structural design: collection of examples of structural works, construction materials and structural systems (concrete, steel, mild steel, wood, acrylic, glass, aluminum, etc.). Interpretation by design of models and evaluation of behavior. Visit the works and built for recognition of concepts and preview of damage effects in practical cases.
4. Freeware programs for the automatic design (Ftool) and for the creation of models of structures (Sketchup) and viewing examples with professional programs.
Bibliography
- Research sites in the area of sustainability, recycling and construction
- Notes prepared by teachers and others, in consultation with web and Moodle.

Access Conditions and Attendance Excuse
Not applicable

Conditions for Exam Admission
Students may perform tests of discipline, if they are properly registered on academic services, and with the name registered on the sheet of classifications.

Evaluation Method
In the classes the exposition method is used to present the theoretical and practical subjects. During the presentation, the students will be surveyed to maintain an active participation in the class. The students will be encouraged to understand the scientific-technical practical problems, and will be encouraged to solve exercises in group and individually. Also, there will be sessions to clarify doubts either in resolution of exercises or in the interpretation of theoretical subjects.

The evaluation of students will be made by the written exam (AEE) to perform on the defined institutional dates and the presentation of individual work of personal study and research about contents (TEP). The student can suggest work or evidence of extra evaluation with work of training and informative topics (TIP), according to indication and teaching instruction (realization and test of scale model of structures with descriptive poster presentation or documents with resolution of problems). It is also considered the frequency of attendance at lessons (AFA).
- Work of Personal Study (TEP): Written documents with work realized, presentation and discussion. The work must be performed individually or in groups (maximum of 3 students). The classification will have the maximum of 5 values.
- Work of training and informative topics (TIP): (optional) Produce a practice works (scale model of structures with descriptive poster presentation or documents with resolution of problems), and presentation and exhibition of their experimental work. The classification will have the maximum of 5 values.
- Evaluation by attendance at lessons (AFA): This classification will have the maximum of 1 value, being defined and weighted according to the number of lesson.
- Evaluation by written exam (AEE): in the date to perform on the defined institutional maps of exams. If the student chooses not to wish to account for any frequency evaluation component, the written exam will be quoted for 20 values. The approval requires having at least 9.5 values of 20 values defined by total obtained in each component (AEE+AFA+TEP+TIP)

Conditions for Results Improvement
It is expected to carry out special character evaluations of students with request additional test or special tests. This exams can be defined by indication of the academic services. The teacher may suggest that these tests are in the form of written exam, oral exam or for presentation and defense of works that can be done.

Date: 20 de janeiro 2019
Signature from the lecturer responsible for the course:

[Signature]
Licenciatura em Gestão Sustentável das Cidades

Ano Lectivo 2018/2019

Ficha de Unidade Curricular

Unidade Curricular: ECONOMIA

Ramo(s): 

Área Científica: Eng. e Gestão Industrial

Natureza Curricular: Obrigatória

Ano: 1º Semestre: 2º

ECTS: 5.0

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Total de Horas de Trabalho: 56

Docentes

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<tr>
<td>Teórico</td>
<td>Ricardo Ferraz</td>
<td>Pós-Doutoramento</td>
<td>Professor Adjunto</td>
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<td>Teórico-Prático</td>
<td>Ivan Simões</td>
<td>Mestrado/Especialista</td>
<td>Convidado Prof. Adj.</td>
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Docente Responsável: Ricardo Ferraz

Objectivos

• Transmitir um conjunto de informação fulcral no campo da Economia. Mais concretamente, pretende-se que os discentes:
  • Desenvolvam conhecimentos e capacidades na área da Economia mediante a compreensão dos seus princípios fundamentais;
  • Apliquem os conceitos teóricos de Economia ao mundo real, criando a capacidade de analisar do ponto de vista da ciência económica problemas reais;
  • Consigam ter a capacidade para resolver problemas concretos, não só enquanto consumidores, mas também na óptica do produtor/vendedor;
  • Adquiram conhecimentos suficientes para participar em debates em torno da ciência económica conseguindo sustentar e fundamentar as suas próprias posições;
  • Possam conhecer a realidade das economias portuguesa e mundial através da análise a um conjunto de indicadores;
  • Compreendam a importância das actividades económicas no contexto das cidades;
  • Desenvolvam um pouco o seu lado criativo e empreendedor.
Competências

- Os estudantes aprenderão a:
  - Conhecer a Ciência Económica e os seus postulados;
  - Compreender as decisões racionais dos consumidores e dos produtores;
  - Conhecer e diferenciar os vários tipos de mercado;
  - Interpretar as actividades do Estado;
  - Conhecer a realidade da economia portuguesa e a evolução da economia mundial;
  - Compreender a importância dos conceitos de economia urbana e de economia circular;
  - Capacidade para analisar um conjunto de indicadores económicos fundamentais;
  - Capacidade para interpretar textos simples de economia e de entender a linguagem económica e de participar em debates.

 Conteúdos Programáticos

- Introdução à ciência económica;
- O problema económico e as suas soluções;
- A cruz marshalliana (procura e oferta);
- Teorias do consumidor e do produtor;
- Teoria do comércio internacional;
- As principais formas de mercado;
- A Actividade económica;
- A importância empreendedorismo para a actividade económica;
- Os conceitos de economia urbana e economia circular;
- A evolução do papel económico do Estado;
- Breves noções de política económica;
- As funções e as características da moeda.

Para além de uma abordagem de carácter mais teórico serão também realizados exercícios práticos de Economia e discutidos textos na sala de aula, bem como, um seminário com um orador convidado.

Bibliografia

- "Economia Urbana". A. Vale e Vasconcellos. RES, 1984
Condições de Obtenção e Dispensa de Frequência
As previstas na legislação em vigor. Aconselha-se os alunos a acompanhem sistematicamente as aulas, como condição indispensável ao aproveitamento escolar e à correta compreensão das matérias.

Condições de Acesso a Exame
Nos termos da regulamentação vigente na instituição.
Metodologia de Avaliação

Opção 1 - Regime Geral de Avaliação:

Consiste em realizar na íntegra o exame final:

Nota Final = Nota do Exame.

Ou

Opção 2 - Regime de Avaliação Contínua*:

Consiste na realização de trabalhos individuais e na realização de aulas uma parte do exame final. A nota final será assim calculada:

Nota final = 0,4 x (nota dos trabalhos individuais) + 0,6 x (Nota do exame).

* O Regime de Avaliação Contínua exige o cumprimento das seguintes regras:

- Exige-se uma assiduidade mínima de 70% nas aulas práticas;
- Exige-se uma nota mínima de 7,0 valores no exame (em 20 valores). Caso a nota mínima de 7,0 valores não seja atingida, então a nota final do aluno corresponderá apenas à nota obtida no exame;
- Os trabalhos individuais consistem em apresentações nas aulas sobre textos de economia e na elaboração de um relatório sobre uma conferência (último deverá ser entregue, no limite, até à última aula);
- Os trabalhos individuais sobre textos de economia serão apresentados, analisados e comentados nas próprias aulas. As notas dos trabalhos individuais sobre textos será igual a 0,0 valores em caso de falta do aluno;

Condições de Melhoria de Classificação

As previstas na legislação em vigor.


Data
21-01-2019

Assinatura do Docente Responsável pela Unidade Curricular

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Course Unit          APPLIED MATHEMATICS II (915507)
Specialization (s)       COMMON FORMATION
Subject type          Mathematics       Research Area          Basic Sciences
Year                1º  Semester        2º  ECTS           5
Working Hours
Activity Type          Working Hours Per Week       Total Hours
Theoretical Lectures            3.5            49
Theoretical-Practical Lectures   
Practical-Laboratory Lectures    
Tutorial Orientation            
Project                          

Total of Working Hours                   130

Lecturer
Activity Type          Name          Qualifications          Category
Theoretical Lectures   João Ricardo de Oliveira Branco  PHD               Adj. Professor
Theoretical-Practical Lectures
Practical-Laboratory Lectures
Tutorial Orientation
Project

Goals
- Develop ability to define and analyze mathematical problems, choose the most effective solving methods, interpret and analyze results.
- Provide basic knowledge of Linear Algebra.
- Identify, understand and solve problems involving matrix calculus.
- Perform basic concepts or theory of errors.
- Apply concepts related to the numerical resolution of linear systems, nonlinear equations, polynomial interpolation and definite integrals.
- Understand the limitations of analytical techniques and develop the capacity to use numerical methods.

Skills
- Identify and solve problems involving linear systems and matrix calculus.
- Identify and use numerical methods to solve mathematical problems involving linear systems, nonlinear equations, interpolation and integration.
- Use mathematical software to interpret and solve problems.
Program Contents

1. Matrices.
   - Definitions.
   - Operations and properties.
2. Systems of linear equations.
   - Definitions.
   - Operations with matrices and properties: matrices condensation and characteristic.
   - Classification and resolution of systems of linear equations:
     i) Direct methods: Gauss elimination;
     ii) Iterative methods: Jacobi and Gauss-Seidel.
   - Applications.
3. Theory of errors (brief remarks).
   - Introduction.
   - Definitions.
4. Roots of nonlinear equations.
   - Introduction.
   - Location of roots: graphical method and Bolzano’s theorem.
   - Bisection and Newton’s methods: iterative rules, error and stopping criteria.
   - Computational aspects.
   - Applications.
5. Polynomial interpolation.
   - Introduction.
   - Uniqueness of the interpolating polynomial.
   - Interpolating polynomial using Lagrange and Newton’s forms.
   - Interpolation error.
   - Computational aspects.
   - Applications.
   - Introduction.
   - Trapezoidal and Simpson’s rules.
   - Numerical integration error.
   - Computational implementation using Matlab.

Bibliography
- Anton, H., Elementary Linear Algebra, John Willey & Sons, Inc, 2000;
- Branco, J. R., Matemática Aplicada II - Folhas de exercícios, Licenciatura em Gestão Sustentável das Cidades, ISEC, 2018/2019;
- Branco, J. R., Métodos Numéricos - Tutoriais para Matlab, ISEC, 2018/2019;
- Fidalgo, C., Álgebra Linear, Instituto Superior de Engenharia de Coimbra;
- Graham, A., Matrix Theory and Applications for Engineers, Ellis Horwood Limited, 1979;
- James, G., Modern Engineering Mathematics, Prentice Hall, 2000;
- Nicholson, W., Elementary Linear Algebra with Applications, PWS Publishing Company, 1986;
- Rodrigues, J. A., Métodos Numéricos - Introdução, Aplicação e Programação, Edições Sílabo, 1ªedição, 2003;
- Santos, F. M., Fundamentos de Análise Numérica, Edições Sílabo, 1ªedição, 2002.

Access Conditions and Attendance Excuse
Not applicable.

Conditions for Exam Admission
Any student enrolled at this curricular unit has access to an examination.

Evaluation Method
Evaluation can be done during the semester (distributed assessment) or by exam. The option for distributed assessment has to be done until regular season exam. Any student enrolled at this curricular unit can take the appeal season exam.

i) The result of distributed assessment will be given by the summation of the results of two tests. Test 1 will evaluate the subjects related to chapters 1 and 2 and will be quoted for 8 values. Test 2 will evaluate the subjects related to chapters 3 to 6 and will be quoted for 12 values. Student will be approved if final result, rounded, is greater or equal than 10 values (out of 20) and the result of each test is greater or equal than 40%. The test results will only be available after the student opts for this evaluation method.

ii) On evaluation by exam, student will be approved if result, rounded, is greater or equal than 10 values (out of 20).

Conditions for Results Improvement
According to "REACTA - Regulamento de Avaliação de Conhecimentos e Transição de Ano dos Estudantes das Licenciaturas do Instituto Superior de Engenharia de Coimbra".

Date
2019/01/21

Signature from the lecturer responsible for the course

Signature