Course Specifications

University: Benha University  Faculty: Benha Faculty of Engineering

Course specifications
Program(s) on which the course is given: Control and Measurements.
Major or minor element of programs: Major
Department offering the program: Electrical Engineering technology Dep.
Department offering the course: Electrical Engineering technology Dep.
Academic year / Level: Forth year
Date of specification approval: 2009

A- Basic Information
Title: Control Engineering  Code: E451
Credit Hours: N.A.  Lecture: 3
Tutorial: 3  Practical: 0  Total: 6

B- Professional Information
1 - Overall aims of course

2- Intended learning outcomes of course (ILOs)

a. Knowledge and understanding:
   • Describe with the components of automatic control systems
   • Describe the control system in state space representation.
   • Mention types of controller.
b. Intellectual Skills:
- Formulate time domain / frequency domain representation of control systems
- Analysis of linear dynamic systems, matrix representation of state equations, state-transition matrix, state-transition equation, controllability of linear systems, and observability of linear systems, state equations of linear
- Categorize control systems and evaluate their responses to external inputs
- Apply stability concepts to systems
- Apply P, PI, PID, Phase-Lead, Phase-Lag, Lead-Lag (Lag-Lead) and Bridged-T (Notch) Controller
- Analyze control systems using root-locus and/or frequency response methods

c- Professional and practical skills
By the end of this course, the student should be able to:
- Perform simple Lab experiments.
- Design control systems using root-locus and/or frequency response methods.
- Design with the PI, PID, Phase-Lead, Phase-Lag, Lead-Lag and (Lag-Lead) Controler in state space.

d- General and transferable skills
By the end of this course, the student should be able to:
- Work cooperatively and effectively in a group

3- Contents

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<thead>
<tr>
<th>Topic</th>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/ Practical</th>
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<tr>
<td>Introduction</td>
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<tr>
<td>Classical design and design specifications in the time domain</td>
<td>8</td>
<td>4</td>
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<td>Cascade compensation</td>
<td>6</td>
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<tr>
<td>Design using the root locus in time-domain</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Design using the bode plot in frequency domain</td>
<td>10</td>
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<tr>
<td>Introduction to state space models of typical control system components</td>
<td>6</td>
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<tr>
<td>Diagonalization</td>
<td>6</td>
<td>3</td>
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<td>Solution of state equations</td>
<td>6</td>
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<td>Concept of controllability and observability</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Design examples</td>
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<td>Total</td>
<td>84</td>
<td>42</td>
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4– Teaching and learning methods

4.1- Lectures  
4.2- Tutorials  
4.3- Practice in Laboratories  
4.4- Internet collected information and Self-study projects

5- Student assessment methods

5-1- Written exams (Final and Midterm), assignments and quizzes to assess knowledge and understanding, solving problems skills and interpretation capabilities of physical phenomena.  
5-2- Oral exams to assess the abilities of discussing physical concepts  
5-3- Practical exam to assess measuring and professional skills

Assessment schedule

Quiz 1  .........................Week No. 4  
Midterm  .........................Week No. 8  
Quiz 2  .........................Week No. 12  
Oral and Practical exam.........Week No. 14  
Final written exam .............Week No. 15

Weighting of assessments

Final-term examination  60%  
Semester work  40%  
Total  100%
6- List of references
   - Essential books
     **Modern Control Engineering** by Katsuhiko Ogata
   - Recommended books
     1. **Modern Control Systems** by Richard C. Dorf and Robert H. Bishop
     2. **Automatic Control Systems** by Benjamin C. Kuo
     3. **Control Systems Engineering** by Norman S. Nise
     4. **Advanced Control Engineering** by Roland Burns
     5. **Modern Control Technology--Components & Systems** by Delmar Thomson

7- Facilities required for teaching and learning
   Lecture rooms – Tutorial section rooms – Experimental Labs - computers – Virtual simulation programs

Course coordinator:
Head of Department: Assoc. Prof. Ghada Amer
Date: