# Course Description

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve, demonstrating whether he/she has made the most of the available learning opportunities. They must be match to the description of the programe.

<table>
<tr><td>1. Educational Institution</td><td colspan="4">Shatt Al-Arab University</td></tr>
<tr><td>2. Scientific Department / Center</td><td colspan="4">Computer Technology Engineering</td></tr>
<tr><td>3. Course name/code</td><td colspan="4">Digital Systems</td></tr>
<tr><td>4. Programme(s) to which it contributes</td><td colspan="4">First year class / Semester 2</td></tr>
<tr><td>5. Available forms of attendance</td><td colspan="4">Lecture, laboratory</td></tr>
<tr><td>6. Semester/Year</td><td colspan="4">2024/2025</td></tr>
<tr><td rowspan="3">7. Number of study hours (total)</td><td rowspan="3">150 hours</td><td colspan="3">Number of hours per week</td></tr>
<tr><td>theoretical</td><td>practical</td><td>Total</td></tr>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td>8. Date of preparation of this description</td><td colspan="4">2 – 1 - 2025</td></tr>
<tr><td colspan="5">9. Course Objectives:<br>a. To understand the flip flop operation.<br>b. To understand the latches operation.<br>c. This course deals with the designing of logic systems.<br>d. To understand the principles of counter circuits.<br>e. To understand the shift registers.<br>f. To have a skill to design ADC and DAC.</td></tr>
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## 10. Course Outcomes and Teaching Methods, Learning and Evaluation

a. Discuss the flip-flops.

b. Recognize the differences between flip-flops and latches.

c. List the applications of flip-flops.

d. Summarize what is meant by the logic systems.

e. Explain the counter circuits and discuss the difference between synchronous and asynchronous counter.

f. Discuss the types of asynchronous counter circuits.

g. Discuss the types of synchronous circuit.

h. Identify the shift registers.

i. Discuss the operations of each types of shift registers.

j. Discuss the shift register counter.

k. Explain the principles of ADC and DAC.

l. Explain the design for each type of ADC and DAC.

**Teaching and learning methods**

Academic lectures: providing a solid foundation upon which to develop cognitive balance for students Practical laboratory:, which provides each student the expertise to help develop practical skills side and consolidate the principles necessary to carry out the projects correctly

**Evaluation Methods**

Interactive tests: basically to assess the student by observing the extent of interaction provides during the lecture and participation

Written tests: that provides knowledge of the extent of the student's understanding and follow-up of the material and scientific observations given by teaching

Quarterly tests: Episode moderation and be to assess the student's interest and its interaction with the scientific article received during the semester

for academic and skills

Final tests: These are the final episode to assess the student's interest and its interaction with the scientific article received during the school year for academic and skills

C. Thinking Skills

C1- Implant the spirit of creativity among students and to ensure that find them innovative solutions to various problems

C2- Students develop the ability to work together effectively as teams come out excellent result

C3- Sense of responsibility among students and psychological configuration to carry the burden on their shoulders Development

C4- Development to ensure the values and perseverance to get the job done to reach satisfactory results

**Teaching and learning methods**

Stimulate the creative side of the students and that by asking various scientific problems and the demand of the students find appropriate scientific solutions to them in different ways

Develop a spirit of cooperation between the students, through the formation of working teams and motivate the students to exert all the necessary conditions for the work of the various efforts and with several people

**Evaluation Methods**

Direct assessment: Where is this assessment by the teaching directly and through note student interaction during the lecture and install notes about it

Practical projects is to assess the student's ability to achievement and creativity and to work in teams, consequences and solutions to various scientific problems

| | | Time/Nu mber | Weight (Marks) | Week Due | Relevant Learning Outcome |
|---|---|---|---|---|---|
| Formative assessment | Quizzes | 1 | 10% (10) | 8 | LO #1-7 |
| | Assignments | 2 | 10% (10) | 4, 10 | LO # 1, 3, LO # 3- 8 |
| | Projects / Lab. | 10 | 10% (1) | Continuous | LO # 1-14 |
| | Report | 10 | 10% (1) | Continuous | LO # 1-14 |

| | | | | | |
|---|---|---|---|---|---|
| Summative assessment | Midterm Exam | 2 hr | 10% (10) | 10 | LO # 1-10 |
| | Final Exam | 4hr | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

## 11. Course Structure

| | Material Covered |
|---|---|
| Week 1 | Flip-flops and laches(SR latch, D latch) |
| Week 2 | Flip-Flops(T-latch, JK ) |
| Week 3 | Flip-Flops(edge triggered, master-slave) |
| Week 4 | Flip-flops (conversion from one type to another, flip flop applications) |
| Week 5 | Asynchronous counter |
| Week 6 | Synchronous counter |
| Week 7 | Decade, up-down counter |
| Week 8 | Cascade counter, Counter decoding |
| Week 9 | Shift-registers (serial in/serial out, serial in/parallel out, parallel in/serial out, parallel in/parallel out) |
| Week 10 | Midterm exam |
| Week 11 | Shift-registers (bidirectional , shift register counter), Johnson counter, Ring counter |
| Week 12 | Multivibrators (definition, astable, bistable) |
| Week 13 | Multivibrators (monostable, 555 timer) |
| Week 14 | A/D convertors (flash ADC, tacking ADC, slope ADC ,successive approximation ADC, digital ramp ADC, delta sigma ADC) |
| Week 15 | D/A convertors (R/2R DAC, $R/2^n R$ DAC) |
| Week 16 | Preparatory week before the final Exam |

| 12.Course Structure - Lab. | |
|---|---|
| | **Material Covered** |
| **Week 1** | SR ff, T ff |
| **Week 2** | D ff, JK ff |
| **Week 3** | Master-slave ff |
| **Week 4** | asynchronous counter (2-bit,3-bit) |
| **Week 5** | asynchronous counter(4-bit, modulus counter) |
| **Week 6** | synchronous counter (2-bit, 3-bit) |
| **Week 7** | synchronous counter ( decade, up-down counter) |
| **Week 8** | Cascade counter, counter decoding |
| **Week 9** | Serial in-serial out, parallel in-parallel out shift register |
| **Week 10** | Serial in-parallel out, parallel in- serial out SR |
| **Week 11** | Johnson counter, ring counter |
| **Week 12** | multivibrator |
| **Week 13** | Analogue to digital convertor |
| **Week 14** | Digital to analogue convertor |

| 13. Infrastructure | |
|---|---|
| 1 Required textbooks | Digital Fundamentals by Floyed |
| 2 Key references (sources) | |
| a. Recommended books and references (scientific journals, reports,.... ) | Digital circuit analysis and design with Simulink modeling by Steven T. Karris |
| b. Electronic references, websites .... | https://www.coursera.org/browse/physical-science-and- |

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|---|---|
| | engineering/electricalengineering |

| 14 Course improvement Plan |
|---|
| improving the subjects of the current curriculum by checking the current materials by deleting / adding others new topics |