

ANALOG AND DIGITAL ELECTRONICS

III Semester: CSE / IT / CSIT / CSE (AI&ML) / CSE (CS)																										
Course Code	Category	Hours / Week			Credits	Maximum Marks																				
AECC08	Core	L	T	P	C	CIA	SEE	Total																		
		3	0	0	3	30	70	100																		
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 45																			
Prerequisites: No Prerequisites																										
<p>I. COURSE OVERVIEW: This course provides the basic knowledge over the construction and functionality of the analog and digital circuits. It covers principles and characteristics of electronic devices such as diodes, transistors and design of switching circuits as combinational and sequential to verify the relation between input and output. The applications includes in the area of VLSI design, microprocessors, microcontrollers and embedded systems.</p> <p>II. COURSE OBJECTIVES: The students will try to learn:</p> <ul style="list-style-type: none"> I The fundamental knowledge of the basic principles and characteristics of semiconductor devices and their applications. II The basic concept of number systems, boolean algebra and switching characteristics of combinational and sequential circuits. III The design of analog and digital circuits which includes industrial electronics in the fields of communication and micro embedded systems. <p>III. COURSE OUTCOMES: After successful completion of the course, students should be able to:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">CO 1</td> <td style="width: 65%;">Demonstrate the volt-ampere characteristics of semiconductor devices to find cut-in voltage, resistance and capacitance.</td> <td style="width: 20%;">Understand</td> </tr> <tr> <td>CO 2</td> <td>Illustrate half wave and full wave rectifier circuits with filter and without filters used to convert the alternating current into direct current.</td> <td>Understand</td> </tr> <tr> <td>CO 3</td> <td>Analyze the input and output characteristics of transistor configurations and small signal h-parameter models to determine the input - output resistances, current gain and voltage gain.</td> <td>Analyze</td> </tr> <tr> <td>CO 4</td> <td>Identify the functionality of logic gates, parity code and hamming code techniques for error detection and correction of single bit in digital systems.</td> <td>Apply</td> </tr> <tr> <td>CO 5</td> <td>Make use of appropriate logic gates to implement combinational logic circuits.</td> <td>Apply</td> </tr> <tr> <td>CO 6</td> <td>Select a required flip flop to realize synchronous and asynchronous counters for memory storing applications.</td> <td>Apply</td> </tr> </table> <p>IV. SYLLABUS:</p> <p>MODULE – I: DIODE AND APPLICATIONS Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times. Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter.</p> <p>MODULE – II: BIPOLAR JUNCTION TRANSISTOR (BJT) Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.</p> <p>MODULE – III: NUMBER SYSTEMS Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.</p> <p>Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.</p>									CO 1	Demonstrate the volt-ampere characteristics of semiconductor devices to find cut-in voltage, resistance and capacitance.	Understand	CO 2	Illustrate half wave and full wave rectifier circuits with filter and without filters used to convert the alternating current into direct current.	Understand	CO 3	Analyze the input and output characteristics of transistor configurations and small signal h-parameter models to determine the input - output resistances, current gain and voltage gain.	Analyze	CO 4	Identify the functionality of logic gates, parity code and hamming code techniques for error detection and correction of single bit in digital systems.	Apply	CO 5	Make use of appropriate logic gates to implement combinational logic circuits.	Apply	CO 6	Select a required flip flop to realize synchronous and asynchronous counters for memory storing applications.	Apply
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MODULE - IV: MINIMIZATION OF BOOLEAN FUNCTIONS

Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

MODULE – V: SEQUENTIAL CIRCUITS FUNDAMENTALS

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

V. TEXT BOOKS:

1. Jacob Millman , “Electronic Devices and Circuits”, McGraw Hill Education, 2017
2. Robert L. Boylestead, Louis Nashelsky, “Electronic Devices and Circuits Theory”, Pearson, 11th Edition, 2009.
3. ZviKohavi&Niraj K. Jha, “Switching and Finite Automata Theory”, Cambridge, 3rd Edition, 2010.
4. R. P. Jain, “Modern Digital Electronics” Tata McGraw-Hill, 3rd Edition, 2007.

VI. REFERENCE BOOKS:

1. J. Millman, H. Taub and Mothiki S. Prakash Rao, “Pulse, Digital and Switching Waveforms”, McGraw Hill 2nd Edition, 2008.
2. S. Salivahanan, N.Suresh Kumar, AVallvaraj , “Electronic Devices and Circuits”, TMH. 2nd Edition, 2008.
3. Morris Mano, “Digital Design, PHI, 4th Edition, 2006.
4. Fredriac J. Hill, Gerald R. Peterson, “Introduction to Switching Theory and Logic Design”, John Wiley & Sons Inc. 3rd Edition, 2006.

VII. WEB REFERENCES:

1. <http://www-mdp.eng.cam.ac.uk/web/library/enginfo/electrical/hong1.pdf>
2. <https://archive.org/details/ElectronicDevicesCircuits>
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASICELECTRONICS/home_page.htm
4. mcsbzu.blogspot.com
5. <http://books.askvenkat.com>
6. <http://worldclassprogramme.com>

VIII. WEB REFERENCES:

1. <http://services.eng.uts.edu.au/pmcl/ec/Downloads/LectureNotes.pdf>
2. <http://nptel.ac.in/courses/122106025/>
3. [http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-\(PDF-313p\).html](http://www.freebookcentre.net/electronics-ebooks-download/Electronic-Devices-and-Circuits-(PDF-313p).html)
4. https://books.google.co.in/books/about/Switching_Theory_and_Logic_Design
5. <https://www.smartworld.com/notes/switching-theory-and-logic-design-stld>
6. https://www.researchgate.net/.../295616521_Switching_Theory_and_Logic_Design