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| **Course Name: DIGITAL LOGIC DESIGN**  |
| **Course Code: COMP 206** | **Course Type: Major Core** | **Course Credits: 2+1** |
| **Class Timings:****Check Empower** | **Section: A, B** | **Student Meeting Hours/ Office Hours:**MW: 11-1After class or online |
| **Instructor Name: Dr Sidra Minhas** |
| **A Note from the Instructor:*** In this course, we will learn about designing optimal digital circuits to enable humans to fulfill their tasks
* In this course, attendance and regularity matter a lot. The prime element is unannounced pop quizzes.
* Class participation and lab experiments will be marked regularly
* **In the blended model,**
	+ video lectures will be uploaded on Google drive at the start of every week. The contents will be discussed during class. Synchronous classes will occur i.e. online students will join live via MS teams
	+ Labs will be hands-on for Face2Face students and simulation-based for online students
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| **Instructor Contact Details**Email: sidraminhas@fccollege.edu.pkOffice Hours: MW: 11-1Guidelines for contacting instructor: Always e-mail before visiting |
| **TA Name and Contact Details: TBD**Name: Email: Other: Office Hours:Guidelines for contacting TA/s: |
| **Lab Engineer Name and Contact Details: TBD**Name: Email: Other: Office Hours:Guidelines for contacting TA/s: |
| **Course Description**:Pre-requisites if any: According to catalogMode of Instruction: Face 2 FaceMode of peer-to-peer Contact Among Students: WhatsApp Group |
| **Main Mode of Instruction:** MS Teams, Moodle & Google Drive**Technology Requirements**: HEC registered account for MS Teams, active moodle and official account**Technology Etiquettes:** Attendance in live sessions is must. Allow 24 hours for replying to e-mails**Considerations for Students with Limited Internet/Technology Access: NA** |
| **Lab Resources:** Physical labs will happen in S-027. Lab handouts and introductory videos will be uploaded on moodle and simulations to be submitted during the live class. |
| **Course Objectives/** [**Student Learning Outcomes**](https://docs.google.com/document/d/1me9vpl8iKR_zNX9gIODm7gkVFY9VkuSKpUJe1VyI57M/edit) **(SLOs)**SLO 1 Learn to convert human language to machine language SLO 2 Design optimal digital circuits with various applicationsSLO 3 Identify various ways to implement a circuitSLO 4 Understand sequential logic and memory elementsSLO 5 How computers take input, process them and store themSLO 6 Basic course for understanding Computer Architecture. |

**Course Content, Learning Material & Activities Schedule**

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|  | **Contents** | **LAB** |
| **Week 1 – 2****13th**  | * Introduction to the course.
* Number systems
* Conversion from one base to another
* Complements
* Subtraction using complements
* Binary codes
 | LAB 1: Introduction to Gates |
| **Week 3** | * Boolean algebra
* Theorems and postulates
* Simplification using theorem and postulates
* Truth table
* Introduction to logic gates
* Designing gate level circuit diagram from Boolean functions
* Minterms Vs Maxterms
* Conversion between canonical and standard forms.
* Sum of Products and Product of Sums.
* Designing gate level circuit
 | LAB 2: Working with Universal Gates |
| **Week 4-5** | * K-maps
* 2-variable, 3, variable and 4-variable k-maps
* Simplification using k-maps
* SOP and POS simplification
* Don’t care conditions
 | LAB 3: Implementation of X-OR & X-NOR |
| **Week 6-7** | * K-Maps Practice
 | LAB 4: Boolean function with Gates  |
| **MID EXAM & EASTER BREAK** |
| **Week 8-9** | * Decoders
* Encoders, Priority Encoders
* Implementation of Boolean functions using Decoders
* Design of larger decoders using smaller ones
 | LAB 5: Design & Implementation of Combinational Circuits |
| **Week 10** | * Multiplexers
* Implementation of Boolean Functions using MUX
 | LAB 6: Implementation of Half/ Full Adder |
| **Week 11-12** | * Introduction to Sequential Circuit
* Flip-flops, their characteristic tables and excitation tables
* Design steps of a sequential circuit
 | LAB 7: BCD to SSD DecoderLAB 8: Implementation of Boolean function with MUX |
| **EID HOLIDAYS/ SPRING BREAK** |
| **Week 13 - 14** | * Registers & Counters
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| **Week 15- 16** | * Project submission & Final Exam
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**Course Project:**

* Autonomous color sensing robot *without microcontrollers*
	+ Group of 3
	+ Learning outcomes: Group work, understanding of sensor/motor configuration, battery power handling

**Community Service (Tentative):**

The learning outcome of this activity is to explore your surroundings and provide possible solutions with IT interventions later. Perform creative community service of your own choice and present to the class with pictures and proof. Group Project for 3 students. Ideas/ domains examples:

1. Funds generation for rehab centers, orphanages, hospitals, TAC etc
2. Cleanliness drives, installation of garbage cans in public areas
3. Volunteering
4. Food distribution
5. Voter registration drive
6. Ehsaas program awareness drive
7. Clothing drive
8. Organize a social media campaign for Fountainhouse

**‘Out-of-class’ Study Required:**

**Following are the best practices to succeed in this course:**

* *Attend classes regularly (physical or live) so you don’t miss on graded quizzes and class tasks*
* *3 Contact Hours with instructor, at least 3 hours at home per week*

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### **Textbooks, Materials, Supplies, and other Resources**

### *Digital Logic Design by Morris Mano, Latest edition*

* Topic-wise google search for practice questions

**Course Requirements:**

The breakup is as follows:

**Class Participation, Attendance & Quizzes 15%**

**Assignments:** 05%

**Labs 15%**

**Course Project 10%**

**Community Service (Tentative) 5%**

**Midterm exam**: 20%

**Final term exam:**  30%

**TOTAL 100%**

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### **Missed Assignments**

- *Late assignments will be accepted with negative marking. Leniency will be observed depending upon performance throughout the semester.*

**Quiz Make-Ups**

-*No policy for re-take of quizzes. A lot of quizzes will be given and best will be selected in the end. This will cater for attendance, class-participation as well as understanding.*