**University**: Benha University

**Faculty**: Faculty of Engineering at Shoubra

**Department offering the program**: Electrical Engineering Department

**Department offering the course**: Electrical Engineering Department

**1- Course Data**

**Course Code:** ECE 111 **Course Title:**  Principles of Electronic

**Semester/Year:** 1st / 2020-2021 **Specialization:** Electrical Engineering and Control

**Credit Hours:** 5 **Lecture:** 4 **Tutorial:** 2 **Lab:** 0

**2- Course Objectives**

For students undertaking this course, they will be able to:

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| 2.1- Demonstrate how diodes, transistors, and integrated circuits work, by first have to study semiconductors: materials that are neither conductors nor insulators.  |
| 2.2- Demonstrate how the doping semiconductor is important in fabrication technology. The rectifier importance to most electronic systems within the power supply which allow current to flow in only one direction.  |
| 2.3- Recognize few of applications for diodes and transistors.  |

**3- Course Competencies (NARS)**

**Level (A) Engineering Competencies**

*On completing this course, students will be able to:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
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| --- |
| **a- 1 - Demonstrate Characteristics of engineering materials related to semiconductors.(a4)**  |
| **a- 2 - Describe Principles of design including elements design, process and/or a system related to semiconductors. (a5)**  |
| **a- 3 - Illustrate electronic engineering principles underlying information technology.(a16)** |
| **a- 4 - Mention basics of design and analyzing of semiconductors. (a18)** |
| **a- 5 - Describe principles of analyzing and design of electronic devices (Diodes, transistors, and integrated circuits) .(a19)** |
| **a- 6 – Mention Methods of fabrication of Diodes and transistors. (a28)** |

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**Level (B) Electrical Engineering Competencies**

*At the end of this course, the students will be able to:*

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| --- |
| **b- 1 -Select appropriate solutions for diodes and transistors problems based on analytical thinking. (b3)**  |
| **b- 2 - Combine, exchange, and assess integrated circuits knowledge from a range of sources. (b5)**  |
| **b- 3 - Assess and evaluate the characteristics and performance of diodes, transistors, and integrated circuits. (b6)** |
| **b- 4 - Investigate the failure of diodes and transistors. (b7)** |

**Level (C) Electrical Engineering & Control Competencies**

*At the end of this course, the students will be able to:*

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| --- |
| **c-1 - Professionally merge the engineering knowledge and understanding and feedback to improve design of diodes and transistors. (c2)**  |
| **c- 2 - Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design diode and transistors circuits. (c5)** |
| **c- 3 - Identify appropriate specifications for diodes and transistor (c18)** |
| **c- 4 - Use appropriate tools to measure the performance of diode and transistor. (c19)** |

**4- Course Contents**

1. **Course Description** (As indicated in program Bylaw)

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| --- |
| Open loop systems and closed loop systems, transfer function and basic system properties, block diagram reduction techniques, signal flow graph reduction techniques, time response of 1st and 2nd order systems, modeling of some electrical, mechanical and thermal systems, system types and error constants, concept of stability analysis, concept and effect of poles and zeros, frequency response analysis, polar plots, concept of stability in control systems, Routh’s stability criterion, Nyquist stability criterion, application of Nyquist stability criterion on Bode plots, root locus method. |

1. Topics to be Covered weekly & Matrix of Competencies

|  |  |  |
| --- | --- | --- |
| Week | Topics | Course Competencies |
| A1 | A2 | A8 | A10 | B2 | B4 | C1 | C4 |
| 1 | * Introduction to control systems,
* Laplace Transform and its properties,
* Inverse Laplace Transform,
* Pole-Zero Map,
 | **√** | **√** |  |  |  |  |  |  |
| 2 | * Block Diagram Representation,
* Calculation of the system Transfer Function (TF),
* Multi Input Single Output (MISO) systems
 | **√** | **√** |  |  |  |  |  |  |
| 3 | * Convert block diagram to signal flow graph
* Signal Flow Graph Representation
* Mason’s formula to calculate T.F.
 | **√** | **√** |  |  |  |  |  |  |
| 4 | * Modeling of Linear physical systems
* Modeling of Rotary physical systems
* Obtaining the system mechanical network
 | **√** | **√** |  |  |  |  |  |  |
| 5 | * Representation of DC motors/generators
* Representation of electro-mechanical systems
 | **√** | **√** |  |  |  |  |  |  |
| 6 | * Transient Response of 1st order Systems
* Transient Response of 2nd order Systems
* Parameters calculation of transient response
 | **√** | **√** | **√** | **√** |  |  |  |  |
| 7 | * P, PD, PI and PID controllers
* PID controller using Matlab
 | **√** | **√** | **√** | **√** |  |  |  |  |
| 8 | * Error coefficients at step, ramp and parabolic inputs
* Calculation of Steady-State Error for unity & non-unity feedback systems
 | **√** | **√** |  |  | **√** | **√** |  |  |
| 9 | * The Concept of Stability
* The Routh–Hurwitz Stability Criterion
* Design the range of system gain for stability
 | **√** | **√** |  |  |  |  | **√** | **√** |
| 10 | * The Root Locus (R.L.) Concept
* Steps required to draw R. L.
 | **√** | **√** |  |  | **√** | **√** |  |  |
| 11 | * Effect of adding pole and zero on R.L.
* Design the system gain to give certain performance
 | **√** | **√** |  |  |  |  |  |  |
| 12 | * Phase and Gain Margins based on R. L.
* Discuss the system stability using R. L.
 | **√** | **√** |  |  |  |  | **√** | **√** |
| 13 | * Constructing the Bode Diagram (Magnitude & Phase Plots)
* Performance Specifications in Frequency Domain
 | **√** | **√** |  |  | **√** | **√** |  |  |
| 14 | * Phase and Gain Margins based on Bode plot
* Discuss the system stability using Bode
 | **√** | **√** |  |  |  |  | **√** | **√** |

**5- a) Teaching and Learning Methods**

|  |  |
| --- | --- |
| **Course Competencies** | **Teaching and Learning Methods** |
| Face-to-face Lecture | Online Education | Tutorial / Exercise | Group Discussions | Laboratory | Site Visit | Presentation | Mini Project | Research and Reporting | Brain Storming  |
| **Level A** | A1 | **√** | **√** | **√** |  |  |  |  |  |  |  |
| A2 |  |  | **√** | **√** |  |  |  | **√** | **√** |  |
| A8 |  |  |  | **√** |  |  | **√** |  |  |  |
| A10 |  |  |  | **√** |  |  |  |  | **√** | **√** |
| **Level B** | B2 | **√** | **√** | **√** |  |  |  |  | **√** |  |  |
| B4 | **√** | **√** | **√** |  |  |  |  | **√** |  |  |
| **Level C** | C1 | **√** | **√** |  | **√** |  |  |  | **√** | **√** |  |
| C4 | **√** | **√** |  | **√** |  | **√** |  | **√** | **√** |  |

**5- b) Teaching and Learning Methods of Disables**

 None

**6- Student Academic Counseling and Support**

* Students are directed to contact teaching staff for academic support during specific office hours.
* Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

**7- Student Assessment**

**a- Student Assessment Methods**

|  |  |
| --- | --- |
| **Course Competencies** | **Assessment Methods** |
| Written Exams | Online Exams | Oral Exam | Quizzes |  Lab Exam | Take-Home Exam | Research Assignments | Reporting Assignments | Project Assignments | In-class Questions |
| **Level A** | A1 | **√** | **√** |  | **√** |  |  |  |  |  | **√** |
| A2 |  |  |  | **√** |  |  | **√** | **√** |  | **√** |
| A8 |  |  |  |  |  |  | **√** | **√** | **√** |  |
| A10 |  |  |  |  |  |  |  | **√** | **√** | **√** |
| **Level B** | B2 | **√** | **√** |  | **√** |  |  | **√** | **√** |  |  |
| B4 | **√** | **√** |  | **√** |  |  | **√** | **√** |  |  |
| **Level C** | C1 | **√** | **√** |  | **√** |  |  |  | **√** | **√** |  |
| C4 | **√** | **√** |  | **√** |  |  |  | **√** | **√** |  |

**b- Assessment Schedule and Weight**

|  |  |  |
| --- | --- | --- |
| **Assessment** | **Week** | **Weight** |
| Midterm Examination | 7 | 30 % |
| Final Examination | (As Schedule) | 40 % |
| Quizzes (4 times) | 3, 5, 9, 12 | 10 % |
| Home assignments, and Reports | 2, 4, 8, 11 | 10% |
| Matlab Mini Project | 8 | 10 % |
| **Total** |  | **100** % |

**8- Facilities**

The following facilities are needed for this course:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ■ | Classroom | □ | Smart Board | □ | Computer with software |
| □ | Lecture Hall | ■ | White Board | ■ | MIS system |
| □ | Sound and Microphone | ■ | Data Show | ■ | Internet Access |
| □ | Other: ………………… |  |  |  |  |

**9- List of References**

**a- Course Notes**

Lectures Notes in PDF

<http://www.bu.edu.eg/staff/ahmedhussein3-courses/15061/files>

**b- Books**

1. Nise, N. S. “Control System Engineering”, 7th edition, John Wiley & Sons Ltd., UK, 2016.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall, 5th Edition.
3. F. Golnaraghi and B. C. Kuo, “Automatic control Systems”, 10th ed., John Wiley & Sons, Inc. 2017.
4. Andrea Bacciotti, “Stability and Control of Linear Systems” Volume 185, Springer, 2019

**c- Recommended Books**

1. R. C. Dorf and R. H. Bishop, "Modern Control Systems", Addison-Wesley, 11th Edition, 2014.

**d- Web Sites**

<http://www.bu.edu.eg/staff/ahmedhussein3-courses/15061/files>

**10- Matrix of Course Objectives and Competencies**

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| --- | --- |
| **Course Objectives** | **Course Competencies** |
| **A1** | **A2** | **A8** | **A10** | **B2** | **B4** | **C1** | **C4** |
| Course Objective #1 | **√** | **√** |  |  |  |  |  |  |
| Course Objective #2 | **√** | **√** |  |  |  |  |  |  |
| Course Objective #3 | **√** | **√** |  |  |  |  |  |  |
| Course Objective #4 | **√** | **√** | **√** | **√** |  |  |  |  |
| Course Objective #5 | **√** | **√** |  |  |  |  | **√** | **√** |
| Course Objective #6 | **√** | **√** | **√** |  | **√** | **√** |  |  |
| Course Objective #7 | **√** | **√** |  | **√** |  |  | **√** | **√** |

**- Course Coordinator: Dr. Ahmed M. Hussein Signature:**

**- Program Coordinator: Assoc. Prof. Mohamed Anwar Signature:**