**University**: Benha University

**Faculty**: Faculty of Engineering at Shoubra

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

**Department offering the course**: Electrical Power & Machines Engineering Program

**1- Course Data (Basic Information)**

**Course Code & Title:** ECE270 Electronic and Logic Circuits **Semester/Year:** Second / 2022-2023

**Prerequisite Course(s):** ------- **Core or Elective:** Core Course

**Contact Hours:** 5 **Weekly Contact Hours**: **Lecture:** 3 **Tutorial/Lab:** 2

**2- Course Aims**

The aim of this course is to provides students the ability to define the concept of digital and binary systems, understand Boolean algebra and basic properties of Boolean algebra, apply Boolean properties to simplify Boolean functions, use Karnaugh maps to optimize simple logic, design and analyze combinational logic circuits, and design and analyze sequential logic circuits.

**3- Course Contents** (As indicated in the program Bylaw)

Logic gates. Number systems. Boolean algebra. Karnaugh maps. decision and memory elements.

Flip flop. Design of sequential and synchronized circuits. Integrated circuits family: logic integrated circuit, VLSI, integrated circuit test. shift registers, sequential counter circuits, adders, subtractors,

memories. Voltage regulators.

**4- Program Competencies Served by The Course (A2, A3, B4)**

**Level (A) Engineering Competencies**

**A.2** Develop and conduct appropriate experimentation and/or simulation, analyze and interpret data, assess and evaluate findings, and use statistical analyses and objective engineering judgment to draw conclusions.

**A.3** Apply engineering design processes to produce cost‐effective solutions that meet specified

 needs with consideration for global, cultural, social, economic, environmental, ethical and

 other aspects as appropriate to the discipline and within the principles and contexts of
 sustainable design and development.

**Level (B) Electrical Engineering Competencies**

**B.4** Estimate and measure the performance of an electrical system and circuit under specific input excitation and evaluate its suitability for a specific application.

**5- Learning Outcomes (LO’s)**

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

|  |
| --- |
| Cognitive Domain |
| LO1 | Identify number systems and their representation. |
| LO2 | Draw the logic gates to construct logic circuits. |
| LO3 | Apply Boolean Algebra and Karnaugh maps to simplify the logic expression.  |
| LO4 | Analyze existing combinational and sequential circuits to estimate their function. |
| Psychomotor Domain |
| LO5 | Design a combinational and sequential Logic circuits to produce cost-effective logic solutions. |

**6- Mapping Learning Outcomes (LO’s) with Competencies**

|  |  |  |  |
| --- | --- | --- | --- |
| **LO’s NARS** | **A2** | **A3** | **B4** |
| Cognitive Domain |  |
| LO1 | ◼ |  |  |
| LO2 | ◼ |  |  |
| LO3 |  | ◼ |  |
| LO4 |  |  | ◼ |
| Psychomotor Domain |  |
| LO5 | ◼ | ◼ |  |

**7- Lecture Plan**

1. Topics to be Covered weekly & Matrix of LO’s

| Week | Topics | Planned Hours | Learning Outcomes |
| --- | --- | --- | --- |
| LO1 | LO2 | LO3 | LO4 | LO5 |
| W1 | * Quality Assurance requirements for the course
* Introduction to Number Systems and their representation.
 | **5** | ◼ |  |  |  |  |
| W2 | * Number Systems operations and codes.
 | **5** | ◼ |  |  |  |  |
| W3 | * Logic Gates
 | **5** |  | ◼ |  |  |  |
| W4 | * Boolean Algebra
 | **5** |  |  | ◼ |  |  |
| W5 | * Karnaugh Maps
 | **5** |  |  | ◼ |  |  |
| W6 | * Universal Gates
 | **5** |  | ◼ |  |  |  |
| W7 | Mid-Term Exam |  |
| W8 | * Combinational Logic Design
* Multiplexer and demultiplexer
* Half Adder, Full Adder, 4-bit Binary Adder
 | **5** |  |  |  | ◼ |  |
| W9 |  | **5** |  |  |  |  |  |
| W10 | logic integrated circuit, VLSI, integrated circuit test. | **5** |  |  |  |  |  |
| W11 | shift registers | **5** |  |  |  |  |  |
| W12 | sequential counter circuits | **5** |  |  |  |  |  |
| W13 | memories | **5** |  |  |  |  |  |
| W14 |  | **5** |  |  |  |  |  |

1. Additional private study/learning hours expected for students per week is Three hours.

**8) Teaching and Learning Methods**

| **Learning Outcomes** | **Teaching and Learning Methods** |
| --- | --- |
| Face-to-face Lecture | Online Lectures | Tutorial / Exercise | Group Discussions | Laboratory | Self-Reading | Presentation | Collaborate Learning (Team Project) | Research and Reporting | Brain Storming  |
| **Cognitive Domain** | LO1 | ⚫ |  | ⚫ |  |  |  |  |  |  | ⚫ |
| LO2 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  |  |  | ⚫ |
| LO3 | ⚫ |  | ⚫ |  |  |  |  |  |  | ⚫ |
| LO4 | ⚫ |  | ⚫ |  | ⚫ |  |  |  |  | ⚫ |
| **Psychomotor Domain** | LO5 | ⚫ |  | ⚫ |  | ⚫ |  | ⚫ | ⚫ | ⚫ | ⚫ |

**Student Academic Counseling and Support**

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

**9- Student Assessment**

**a) Student Assessment Methods**

| **Learning Outcomes** | **Assessment Methods** |
| --- | --- |
| Written Exams | Online Exams | Oral Exam | Pop Quizzes |  In-class Problem Solving | Take-Home Exam | Research Assignments | Reporting Assignments | Project Assignments | In-class Questions |
| **Cognitive Domain** | LO1 | ⚫ |  | ⚫ |  |  |  |  |  |  | ⚫ |
| LO2 | ⚫ |  | ⚫ | ⚫ | ⚫ |  |  |  |  | ⚫ |
| LO3 | ⚫ |  | ⚫ |  |  |  |  |  |  | ⚫ |
| LO4 | ⚫ |  | ⚫ |  | ⚫ |  |  |  |  | ⚫ |
| **Psychomotor Domain** | LO5 | ⚫ |  | ⚫ |  | ⚫ |  | ⚫ | ⚫ | ⚫ | ⚫ |

**b- Assessment Schedule and Weight**

|  |  |  |
| --- | --- | --- |
| **Assessment Tools** | **Week** | **Weight** |
| Midterm Examination | 7 | 12 % |
| Simulation activities and Mini Project | 12 | 20% |
| Final Examination | (As Scheduled) | 60 % |
| Quizzes (2 times) | 5, 10 | 4 % |
| Home assignments | 2,4,9,11 | 4 % |
| **Total** |  | **100** % |

**10- 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: ………………… |  |  |  |  |
|  |  |  |  |  |  |

**11- List of References**

**a- Course Notes**

Lectures Notes in PDF

**b- Books**

1. “Digital Logic and Computer Design” By M. Morris Mano, Kindle Edition, Pearson, 2020.
2. “Logic and Computer Design Fundamentals”, by Morris Mano, Charles Kime, and Tom Martin, 5th Edition, Pearson, 2015.

**c- Recommended Books**

1. Digital Design (6th ed.) [M. Morris Mano & Michael D. Ciletti 2018]

**- Course Coordinator: Dr. Ayman Youssef & Dr. Mohamed salah & Dr. Mohamed salah Signature:**

**- Program Coordinator: Prof. Mahmoud Soliman Signature:**