

### 1.1.1 Elastic Stability

#### GENERAL

|   |                              |                 |     |
|---|------------------------------|-----------------|-----|
| <b>SCHOOL</b>   | Engineering                  |                 |     |
| <b>ACADEMIC UNIT</b>  | CIVIL ENGINEERING            |                 |     |
| <b>LEVEL OF STUDIES</b>   | Undergraduate                |                 |     |
| <b>COURSE CODE</b>  | ΔOM028                       | <b>SEMESTER</b> | 8th |
| <b>COURSE TITLE</b>   | Elastic Stability            |                 |     |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br><i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i> | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b>  |     |
|   | 4                            | 5               |     |
|   |                              |                 |     |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>  |                              |                 |     |
| <b>COURSE TYPE</b><br><i>general background, special background, specialised general knowledge, skills development</i>  | Specialization Course        |                 |     |
| <b>PREREQUISITE COURSES:</b>  |                              |                 |     |
| <b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>  | Greek                        |                 |     |
| <b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>  | No                           |                 |     |
| <b>COURSE WEBSITE (URL)</b>   |                              |                 |     |

#### LEARNING OUTCOMES

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| <p><b>Learning outcomes</b><br/><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i></p> <p>Consult Appendix A</p> <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</li> <li>• Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</li> <li>• Guidelines for writing Learning Outcomes</li> </ul>   |  |  |
| <p>Upon successful completion of the course, students are expected to:</p> <ol style="list-style-type: none"> <li>1) Identify problems related to the stability of structural elements and constructions.</li> <li>2) Select appropriate strategies for addressing stability problems under static and dynamic loads.</li> <li>3) Determine equilibrium paths and critical points in structures depending on the applied loading.</li> <li>4) Evaluate the behavior of structural elements against buckling</li> <li>5) Dimension the members and connections of the load-bearing system.</li> </ol>   |  |  |
| <p><b>General Competences</b><br/><i>Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> <i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i><br/> <i>Adapting to new situations</i><br/> <i>Decision-making</i><br/> <i>Working independently</i><br/> <i>Team work</i> </td> <td style="width: 50%; border: none;"> <i>Project planning and management</i><br/> <i>Respect for difference and multiculturalism</i><br/> <i>Respect for the natural environment</i><br/> <i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i><br/> <i>Criticism and self-criticism</i> </td> </tr> </table> | <i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i><br><i>Adapting to new situations</i><br><i>Decision-making</i><br><i>Working independently</i><br><i>Team work</i>   | <i>Project planning and management</i><br><i>Respect for difference and multiculturalism</i><br><i>Respect for the natural environment</i><br><i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i><br><i>Criticism and self-criticism</i> |
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|  |  |
|--|--|
| <i>Working in an international environment</i>     | <i>Production of free, creative and inductive thinking</i> |
| <i>Working in an interdisciplinary environment</i> | .....  |
| <i>Production of new research ideas</i>            | <i>Others...</i>   |
|  | .....  |

  

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| <ul style="list-style-type: none"> <li>- Search for, analysis and synthesis of data and information, with the use of the necessary technology</li> <li>- Adapting to new situations</li> <li>- Decision-making</li> <li>- Working independently</li> <li>- Team work</li> <li>- Working in an interdisciplinary environment</li> <li>- Project planning and management</li> <li>- Criticism and self-criticism</li> <li>- Production of free, creative and inductive thinking</li> </ul> |
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**SYLLABUS**

Principles of the elastic stability theory. Stable, unstable and neutral equilibrium. Bending as a stability issue. Differential bending equation.  
 Influence of axial forces. Bending as an eigenvalue problem. The influence of boundary conditions. Stability criterion - Stability determinant, Orthogonality condition of functions. Energy methods (Timoshenko total potential). Rayleigh-Ritz and Galerkin methods.  
 The problem of elastic stability of surface structures. Strength and stability checks of shells, thin plates, tanks, and silos.

**TEACHING and LEARNING METHODS - EVALUATION**

|   |  |                          |
|---|--|--------------------------|
| <b>DELIVERY</b><br><i>Face-to-face, Distance learning, etc.</i>   | Face to face.  |                          |
| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b><br><i>Use of ICT in teaching, laboratory education, communication with students</i>   |  |                          |
| <b>TEACHING METHODS</b><br><i>The manner and methods of teaching are described in detail.<br/>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.<br/><br/>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</i>                              | <b>Activity</b>  | <b>Semester workload</b> |
|   | Lectures   | 52                       |
|   | Individual study   | 78                       |
|   |  |                          |
|   |  |                          |
|   |  |                          |
|   |  |                          |
|   | Course total (26 hours workload per ECTS credit)   | <b>130</b>               |
| <b>STUDENT PERFORMANCE EVALUATION</b><br><i>Description of the evaluation procedure<br/><br/>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other<br/><br/>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i> | <ol style="list-style-type: none"> <li>1. Assignment of tasks aimed at exploring the understanding of the concepts taught.</li> <li>2. Final written exam at the end of the semester (in Greek).</li> <li>3. Each student is given the opportunity to review their written exam and have their mistakes analyzed.</li> </ol> |                          |

## ATTACHED BIBLIOGRAPHY

- Gantes Ch., NonLinear Behavior of Structures, HEAL-Link, 2015, <http://hdl.handle.net/11419/5318> (in Greek)
- Sogianopoulos D., NonLinear Stability of Structures, HEAL-Link, 2015, <http://hdl.handle.net/11419/2024> (in Greek)
- Kounadis A., Elastic Stability Linear Theory 2nd ed., Symeon publ., 1997 (in Greek)
- Timoshenko Gere, Theory of Elastic Stability, Dover Civil and Mechanical Engineering, 2009, ISBN-10: 0486472078
- Bazant Cedolin, Stability of Structures Stability of Structures, Elastic, Inelastic and Damage Theories, 1991, Εκδόσεις Oxford University, ISBN-10: 0195055292