Seoul National University of
Science & Technology
232 Gongneung-ro,Nowon-gu,
Seoul 01811 Korea

MSDE Module Descriptor

Module Title Computer Aided Engineering	**Module Code** MSDE 327	**Semester (Sem 1 / Sem 2)** Sem 2
Credits 10	**Level** 5	**Professor and email** Hyo-Sok Ahn hsahn@seoultech.ac.kr
Delivery Method Lecture	**Delivery Location** SeoulTech, Mugung Hall	

Module Synopsis

The module concentrates on the basic theory of the Finite Element Method (FEM) and its applications by using the CAE commercial program such as the ANSYS. Before making and analysing a modelling using the ANSYS, solid mechanics are reviewed to make the students understand the theoretical backgrounds. The basic concept is introduced at the beginning while considering one dimensional problems and its extension to two and three dimensional problems is briefly discussed. Applications to one and two dimensional problems are discussed.

Outline Syllabus

Theoretical Study

FEM General Overview
Basic Concept of the FEM

Linear Algebra
Matrix production, addition and subtraction; Inverse matrix; Determination,

One-dimensional Elements (Bar and Beam Elements)
Linear one-dimensional elements; Element shape function; Stiffness matrix; Bar elements in 2D and 3-D space; Direct method and formal approach to build-up stiffness marix
Simulation : Beams and Plates
Simulation : Heat Transfer, Thermal Stresses

Shape function
Finite element basis functions in 1D; Element shape functions; Two-node linear element; Three-node element: quadratic interpolation; Four-node (cubic) elements; Master elements in natural coordinate; Global and element shape functions

Two Dimensional Elements
Statics; Finite Elements for 2-D Problems***; Stiffness matrix***

Laboratory
Basic Concepts for FE Programs ANSYS;
User environment of ANSYS, and how to use it basically
How to make a modelling for FE analysis I, II, and III; Creation of FE model
Constraint and boundary conditions, application of load, and executing analysis

Examples – Truss & Beam analysis;
Practices of ANSYS using WORKBENCH II for the term project

Indicative Reading

1) Finite Element Analysis: Theory and Application with ANSYS (3rd Ed.), Saeed Moaveni, 2007Reference: Finite Element Simulations with ANSYS Workbench 14, Huei-Huang Lee, SDC
2) Introduction to Finite Element Analysis and Linear Analysis by TAESUNG Software & Engineering, Inc. 2010

NOTIONAL STUDENT WORKLOAD	**Hours**
MODE OF DELIVERY (FT / PT / DL)	FT
Lectures	30
Seminars	
Tutorials	10
Laboratories/studios/practical	30
Directed learning	10
Independent Learning	10
Work experience/fieldwork	
Other: eg formal presentation	10
Total Workload 100 hours for a 10 credit module 200 hours for a 20 credit module	100

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Module Learning Outcomes	
KU1,3,4	KU1. Apply advanced knowledge of the scientific and mathematical foundations of engineering to solve problems. KU3. Identify and utilise advanced methodologies to create solutions to a variety of engineering problems. KU4. Define and investigate complex interdisciplinary problems and constraints that occur in mechanical engineering design with the aid of specialist tools and the latest research.
IPSA4	IPSA4. Illustrate solutions to basic engineering problems.
PVA2,4	PVA2. Apply creativity in the development of solutions to standard engineering problems. PVA4. Apply effective interpersonal and learning skills.

Assessments	Assessment Type	Weighting %	Mid-Term/interim/final
Coursework			
Project	Group project 1 Group project 2 (Term project)	25 45	
Quiz			
Test			
Laboratory			
Exam	2 hrs exam	30	Mid-term
Presentation			