Alanya Alaaddin Keykubat University | Rafet Kayış Faculty of Engineering
Mechanical Engineering Department
2021-2022 Fall Semester
**SYLLABUS**

| | |
|---|---|
| **Code/Name** | SEC 301.2 / Computer Aided Structural Analysis |
| **Type** | Elective |
| **Credit/ECTS** | 6/6 |
| **Hour per Week** | 4 (2+0+2) |
| **Level/Year** | Undergraduate/3 |
| **Semester** | Fall |
| **Classroom** | TBA |
| **Content** | Computer-aided structural analysis using commercial finite-element analysis software. Finite element modeling techniques of engineering problems in the design of a machine or its components. Linear static analysis for shell and solids structures, non-linear static analysis, plasticity, contact problems, and large deformations and buckling. Dynamic loading conditions, frequency response analysis, natural frequency extraction, and impact problems. |
| **Prerequisites** | MEC 201 Strength of Materials I |
| **Textbooks** | ***Primary***<br>Stolarski et. al., Engineering Analysis with ANSYS Software, Elsevier Butterworth-Heinemann, 2nd Ed., 2018.<br>***Supplementary***<br>R. G. Budynas, J. K. Nisbett, Shigley´s The Finite Element Method and Applications in Engineering Using ANSYS, Springer, 2nd Ed., 2015. |
| **Objectives** | • To explain the principles of Finite Element Analysis (FEA).<br>• To apply the FEA using commercial ANSYS FEA software to solve structural problems |
| **Course Outcomes** | In this course you will be able to:<br>CO1 Demonstrate a basic understanding of the concepts, mathematical formulation and numerical implementation underlying the FEM as applied to solid mechanics and thermal analysis<br>CO2 Analyze more complex mechanical and heat transfer problems using commercial FEA software.<br>CO3 Demonstrate the ability to invoke appropriate assumptions, select proper elements and develop FEA models that adequately and efficiently represent physical systems.<br>CO4 Demonstrate the ability to perform parametric and convergence studies for mechanical and thermal analysis and design;<br>CO5 Demonstrate the ability to give a professional and well-organized presentation and report of their work. |

**Weekly Schedule of Topics**

| W | Topic |
|---|---|
| 1 | Introduction to Finite Element Method-ANSYS |
| 2 | Overview of ANSYS Structure and Visual Capabilities |
| 3 | Application of ANSYS to Stress Analysis-Cantilever Beam |
| 4 | Application of ANSYS to Stepped Beam-Principles of St Venant |
| 5 | Application of ANSYS to Stress Concentration due to Elliptic Holes |
| 6 | Application of ANSYS to Modal Analysis |
| 7 | Application of ANSYS to 2D Fracture Analysis |
| 8 | Application of ANSYS to Thermo-Mechanics |
| 9 | Application of ANSYS to Contact Problems |

| | |
|---|---|
| 10 | Application of ANSYS to Buckling Analysis of Beam |
| 11 | Application of ANSYS to Axisymmetric Analysis |
| 12 | Application of ANSYS to Welding |
| 13 | Application of ANSYS to Bonding |
| 14 | Student Applications |

| | |
|---|---|
| **Professional Contribution** | Ability to analyze and design using a commercial FEA software |

**Contribution to Program Outcomes***

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 5 | 1 | 5 | 0 | 5 | 0 | 0 | 1 | 0 | 3 | 5 |
| CO2 | 5 | 1 | 4 | 0 | 5 | 0 | 0 | 1 | 0 | 3 | 5 |
| CO3 | 5 | 1 | 3 | 0 | 5 | 0 | 0 | 1 | 0 | 4 | 5 |
| CO4 | 5 | 1 | 3 | 0 | 4 | 0 | 0 | 1 | 0 | 2 | 5 |
| CO5 | 5 | 1 | 5 | 0 | 4 | 0 | 0 | 1 | 0 | 5 | 5 |
| CO6 | 0 | 0 | 0 | 1 | 0 | 4 | 5 | 0 | 0 | 0 | 0 |

* Contribution Level | 0: None | 1: Very Low | 2: Low | 3: Medium | 4: High | 5: Very High

| | |
|---|---|
| **Special Conditions** | • Students work in groups for presentation and assignment.<br>• The consequence of violation of the attendance rule is to receive a grade of **NA.** |
| **Requirements** | Basic knowledge of statics |
| **Evaluation** | Midterm Exam 30%<br>Assignment 20%<br>Final Exam 50%<br>Total 100% |
| **Rubric** | A rubric will be announced prior to presentation sessions. The rubric has 2 main parts for the grading: technical assessment (50%) and writing or presentation performance (50%) |
| **Course Policy** | 1. You must attend at least 70% of the sessions including add-drop period.<br>2. Be in the class on time.<br>3. English should always be used to communicate with one another.<br>4. Mobile phone should be switched off and put away during the class.<br>5. You cannot talk to your friends during class no matter what the subject is. |
| **Cheating & Plagiarism** | • Copying or letting someone to copy your work on exams, assignments, or reports is cheating.<br>• Cutting and pasting text, figures and tables from the web sources or any other electronic source is plagiarism.<br>• The consequence of academic dishonesty is to receive a grade of **F** for the course. |

**Instructor**



| | | | |
|---|---|---|---|
| Name/Surname | Sefa Yıldırım | Email | sefa.yildirim@alanya.edu.tr |
| Room | 233 | Office Hours | TBA |