AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Applications of Finite Element Analysis								
Course Code	MME631		Couse Level	Third Cycle (Doctorate Degree)					
ECTS Credit	8	Workload	200 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	Giving students a numerical method that can solve complex problems faced by engineers or problems that can not be closed form solutions with an acceptable approximation								
Course Content	Linear Algebra and Tansorr Mechanics; Examination of Basic Finite Element Method approaches; Application Areas of the Finite Element Method and how to apply them; Introduction of simulation types (Analytical and Numerical Finite Element Methods under Elastic and Plastic Conditions, Stress-Strain Relations, Experimental Determination and Calculations of Mechanical Properties, Sample Problems and Simulation Applications.								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Demonstration, Discussion, Case Study, Project Based Study, Individual Study								
Name of Lecturer(s)									

Prerequisites & Co-requisities	
Language Requisite	Yes

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	20
Final Examination	1	50
Seminar	1	15
Assignment	1	15

Recommended or Required Reading	
1	Finite Element Procedures 2nd Ed., K.J. Bathe, Prentice Hall, New Jersey, 1996.
2	A First Course in the Finite Element Method 5th Ed., Daryl L. Logan, Cengage Learning, Stamford USA, 2010.
3	An Introduction to the Finite Element Method 3rd Ed., J.N. Reddy, McGraw-Hill, Singapore, 2006
4	Finite Element Analysis: Theory and application with ANSYS, Saeed Moaveni, Prentice Hall, New Jersey, 1999
5	FEM Simulations with Ansys Workbench 14, Theory, Applications, Case Studies, Huei Huang Lee, SDC Publications, 2014
6	Elasticity, Theory, Applications, and Numerics 3rd Ed., Martin H. Sadd, Academic Press (Elsevier), Massachusetts, USA, 2014
7	Schaum's Outlines: Linear Algebra 3rd Ed., Seymour Lipschutz, Marc Lars Lipson, McGraw-Hill, USA, 2001

Week	Weekly Detailed Course Contents	
1	Theoretical	Introduction, Basic concepts and application areas of Finite Element Method
2	Theoretical	Introduction, Basic concepts and application areas of Finite Element Method
3	Theoretical	Linear Algebra fast repetition
4	Theoretical	Introduction to elasticity, and Hooke equations
5	Theoretical	Direct Stiffness Method and Linear Spring Element Approach
6	Theoretical	Linear, Static Analysis of Bar and Beam Elements; Analytical and Simulation applications; Comparing with Basic Strength Problems and interpreting the results
7	Theoretical	Distributed loads in bars, 2D and 3D Bar Elements, Transformation Matrices; Analytical and Simulation applications
8	Intermediate Exam	Midterm
9	Theoretical	2D and 3D Beam Elements; Equivalent point loads of transverse distributed loads; Analytical and Simulation applications
10	Theoretical	Analysis of Frame Systems with Finite Elements; Analytical and Simulation applications
11	Theoretical	2D Problems: Plane Stress, Plane Strain, Stress-Stress Thermal Relations, Strain and Displacement, Boundary Conditions, Definite (Exact) Elastic Solution and Constant Stress Triangle (CST or T3) and Analytical Applications
12	Theoretical	Linear Strain Triangle (LST or T6), Linear Quadrilateral Element (Q4), Quadratic Quadrilateral Element (Q8); Analytical and Simulation applications

13	Theoretical	Load Transformations and Stress calculation; Analytical and Simulation applications
14	Theoretical	Sonlu Elemanlar Çözümleme Teknikleri
15	Theoretical	Plane and Shell Elements, 3D Solid Elements and Elasticity
16	Final Exam	Final Exam

Workload Calculation

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	6	3	126
Assignment	7	3	1	28
Midterm Examination	1	20	3	23
Final Examination	1	20	3	23
			Total Workload (Hours)	200
			[Total Workload (Hours) / 25*] = **ECTS**	8

**25 hour workload is accepted as 1 ECTS*

Learning Outcomes

1	Calculates 1D, 2D and 3D Linear elastic problems with fundamental analytical approach by Finite Element Method
2	Makes problems simpler and enables simulations
3	Simulates 1D, 2D and 3D Linear elastic problems in a fundamental way
4	Implements computer aided simulations
5	Interprets computer aided simulation results in real terms

Programme Outcomes *(Mechanical Engineering (English) Doctorate)*

1	1. In Mathematics, natural sciences and mechanical engineering, department has the sufficient infrastructure; the ability to use the theoretical and practical information for engineering solutions
2	2. The ability to identify, define, and solve the formula for complex engineering problems; the ability to select and apply for the appropriate analytical methods and modelling techniques
3	3. To meet desired needs of a system, system component, or process, analysing and designing skill under realistic constraints; in this respect, the ability to apply the methods of modern design
4	4. The ability to use and choose modern techniques and tools for required engineering applications and; the ability to use information technology effectively
5	5. The ability to design the experiment, collect the data for the experiment and interpret to analysing results
6	6. The ability to use computer software and hardware information, access to information and other information sources
7	7. The ability to work individually and with multidisciplinary teams effectively, taking responsibility self-confidence for complex situations
8	8. The ability to communicate with foreign colleagues by having high level of foreign language knowledge in the field of engineering
9	9. Monitoring the science and technology developments and the ability to renew itself with innovative ideas constantly
10	10. Professional and ethical responsibility awareness
11	11. Having an adequate information and awareness in the subjects of occupational safety, occupational health, social security rights, quality control and management issues of environmental protection
12	12. The ability to appreciate the effects of engineering solutions and applications in universal and social dimensions
13	13. The ability to be enlightened to the experts or non-expert audience groups on the issues related with engineering problems and solutions written and oral
14	14. The ability to have adequate knowledge and skills in the project development and application, manage the activities planning, including the projects to the employees having the responsibility of the project by increasing vocational awareness

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	4	4	4	4	5
P2	5	3	5	4	5
P3	4	3	3	4	5
P4	4	5	3	3	4
P5	5	4	4	5	4
P6	4	3	4	4	3
P7	4	3	3	3	5
P8	4	5	5	5	4

P9	4	5	5	4	3
P10	5	4	4	5	5
P11	5	3	5	5	3
P12	4	5	5	5	4
P13	4	5	5	4	5
P14	5	5	5	5	5