Course Name: DIGITAL DESIGN & COMPUTER ARCHITECTURE Course Code: ITEC252

General Information						
Course Code	**252**	**Level/Year**	**4/2nd**	**Required (R) / Selected Elective (SE)**		**R**
Credit Hours	**Theory**	**2**	**Lab**	**1**	**Total**	**3**
Prerequisites	**NA**	**Course Coordinator**		**Dr. Chamandeep Kaur**		
Corequisites	**NA**	**Track Leader**		**Dr. Ali Tahir**		

Course Description

This course addresses principles of digital design, such as combinational and sequential logic, and digital building blocks, and builds on this to introduce various processor architectures, and the interfaces between hardware and program code. Initially, the various number system suitable for representing information in digital systems and binary codes are illustrated with its conversions and arithmetic operations. Then, this course introduces the basic postulates of Boolean algebra and demonstrates the correlation between Boolean expressions and their corresponding logic diagrams. In addition, this course covers canonical, and standards forms using the Karnaugh mapping method for simplifying Boolean functions. Besides, this course deals with various combinatorial circuit components like the adder, subtractor, decoder, encoder, multiplexer, and de-multiplexer and sequential circuit components such as registers, shift registers, and counters along with memory circuits. In addition, this course discusses MIPS and AI-32 architectures, assembly and machine languages, and operands. Lastly, it will explain compile and run a program using high level code and assembly code.

Course Objectives : On completion of the course, the student will be able to:

- Understand the concepts of digital and number systems using various techniques in detail.
- Outline Boolean algebra, Boolean function, Canonical, and Standard forms using the Karnaugh Map.
- Identify various types of registers, counters, and storage elements including flip flops, laches, and memory.
- Implement the design of combinational and sequential circuits using logic gates.
- Learn the different architectures, microarchitectures, assembly language, and instructions to compile and run a program on modern computers.

Course Contents

List of Topics	Weeks
CH 1: Digital System and Binary Numbers	1, 2, 3
CH 2: Boolean Algebra, Logic Gates and Gate Level Minimization	4, 5, 6
CH 3: Combinational and Sequential Logic Circuits	7, 8, 9
CH 4: Registers Counters and Memory	10, 11, 12
CH 5: Computer Architecture	13, 14, 15

Textbook

- Digital Design and Computer Architecture, ARM Edition, by Sarah L. Harris, David Money Harris, Morgan Kaufmann Publishers, 2018, ISBN: 0128000562
- M. Morris Mano," Digital Design", Prentice Hall, Pearson Education International, 5th Edition, 2013. ISBN: 9780132774208.

Reference Materials

Computer Architecture, Sixth Edition: A Quantitative Approach by John Hennessy, David Patterson, 6th Edition, Morgan Kaufmann, 2019, ISBN: 0128119055ISBN: 0128000562.

Course Learning Outcomes

CLO	Description	Mapped PI
CLO#01	**Define** the fundamental concepts and principles of digital logic design, such as Boolean algebra and logic gates, as well as the principles of computer architecture.	PI 1.1
CLO#02	**Explain** combinational circuits using various minimization techniques and tools.	PI 1.2
CLO#03	**Recognize** and differentiate various sequential circuits, such as flip-flops and counters.	PI 1.3
CLO#04	**Compare** different CPU architectures, including RISC and CISC, and their instruction set architectures (ISAs).	PI 2.2
CLO#05	**Implement** and analyze combinational circuits, sequential circuits using flip-flops, counters, and state machines.	PI 2.3 PI 2.4
CLO#06	**Produce** clear and concise technical documentation for various audiences, deliver effective oral presentations on technical topics using appropriate visual aids, and communicate project status, results, and issues to team members and stakeholders.	PI 3.1 PI 3.2 PI 3.3

CLO-PI-SO Mapping

	SO-1	SO-2	SO-3	SO-4	SO-5	SO-6
CLO#01	PI 1.1	-	-	-	-	-
CLO#02	PI 1.2	-	-	-	-	-
CLO#03	PI 1.3	-	-	-	-	-
CLO#04	-	PI 2.2	-	-	-	-
CLO#05	-	PI 2.3 PI 2.4	-	-	-	-
CLO#06	-	-	PI 3.1 PI 3.2 PI 3.3	-	-	-