

SYLLABUS

Approved,
DEAN

1. Program Data

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| 1.1. Institution of Higher Education | Babeş-Bolyai University |
| 1.2. Faculty | Faculty of Engineering |
| 1.3. Department | Department of Engineering Science |
| 1.4. Field of Study | Electrical Engineering |
| 1.5. Course of Study | License/ Bachelor |
| 1.6. Study Programme | Electromechanics |

2. Discipline Data

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|-------------------------------|--|---------------|---|----------------------|---|------------------------|----|
| 2.1. Discipline Name | Mechanics and strength of materials | | | | | | |
| 2.2. Course Coordinator | Lecturer phd.eng. Ana-Maria BUDAI | | | | | | |
| 2.3.1. Seminary Coordinator | Lecturer phd.eng. Ana-Maria BUDAI | | | | | | |
| 2.3.2. Laboratory Coordinator | Lecturer phd.eng. Ana-Maria BUDAI | | | | | | |
| 2.3.3. Project Coordinator | - | | | | | | |
| 2.4. Year of Study | I | 2.5. Semester | I | 2.6. Evaluation Time | E | 2.7. Discipline Regime | DD |

3. Estimated Total Time (hours per semester of teaching activities)

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|--|------------|-------------------------|-----------|---------------------------|--------------|
| 3.1. Number of Hours per Week | 5 | from which: 3.2. Course | 2 | 3.3. seminary/ laboratory | 2/1 |
| 3.4. Total Hours from the Curriculum Plan | 70 | from which: 3.5. Course | 28 | 3.6. seminary/ laboratory | 28/14 |
| Time Fund Distribution - hours | | | | | 80 |
| Study of Handbook, Course Materials, Bibliography & Notes | | | | | 36 |
| Additional Documentation in Library, on Special E-learning Platforms & in the Field | | | | | 25 |
| Preparation of seminars/laboratories/ projects, topics, reports, portfolios & essays | | | | | 15 |
| Mentoring | | | | | - |
| Examination | | | | | 4 |
| Other Activities | | | | | - |
| 3.7. Total Time of Individual Study | 80 | | | | |
| 3.8. Total Hours per Semester | 150 | | | | |
| 3.9. Number of Credits | 6 | | | | |

4. Pre-condition (where is the case)

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| 4.1. of Curriculum | • High school physics |
| 4.2. of Competences | • Interpretation of practical results and computer usage |

5. Condition (where is the case)

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| 5.1. of Course Progress | • computer, internet access / classroom, video projector |
| 5.2.1. of Seminary Progress | • computer, internet access / classroom, video projector |
| 5.2.2. of Laboratory Progress | • computer, internet access, specialized laboratory |
| 5.2.3. of Project Progress | • - |

6. Acquired Specific Competences

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| Professional Competences | <ul style="list-style-type: none"> • Application and adequacy of specialized knowledge of mathematics, physics, informatics specific in the field of electrical engineering (<i>PCI</i>). • Operating with specialized concepts in the field of computer technology and information technology. (<i>PC2</i>) |
| Transversal Competences | <ul style="list-style-type: none"> • Identifying the objectives to be achieved, the available resources, the conditions for their completion, the work stages, the related deadlines and the related risks. (<i>TC 1</i>) • Identify roles and responsibilities in a multidisciplinary team and apply effective relationship and work techniques within the team. (<i>TC 2</i>) • Efficient use of information resources and of assisted communication and training resources (internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in a language of international circulation. (<i>TC 3</i>) |

7. Discipline Objectives (coming out from the Checklist of Acquired Specific Competences)

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| 7.1. General Objective of Discipline | <ul style="list-style-type: none"> The acquisition by the student of the fundamental notions regarding the statics of the material systems Familiarization of the future engineer with the main theoretical and practical calculation tools, for the dimensioning, verification and calculation of the load-bearing elements that enter the structure of the engineering material systems. |
| 7.2. Specific Objectives | <ul style="list-style-type: none"> Identifying and determining the values of the stresses of the components of engineering structures. Mastering the work steps to be followed in order to design and rehabilitate engineering structures in known operating conditions. |

8. Content

| 8.1. Course | Teaching methods | Observation |
|--|--|-------------|
| 1. Newtonian laws of mechanics. Scalar quantities and vector quantities. The moment of a force on a point and an axis. | Exposure, problematization, conversations, explanations | 2 hours |
| 2. Forces that strain the material body. The torque. Reduction of competing forces. | | 2 hours |
| 3. The torsor of a force to a point. The torsor of a system of forces. Central axis. The center of mass of a rigid material body. Rigid solid bonds. The balance of the rigid solid. | | 2 hours |
| 4. Reduction of distributed forces. Mechanical stress components. Relationships between stresses and sectional efforts. Specific deformations and displacements. Hooke's law. | | 2 hours |
| 5. Axial force diagrams. Torque diagrams. Diagrams of shear forces and bending moment. Sign conventions. | | 2 hours |
| 6. Static moment. Moments of inertia and strength modulus to flat sections. Steiner's relationship. Moments of inertia in simple sections. Main moments of inertia. Rays of inertia. Moments of inertia at complex sections. | | 2 hours |
| 7. Stretching stresses. Shearing parts. | | 2 hours |
| 8. Bending stresses. Torsion of the bars | | 2 hours |
| 9. Compound stresses. General. Axial and bending stress. Eccentric stretch stress. Compound stresses with normal and tangential stresses. | | 2 hours |
| 10. Euler's formula. Usual cases of buckling. Tetmajer - Iaşinski's formula. | | 2 hours |
| 11. Inertia stresses. Shock stresses. Dynamic twisting stresses. | | 2 hours |
| 12. Types of stress cycles. The mechanism of fatigue rupture. Factors that influence the fatigue strength of a part. | | 2 hours |
| 13. Mechanical properties of materials. Tests characteristic of the strength of materials. | | 2 hours |
| 14. Estimation of fatigue life. | | 2 hours |
| Bibliography <ul style="list-style-type: none">Budai,A.M., <i>Mechanics and strength of materials</i>, Publishing House E.Murgu, Reşiţa, 2012;Suciu, L., <i>Mechanics. Static. Theory and applications</i>, Publishing House Eftimie Murgu, Reşiţa, 2010;Mănescu, T.Ş., <i>Streghth of materials</i>, Publishing House Eftimie Murgu, Reşiţa, 2010.e-mail: ana.budai@ubbcluj.ro | | |
| 8.2.1. Seminary | Teaching methods | Observation |
| 1. Vector calculation | Explanations using calculation example, solving similar problems | 2 hours |
| 2. Reduction of force systems | | 2 hours |
| 3. Reducing torsion and central axis | | 4 hours |
| 4. Determination of centers of mass (centers of gravity) | | 4 hours |
| 5. Effort charts | | 6 hours |
| 6. Determination of moments of inertia and resistance modules | | 4 hours |
| 7. Simple stresses calculation | | 4 hours |
| 8. Assessment of knowledge gained | | 2 hours |
| Bibliography <ul style="list-style-type: none">Lenuţa Suciu; „<i>MECHANICS. Statics - Theory and applications</i>”, Publishing House „Eftimie Murgu”, Reşiţa, 2010.Tiberiu Ştefan Mănescu; „<i>Practical applications of strength of materials</i>”, Publishing House „Eftimie Murgu”, Reşiţa, 2009.e-mail: ana.budai@ubbcluj.ro | | |

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|---|--|-------------|
| 8.2.2. Laboratory | Teaching methods | Observation |
| 1. Presentation of laboratory topics. Labor protection rules | Group work, problem solving and discovery, linking theoretical knowledge to practical applications | 2 hours |
| 2. Simple stresses. Tensile test. | | 2 hours |
| 3. Simple stresses. Bending test. | | 2 hours |
| 4. Shear test | | 2 hours |
| 5. Buckling test. | | 2 hours |
| 6. Verification of the reciprocity theorem of displacement. | | 2 hours |
| 7. Evaluation of laboratory activity. | | 2 hours |
| Bibliography <ul style="list-style-type: none">Mănescu, T.Ș., Stroia, M.D.,ș.a., <i>Practical applications of strength of materials</i>, Publishing House Eftimie Murgu, Reșița, 2009;Pricop M., Scurtu I.C., ” Laboratory strength of materials guide”, Constanța, 2014;e-mail: ana.budai@ubbcluj.ro | | |
| 8.2.3. Project | Teaching methods | Observation |
| 1. - | - | - |
| Bibliography | | |

9. Corroborating Discipline's Contents with the Expectation of the Epistemic Community Representatives, the Professional Associations and the Employers' Representatives from the Programme Corresponding Field

- They have been established with the main employers by previous discussions at the study programme substantiation.

10. Evaluation

| Type of activity | 10.1. Evaluation criteria | 10.2. Evaluation methods | 10.3. Weight from the final grade |
|---|--|--------------------------|-----------------------------------|
| 10.4. Course | Debates participation | Number of interventions | 10 % |
| | Acquired knowledge level | Exam (oral) | 60 % |
| 10.5.1. Seminary | Activity / implication | Number of interventions | 10 % |
| | Gained competence level | Test (written) | 10 % |
| 10.5.2. Laboratory | Activity / implication | Number of interventions | - |
| | Gained competence level in practice | Interactive | 10 % |
| 10.5.3. Project | Readiness in phrasing the project stages | - | - |
| | Project quality | - | - |
| 10.6. Performance Minimum Standard | | | |
| <ul style="list-style-type: none"> • Completion of Applicative Activities (laboratory / seminary work accomplishment approval by the minimum grade of 5). • Completion of final exam by the minimum grade of 5. | | | |

Completion Date

03.05.2022

Course Coordinator's Signature

Lecturer phd.eng. Ana-Maria BUDAI

Laboratory / Seminary Coordinator's Signature

Lecturer phd.eng. Ana-Maria BUDAI

Department Endorsement Date

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Chief of Department Signature

Lecturer phd.fiz. Cornel Hațiegan