**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 objectives1. 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 percentageQuizzes 10 % Homework 10%Practical design project 15%Practical report 5%Midterm exam 10%Final exam 50% |
| C - Emotional and value goals1. 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 .
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| 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 .
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| 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.
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| 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 .
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| 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 . |