Department of Mathematics

Course Profile

<table>
<tr><td>Course Number: MATH252</td><td>Course Title: Introduction to Mathematical Engineering</td></tr>
<tr><td>Required / Elective: Required</td><td>Prerequisites: None</td></tr>
<tr><td>Catalog Description: Concept of mathematical modeling, examples from physics, mechanics, and engineering applications. Statics of rigid bodies, general principles; force and moment equilibrium. Structural analysis, modeling of 3D bodies as 1D body, internal loading, stress and strain, mechanical properties of materials. Analysis of bars under several type of loading.</td><td>Textbook / Required Material:
R.C.HIBBELER, Statics and Mechanics of Materials, (2004), Princete Hall
J. N. KAPUR, Mathematical Modeling, (1990), Wiley Eastern</td></tr>
<tr><td colspan="2">Course Structure / Schedule: (3+0+0) 3/ 4 ECTS</td></tr>
<tr><td colspan="2">Extended Description: What is mathematical engineering? Why modeling? Needs, techniques, classification (linear or nonlinear, static or dynamic, deterministic or stochastic, discrete or continuous) and simple illustrations. Mathematical modeling through differential equations. Mathematical models in physical sciences and engineering. Mathematical models of mechanical problems, vibrations, waves (conservation law). Modeling of structural systems. Basic concepts. Body, force, force systems. Equilibrium. Simple structures. Concepts of stress and strain. Material models, mechanical properties of materials. Concept of energy, elastic energy. Hooke’s law. Special problems (axial loading, torsion, bending,). Concept of stability.</td></tr>
<tr><td>Design content: None</td><td>Computer usage: No particular computer usage required</td></tr>
<tr><td colspan="2">Course Outcomes: By the end of the course the students should be able to:
1. present the basic ideas of mathematical modelling [2, 3, 6],
2. provide a mathematical and mechanical foundation for further studies in mechanics, material sciences and other branches of science and engineering [2, 3, 6, 7],
3. have the ability of using mathematics in the modelling engineering problems [2, 3, 6, 7].

[2] demonstrate knowledge of mathematics and mechanics to construct, analyze and interpret real world problems,

[3] demonstrate the ability to apply mathematics to the solutions of problems,

[6] have a basic knowledge of the main fields of mathematics and mechanics, including differential equations, elasticity theory, fluid mechanics,

[7] have an ability to function both independently and as a member of a multidisciplinary team.</td></tr>
<tr><td colspan="2">Recommended reading:</td></tr>
</table>

T. SVOBODNY, *Mathematical Modeling for Industry and Engineering,* (1998), Prentice Hall

I. GRANET, *Statics and Strength of Materials*, Holt, Rinehart and Winston, 1982.

J.G. ANDREWS, R.R. McLONE, *Mathematical Modeling* , (1976), Butterwords.

V. IVANOFF, *Engineering Mechanics*, McGraw-Hill, 1999.

Teaching methods: Lectures, presentation, problem solving.

Assessment methods:

Homework, quiz, midterm and final exams.

Student workload:

Pre-reading	15 hrs
Lectures ……	45 hrs
Preparatory reading ……..	30 hrs
Team work for presentation ……	10 hrs
**TOTAL …… **	**100 hrs …… to match 25x4 ECTS**

Prepared by : Esin İnan	Revision Date : 08.02.2010