هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

# Course Specification
## (Bachelor)

| | |
|---|---|
| Course Title: | Digital Logic Design |
| Course Code: | 211-CCN-3 |
| Program: | Bachelor of Science in Computer Networks |
| Department: | Networks and Communications Engineering |
| College: | Computer Science and Information Systems |
| Institution: | Najran University |
| Version: | 1.0 |
| Last Revision Date: | 2 Sep 2025 |

## Table of Contents

# A. General information about the course:

| Course Identification | | | | | |
|---|---|---|---|---|---|
| 1. Credit hours: | 3 (2,1,1) [Theory, Lab, Tutorial] | | | | |
| 2. Course type | | | | | |
| a. | University ☐ | College ☐ | Department☒ | Track☐ | Others☐ |
| b. | Required ☒ | Elective☐ | | | |
| 3. Level/year at which this course is | Level 3/ Year 2 | | | | |
| 4. Course general Description<br><br>This course covers many basic topics such as numbering systems, Boolean algebra, simplification using Boolean algebra and Karnaugh maps, and different logic gates. The course also deals with analysis and synthesis of combinational circuits, e.g., adders, encoders, decoders, multiplexers and demultiplexers. Flip-flops and Sequential circuits such as registers, counters, and other basics are also presented. The course prepares the students to apply the above basic skills to design, implement, and test digital logic circuits in the laboratory. | | | | | |
| 5. Pre-requirements for this course (if any): N/A | | | | | |
| 6. Co- requirements for this course (if any): N/A | | | | | |
| 7. Course Main Objective(s)<br><br>This course prepares students to deal with logic circuits and gives them the skills to design and implement both combinational and sequential circuits | | | | | |

## 1. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1. | Traditional classroom | 75 | 100% |
| 2. | E-learning | | |
| 3. | Hybrid<br>• Traditional classroom<br>• E-learning | | |
| 4. | Distance learning | | |

## 2. Contact Hours (based on the academic semester)

| No | Activity | | Contact Hours |
|---|---|---|---|
| 1. | Lectures | [2 contact hours ´ 15 weeks] | 30 |
| 2. | Laboratory/Studio | [2 contact hours ´ 15 weeks] | 30 |
| 3. | Field | | |
| 4. | Tutorial | [1 contact hour ´ 15 weeks] | 15 |
| 5. | Others (specify) | | |
| | Total | | 75 |

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| 1.0 | Knowledge and understanding | | | |
| 1.1 | Represent numbers using different number systems, and to perform basic binary operations | K2 | Lecture | Tests, Quizzes, and Assignments |
| 1.2 | Apply the different switching algebra theorems for the minimization of logic functions | K1, K2 | Lecture | Tests, Quizzes, and Assignments |
| 1.3 | Apply Karnaugh map for minimization of logic functions | K1, K2 | Lecture | Tests, Quizzes, and Assignments |
| 2.0 | Skills | | | |
| 2.1 | Analyze different combinational and sequential circuits | S4 | Lecture, Lab | Tests, Quizzes, Assignments, and Lab |
| 2.2 | Design different combinational and sequential circuits | S4 | Lecture, Lab | Tests, Quizzes, Assignments, and Lab |
| 3.0 | Values, autonomy, and responsibility | | | |

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| 3.1 | Recognize professional responsibilities and make informed judgments in digital logic design | C3 | Lecture, Lab | Tests, Quizzes, Assignments, and Lab |
| .. | | | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Introduction to Digital Concepts | 5 |
| 2 | Number systems, Binary addition, subtraction, Representation of negative numbers, 2's complement addition/subtraction, Binary codes. | 10 |
| 3 | Switching algebra, Theorems, Standard representation of logic functions Truth table, Minimization techniques. | 5 |
| 4 | Simplification of three and four variable using Karnaugh maps | 10 |
| 5 | Combinational circuits building blocks Half and Full adders, Encoders/Decoders. Mux/Dmux/XOR circuits. | 10 |
| 6 | Midterm Exam | 5 |
| 7 | Sequential Circuits. Bistable elements. Latches and Flip Flops. Flip Flops and Related Devices | 5 |
| 8 | Theoretical design Shift registers serial and parallel. Design Examples | 5 |
| 9 | Counters serial and parallel, Design examples | 10 |
| 10 | Finite State machine; design analysis and synthesis. | 10 |
| Total | | 60 |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 1. | Quizzes | 2,4,7,9 | 8% |
| 2. | Assignments or mini project (presentation) | 3,5,8,9 | 12% |

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 3. | Midterm Examination | 6th week | 20% |
| 4. | Lab Activities | 2-14th week | 10% |
| ٥. | Lab Final Examination | 15th week | 10% |
| 6. | Final Examination | 16th,17th week | 40% |

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

# E. Learning Resources and Facilities

## 1. References and Learning Resources

| | |
|---|---|
| Essential References | Morris Mano, "Digital Design", Fifth edition, Prentice Hall, 2012 |
| Supportive References | T. L. Floyd, "Digital Fundamentals", 10 th edition, Prentice-Hall, 2009. |
| Electronic Materials | Available in Blackboard |
| Other Learning Materials | |

## 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Lecture Room and Laboratory |
| Technology equipment (projector, smart board, software) | Data show, PCs. |
| Other equipment (depending on the nature of the specialty) | Embedded Systems Lab |

# F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | Students | • Indirect (questionnaire )<br>• University online questionnaire for evaluation the course by students.<br>• Observing the students' opinions recorded in the college student site. |

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| | | • Appeal & suggestions box |
| Effectiveness of student's assessment | Peer reviewer | Direct (review of quality of the exam done by course coordinator) |
| Quality of learning resources | Faculty & students | Lecturers prepare and create the learning resources before the class begins and make them more related to the course. Questionnaire |
| The extent to which CLOs have been achieved | Faculty | Student assessments reviewing |
| Other | | |

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

## G. Specification Approval Data

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|---|---|
| COUNCIL /COMMITTEE | NETWORK AND COMMUNICATIONS ENGINEERING DEPARTMENT COUNCIL |
| REFERENCE NO. | **14450824-0482-00014** |
| DATE | **5/3/2024** |