University / Academy : Menoufiya University

Collge / Institute : Faculty of Electronic Engineering

Department : Industrial electronics and Control Engineering

# Course Specification

| 1- Course basic information : | | |
|---|---|---|
| **Course Code: AC241** | **Course Title:** Control Engineering | **Academic year:** **Level (2 ) – Semester : 1** |
| **Department requirement** | **Teaching hours: Lecture** 3 **orial** ( 2 - | |

| **2- Aim of the course** | ○ To know the introduction and the basic knowledge of system engineering.<br>○ Having acquired a good knowledge of performing computations of transient response, frequency response and stability.<br>○ Analyzing the dynamics of a control system |
|---|---|
| **3- Intended Learning Outcomes:** | |
| **A- Knowledge and Understanding:** | a1) Concepts and theories of mathematics and sciences appropriate to industrial electronics and control engineering.<br>a3) Characteristics of engineering materials related to industrial electronics and control engineering.<br>a5) Methodologies of solving engineering problems, data collection and interpretation<br>a6) Quality assurance systems, codes of practice and standards, health and safety requirements and environmental issues.<br>a8) Current engineering technologies as related to industrial electronics and control engineering.<br>a14) Basics of design and analyzing electronic engineering systems, while considering the constraints of applying inappropriate technology and the needs of commercial risk evaluation.<br>a16) Principles of Analyzing and design of control systems with performance evaluation |
| B- Intellectual Skills | b1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems.<br>b2) Select appropriate solutions for engineering problems based on analytical thinking. |

| | |
|---|---|
| | b3) Think in a creative and innovative way in problem solving and design.<br>b7) Solve engineering problems, often on the basis of limited and possibly contradicting information.<br>b11) Analyze results of numerical models and assess their limitations.<br>b12) Create systematic and methodic approaches when dealing with new and advancing technology.<br>b13) Develop innovative solutions for the practical industrial problems.<br>b14) Analyze the performance of digital and analog control systems.<br>b17) Create solutions to control systems especially to manufacturing, maintenance and interfacing problems in a creative way, taking account of industrial and commercial constraints. |
| **C- Professional Skills** | c1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.<br>c2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, products and/or services.<br>c3) Create and/or re-design a process, component or system, and carry out specialized engineering designs.<br>c4) Practice the neatness and aesthetics in design and approach.<br>c7) Apply numerical modeling methods to engineering problems.<br>c9) Demonstrate basic organizational and project management skills.<br>c18) Manage field problem, identification, formulation and solution;<br>c19) Utilize practical systems approach to design and performance evaluation;<br>c24) Apply modern techniques, skills and engineering tools to control systems |
| **D- General Skills** | d2) Work in stressful environment and within constraints.<br>d3) Communicate effectively.<br>d5) Lead and motivate individuals.<br>d6) Effectively manage tasks, time, and resources.<br>d7) Search for information and engage in life-long self learning discipline.<br>d9) Refer to relevant literatures |
| **4- Course Contents** | Dynamic system model building principles.<br>Introduction, Differential equation, Laplace transform<br>Time response, Step and impulse responses<br>System transient response(steady state error and dynamics)<br>Basics of system modeling, |

| | |
|---|---|
| | Mathematical models, Physical models, Parameter models, Balance equations<br>Application to thermal systems, chemical and mechanical process, Mechanical and electromechanical systems<br>Analogy between different systems.<br>Characteristics of closed loop systems<br>Introduction to closed loop systems, Performance of control systems, Pole assignments.<br>Stability of linear systems, Routh Hurwitz stability |
| **5- Teaching and Learning Methods** | - **Lectures**<br>- **Tutorials**<br>- **Research assignments** |
| **6- Teaching and Learning Methods for disable students** | **NA** |
| **7- Student Assessment** | |
| **a- Assessment Methods** | **- Weekly sheet exercises at class room**<br>**- Quizzes**<br>**- Mid term, and final exams** |
| **b- Assessment Schedule** | **- Exercise sheet/ Lab assignment : Weekly**<br>**- Quizz-1: Week no 5**<br>**- Mid-Term exam: Week no 8**<br>**- Quizz-2: Week no**<br>**- Lab exam: Week no**<br>**- Final – term examination: Week no 16** |
| **c- Weighting of Assessment** | **- Class tutorial and quizzes : 16 %**<br>**- Mid-term examination: 16 %**<br>**- Case study and/or practical exam: … %**<br>**- Final – term examination: 68 %**<br>**- Other types of assessment: …… %**<br>**Total 100 %** |
| **8- List of text books and references:** | |
| **a- Course notes** | There are lectures notes prepared in the form of a book authorized by the department |
| **b- Text books** | Control system engineering, Ogata |
| **c- Recommended books** | |
| **d- Periodicals, Web sites ……etc** | IEEE Transaction on automatic control |

## Course contents - ILOs Matrix

| Content Topics | Week | A- Knowledge & Understanding | B- Intellectual skills | C- Professional and practical skills | D- General and transferable skills |
|---|---|---|---|---|---|
| Dynamic system model building principles.<br>Introduction<br>Examples for some practical system. | | a1, | b1, | c1, | d2 |
| Differential equation | | a5, | b2, | c2, | d3 |
| Laplace transform | | a6, | b3, | c7, | d2 |
| Time response.<br>Step and impulse responses | | a8, | b7, | c3, | d3 |
| System transient response(steady state error and dynamics) | | a3, | b12, | c9, | d5 |
| Basics of system modeling,<br>Mathematical models.<br>Physical models. | | a1, | b1, | c24 | |
| Parameter models.<br>Balance equations | | a14, | b11, | c1, | d2 |
| Application to thermal systems.<br>chemical and mechanical process | | a16, | b13, | c9, | d5 |
| Mechanical and electromechanical systems | | a14, | b14, | | d3 |
| Analogy between different systems. | | a5, | b17, | c18, | d5 |
| Examples of practical systems | | | b17, | | d6 |
| Characteristics of closed loop systems<br>Introduction to closed loop systems<br>Performance of control systems | | a3, | b1, | c4, | d6 |

| | | | | | |
|---|---|---|---|---|---|
| Pole assignments. | | a8, | b12, | c19, | d7 |
| Routh Hurwitz stability | | a3, | | c4 | ,d9 |

**Course coordinator:** **Prof. Abdelazim Sobieh Ibrahim**

**Head of Department:** **Prof. Mohamed A. Fkirin**

**Date:** / /