COMPUTER AIDED ENGINEERING
2016-2017

Bachelor Degree:	Mechanical Engineering		803G
Course title:	Computer Aided Engineering		611
Year/Semester:	4º/1º	ECTS Credits:	4.5

DEPARTMENT

Mechanical Engineering					
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ENGLISH-FRIENDLY FACULTY

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CONTENTS

UNIT 1: INTRODUCTION TO FINITE ELEMENT METHOD (FEM)
Numerical methods. MEF foundation. Applications.

UNIT 2: DISCRETIZATION
Domain discretization. Primitive method and shape functions method. Natural coordinates and reference elements. Isoparametric formulation. Shape functions for one-dimensional, 2-D and 3-D elements. Finite element order. Lagrangian and serendipity elements. P-Method and H-Method.

UNIT 3: FEM FORMULATION (6 hours)
Fundamental assumptions of elasticity. Strain compatibility equations. Constitutive equations in 1D, 2D (plane stress, plane strain, axial symmetry) and 3D. Virtual work principle. Minimum total potential energy principle. Stiffness matrix. Elements assembly. Expanded stiffness matrix. Complete stiffness matrix. Boundary conditions and loads.

UNIT 4: CONVERGENCE AND ERROR
Conditions of displacement functions. Convergence criteria. Equilibrium and instability. Errors. Recovery processes and error estimators.

REFERENCES

Title
ALAWADHI, E.M. (2010) Finite element simulations using Ansys. CRC Press Taylor & Francis Group
CHOUDARY, R.B. (2011) Introduction to Ansys 10.0. IK International Publishing House
MADENCI, E., GUVEN, I. (2007) The finite element method and applications in engineering using Ansys. Springer
MOAVENI, S. (2008) Finite element analysis: theory and application with Ansys. Pearson Prentice Hall
NAKASONE, Y., YOSHIMOTO, S. (2006) Engineering analysis with Ansys software. Butterworth-Heinemann

EVALUATION SYSTEM

Attendance and participation in classroom activities (10%; unrecoverable)

Written exam (60%; recoverable)

Oral presentation of works (5%, unrecoverable)

Course works reports (10%, unrecoverable)

Practices reports (15%; unrecoverable)

A minimum total score of 5/10 points and a minimum score of 4/10 in written exam are required. A minimum 90% attendance in classroom activities is required to consider unrecoverable evaluation systems.