**Course Description Form**

# Description of the location

This course description provides a concise summary of the main features of the course and the learning outcomes expected of the student, demonstrating whether the student has made the most of the available learning opportunities . It must be linked to the course description. The program .

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| Shatt al-Arab Private University | 1. Educational institution |
| Computer Science | 2. Scientific Department / Center |
| logical design | 3. Course name / code |
| My electronic presence | 4. Available forms of attendance |
| 15 weeks | 5. Semester / Year​ |
|  | 6. Number of study hours ( total ) |
| 29/7/2025 | 7. Date of preparation of this description |
| 8. Course objectives  This course aims to provide students with a comprehensive understanding of the theoretical and practical foundations of digital logic design, including the analysis and design of combinational and sequential logic circuits . It also focuses on the skills of using Karnaugh maps, logical simplification, constructing counters and registers, and understanding basic and combinational logic gates . | |

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| 9. Course outcomes, teaching, learning and assessment methods |
| A - Cognitive objectives  1. The student should identify the different number systems and their transformations .  2. The student should explain the basic principles of logic gates .  3. The student simplifies logical expressions using Boolean algebra and Karnaugh maps .  4. The student analyzes combinational circuits such as collectors, comparators, and multi-input switches .  5. The student should be able to distinguish between combinational and series circuits .  6. The student will explain the components of memory such as flip-flops , registers, and counters . |
| **B - Skill objectives**  1. The student designs a combinational logic circuit using Karnaugh maps .  2. The student converts a problem from a verbal description to a digital logic circuit .  3. The student models simple serial circuits .  4. The student should use digital simulation tools ( such as LogicWorks or Proteus). |
| Teaching and learning methods |
| • Theoretical lectures explained and supported by examples .  • Laboratory lessons using logical design software .  • Individual and group design projects .  • Homework containing analytical and design problems .  • Practical classroom discussions . |
| Evaluation methods  Evaluation type percentage  Quizzes 10 %  Homework 10%  Practical design project 15%  Practical report 5%  Midterm exam 10%  Final exam 50% |
| C - Emotional and value goals   1. The student should appreciate the importance of logical and systematic thinking in solving technical problems . 2. The student must demonstrate a commitment to accuracy and discipline when dealing with digital models and circuits . 3. The student must demonstrate a willingness to work in teams and cooperate effectively with his colleagues in design projects . 4. The student must have a spirit of innovation and perseverance in developing effective digital solutions . 5. The student must demonstrate responsible academic behavior in laboratories and classroom activities . 6. The student must adhere to ethical practices in the use of design and simulation tools . |
| Teaching and learning methods |
| 1. Interactive theoretical lectures :  Presenting basic concepts in logical design using interactive examples and explanations, to enhance theoretical understanding . 2. Practical laboratory sessions :  Students are trained practically to build and analyze logic circuits using simulation tools ( such as Proteus or Logicly) , and to support the acquired technical skills . 3. Individual and group projects :  Students are assigned to design miniature digital systems or integrated circuits, which enhances their ability to think creatively and work collaboratively . 4. Classroom and extracurricular activities :  Using analytical exercises and homework assignments to solve real-life problems, thus enhancing self-learning and applied learning . 5. Presentations and Class Discussions :  Encourage students to present and discuss their projects in front of their peers, which develops communication skills and the ability to defend design solutions . 6. Use of electronic educational resources :  Directing students to use digital tools, simulators, and interactive educational platforms to support learning outside the classroom . |
| Evaluation methods |
| 1. Theory tests ( short and final ):  are used to assess the student's understanding of basic concepts in number systems, Boolean algebra, circuit simplification, and logic gate analysis . 2. Practical tests :  aim to measure the student’s ability to design and analyze logic circuits using digital simulation tools, and to verify the correctness of the circuit’s functional performance . 3. Homework and analytical assignments :  These include problems of designing and analyzing logic circuits, and encourage the student to use theoretical concepts to solve real-world technical problems . 4. Group or Individual Projects :  Students are assigned complete design projects for a digital circuit, measuring design skills, innovation, and collaborative work . 5. Technical Reports :  Students are required to prepare reports documenting the steps in designing and analyzing a particular circuit, which assesses technical writing and systematic analysis skills . 6. Classroom monitoring and active participation :  The student’s interaction and participation in class discussions and group activities are monitored, reflecting his commitment and appreciation for the subject . 7. Project Presentations :  The student is evaluated on his or her ability to present and explain his or her design technically to a committee or peers, enhancing technical communication and critical thinking. |
| D - General and transferable skills ( other skills related to employability and personal development ).   1. Basic computer and office technology skills     * Microsoft Office applications (Word, Excel, PowerPoint , etc. ) , which is a basic requirement for most administrative and educational jobs . 2. Organizational and time management skills     * By adhering to deadlines for assignments and projects and working on multiple tasks efficiently . 3. Digital research and analysis skills     * Ability to research technical information, analyze data, and write source-supported technical reports . 4. Teamwork and effective communication skills     * Interact within collaborative working groups, contribute to presentations or implement joint projects . |
| 10. Course structure |

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| week | the topic | Learning outcomes | Type of learning |
| 1 | Number systems and conversion between them | LO1 | a lecture |
| 2 | Boolean algebra and logic gates | LO2 | Lecture + Lab |
| 3 | Simplifying circuits using Karnaugh maps | LO3 | Lecture + Application |
| 4 | Combinational Circuit Analysis and Design | LO4 | a lecture |
| 5 | First short test | LO1, LO2 | a test |
| 6 | Half and full mosque design and comparisons | LO4 | Lecture + Lab |
| 7 | Midterm exam | LO1 – LO4 | a test |
| 8 | Sequential Circuit Concepts – Flip-Flops | LO5, LO6 | a lecture |
| 9 | Design of registers and meters | LO6 | Lecture + Lab |
| 10 | Second short test | LO6 | a test |
| 11 | Applications of ring counters and synchronization | LO6 | a lecture |
| 12 | Digital Integrated Circuit Design Project | LO3 – LO6 | project |
| 13 | Project report writing and analysis | LO3 – LO6 | a report |
| 14 | General review | All LO | review |
| 15 | Final exam | All LO | a test |

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| 11. Infrastructure | |
| 1- Required textbooks | M. Morris Mano, Digital Logic and Computer Design, Pearson. |
| 2- Main references ( sources ) | • Floyd, T. L. (2014). Digital Fundamentals, 11th Edition, Pearson. |
| A ) Recommended books and references ( scientific journals , reports , etc.) |  |
| b ) Electronic references , websites , etc. | • <https://www.tinkercad.com>  • <https://www.electronics-tutorials.ws>  • Logic Circuit Simulator Pro – <https://logic.ly> |

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| 12. Curriculum Development Plan |
| The development of the logic design curriculum includes updating simulation tools and using active learning techniques ( such as project-based learning ) , incorporating models of modern digital systems, and encouraging students to use VHDL or Verilog programming as a step toward advanced digital design . Emphasis will also be placed on collaborative projects and digital circuit documentation skills to bring theoretical concepts closer to practical applications . |