Course Specifications

University: Benha University  Faculty: High Institute of Technology

Course specifications
Programme(s) on which the course is given: 1. Mechanical power engineering, 2. Production Engineering
Major or minor element of programmes: Major
Department offering the programme: Mechanical Engineering
Department offering the course: Mechanical Engineering

Academic year / Level: 2008/2009
Date of specification approval: June, 2009

A- Basic Information

Title: System Dynamic  Code: M 461
Credit Hours:  Lecture: 3
Tutorial: 2  Practical: 1  Total: 6

B- Professional Information

1 - Overall aims of course
On successful completion of the course student must be able to:

✓ Demonstrate knowledge and understanding of different mechanical, thermal, hydraulic and electrical systems.
✓ Knows the concepts and theories of modeling of lumped elements of mechanical, thermal, hydraulic and electrical systems.
✓ Demonstrate knowledge and understanding of methodology of mathematical modeling of mechanical, thermal, hydraulic and electrical system.
✓ Getting familiar with the analogy between the different systems: mechanical, thermal, hydraulic and electrical system.
✓ Getting familiar with the different techniques of solving the systems mathematical models.
✓ Know how to predict the system response for specified system parameters.
✓ Know how to identify the system parameters for a given system response.
2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:
   a.1 Define system type and system elements.
   a.2 The techniques and theories of lumped a group of system element to a single lumped element.
   a.3 Deduce the mathematical modeling of the system from the basic governing equations of the system.
   a.4 Analogies between the governing lows of the different systems: mechanical, thermal, hydraulic and electrical.
   a.5 The different methodologies of the system modeling and analysis.
   a.6 The parameters used for determine system response and system performance.

b. Intellectual skills
   b.1 Deduce a physical model for an actual model.
   b.2 Using analogy to find the mathematical model of a system from another system.
   b.3 Simplify a complicated system by lumped a group of its elements to a single elements.
   b.4 Predicting the system response knowing the system elements
   b.5 Analyze an actual system from the mechanical, thermal, hydraulic and electrical point of view.
   b.6 Mathematical tools used for system analysis

c- Professional and practical skills
   c.1 Use appropriate apparatus for lumped elements
   c.2 Design and constructing different physical models for actual models
   c.3 Design and perform experiments in the lab in a proper way
   c.4 Obtain and analysis of experimental data on system dynamics
   c.5 Use appropriate apparatus for finding system response.

d- General and transferable skills
   d.1 Write lab reports in accordance with the scientific guidelines
   d.2 Present and analysis of data on a scientific way
d.3 Discuss results and obtain conclusions

d.4 Work successfully as a part of a team

3- Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
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<tr>
<td>Introduction to System Dynamics: System, System Classifications, Further Classifications, Analysis of a system, Design of a system, Dynamic Investigations.</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Modeling of Lumped Mechanical Elements: Equivalent lumped mass, Springs, Dampers.</td>
<td>6</td>
<td>2</td>
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<tr>
<td>Modeling of Mechanical Systems: From physical model to mechanical model, Procedure of Modeling.</td>
<td>6</td>
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<tr>
<td>Modeling of Electrical System</td>
<td>3</td>
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<tr>
<td>Modeling of Thermal System</td>
<td>3</td>
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<tr>
<td>Modeling of Hydraulic System</td>
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<tr>
<td>Solution Methods: Differential equation, Laplace transformations</td>
<td>6</td>
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<td>6</td>
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<td>Response of Dynamic Systems: transient, steady state, and frequency response, Various input functions</td>
<td>3</td>
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<td>Response of First Order System</td>
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<tr>
<td>Response of Second Order System</td>
<td>6</td>
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<td>6</td>
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<tr>
<td>Characteristics of System</td>
<td>3</td>
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4– Teaching and learning methods
   4.1- Lectures
   4.2- Tutorials and discussion sessions
   4.3- Laboratories
   4.4- Small projects

5- Student assessment methods
   5.1 Written exams to assess the understanding of the air conditioning
                   profession and the design and required calculations of air
                   conditioning equipment and process.
   5.2 Oral Discussions to assess the students ability on discussions on subjects
                        related to the course contents,
   5.3 Class work to assess the discussion of the technical reports
                   assignments, data sheet calculations and measuring the
                   ability of system design and problem solving

Assessment schedule
   Assessment 1 (Written Exam)       Week 5
   Assessment 2 (Written Exam)       week 10
   Assessment 3 (Class Work)         weeks 1 to Week 15 (Continuous)
   Assessment 3 (Oral/Experimental Exam) week 14
   Assessment 4 (Final Written Exam) week 16

Weighting of assessments
   Assessment 1 (Written Exam)       10  
   Assessment 2 (Written Exam)       10  
   Assessment 3 (Class Work)         15  
   Oral /Experimental Exam.          5   
   Final Written Exam                60  
   Total                             100 

6- List of references

6.1- Course notes
   Lecture notes

6.2- Essential books (text books)

6.3- Recommended books

6.4- Periodicals, Web sites, ... etc

7- Facilities required for teaching and learning
   Teaching facilities (whiteboard, presentation board, data show)
   Laboratory

   Course coordinator: Dr. Sameh Nada

   Head of Department: Dr. Sameh Nada

   Date: //