UNIVERSITY OF JAMMU

(NAAC ACCREDITED A + GRADE UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION
(23/Sept/Adp/86)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of the revised Syllabi and Courses of Studies of **Master of Technology (M.Tech.) in Electronics and Communication Engineering for Semester I to IV** under Credit Based System (as given in the Annexure) for the Examinations to be held in the years indicated against each Semester as under:-

Branch	Semester	For the Examination to be held in the years
E&C	**Semester-I**	**December 2023, 2024, 2025**
	Semester-II	**May 2024, 2025, 2026**
	Semester-III	**December 2024, 2025, 2026**
	Semester-IV	**May 2025, 2026, 2027**

The Syllabi of the course are available on the University Website: www.jammuuniversity.ac.in.

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/23/10047-10053
Dated:14/09/2023
Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET
3. C.A to the Controller of Examinations
4. Joint/Assistant Registrar (Exams Prof./Eval Prof./Confidential)
5. Incharge University Website

Endorsed 14/Sept/23
Assistant Registrar (Academic)
14/9/23 14/09/23

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Contact Hours/Week:23

S.No	Subject Code	Subject	Teaching Hours/Week			Credits	Marks		%change
			L	T	P		Internal	External	
1	MECE101	Advance Digital Communication	3	1	-	4	25	75	20%
2	MECE102	Digital System Design	3	1	-	4	25	75	25%
3	MECE103	Embedded System Design	3	1	-	4	25	75	20%
4	MHUM101	Research Methodology	3	1	-	4	25	75	00%
5	MOOC100	NPTEL	3	-	-	3	100	-	100%
6	MECE111	Embedded system laboratory	-	-	2	1	50	-	00%
7	MECE112	VHDL Programming Laboratory	-	-	2	1	50	-	00%
Total Credits						21	300	300	

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Contact Hours/Week:28hours.

S.No	Subject Code	Subject	Teaching Hours/Week			Credits	Marks		%Change
			L	T	P		Internal	External	
1	MECE201	IoT and its Industrial Applications	3	1	-	4	25	75	20%
2	MECE202	Advance Digital Signal Processing	3	1	-	4	25	75	20%
3	MECE203	Wireless and mobile communication	3	1		4	25	75	100%
4	Elective-A		3	1	-	4	25	75	
	MECE2A1	RF and Microwave circuit Design							0%
	MECE2A2	VLSI Process Technology							10%
	MECE2A3	Digital ASIC Design							5%
5	Elective -B		3	1	-	4	25	75	
	MECE2B1	Advance Computer Networks							100%
	MECE2B2	Digital VLSI Circuit Design							15%
	MECE2B3	Digital Image Processing							20%
6	Elective –B laboratory		-	-	2	1	50	-	
	MECE2BA	Advance Computer Networks laboratory							100%
	MECE2BB	Digital VLSI Circuit Design laboratory							0%
	MECE2BC	Digital Image Processing laboratory							100%
7	MECE211	IOT laboratory			2	1	50	-	20%
8	MECE212	Research Seminar-I	-	-	4	2	100	-	0%
Total Credits						24	325	375	

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M.Tech 3rd Semester Electronics and Communication Engineering For Examinations to be held in December 2024,2025,2026

Contact hours/week:28

S.No.	Subject Code	Subject	Teaching Hours/Week			Credits	Marks		% change
			L	T	P		Internal	External	
1	**Elective-C**		3	1	-	4	25	75	
	MECE3C1	Information Theory and Coding							0%
	MECE3C2	Analog VLSI Design							15%
	MECE3C3	Wireless Sensor Network							100%
	MECE3C4	Cryptography and Network Security							20%
2	**Elective-D**		3	1	-	4	25	75	
	MECE3D1	Advance Optical Fiber Communication system							100%
	MECE3D2	MEMS							20%
	MECE3D3	Nano-Electronics							5%
	MECE3D4	Bio Medical Electronics							5%
3	MECE311	**Dissertation Phase I** (To be continued in 4thSem)	-	-	20	9	250	-	0%
Total Credits							300	150	

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M.Tech 4th Semester Electronics and Communication Engineering For Examinations to be held in May 2025,2026,2027

Contact Hours/Week:38

S.No	Subject code	Subject	Teaching Hours/Week			Credits	Marks	
			L	T	P		Internal	External
1	MECE411	Dissertation Phase II	-	-	38	18	300	150
Total Credits						18	300	150

M. Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
Course Title: Advance Digital Communication	3	1	-	4	75	25
Course No.: MECE101						
Duration of Exam:3HRS						

Course Overview: This course aims to acquaint the students with the fundamentals of Advanced Digital communication system, various modulation and spread spectrum techniques. Discussion of AWGN channels, implementation of optimal receiver for AWGN along with carrier and symbol synchronization will also be a part of this course.

Course Outcomes: By the end of the course, students will be able to:

CO1	Explain the fundamental concept of digital communication, including modulation, demodulation, encoding and decoding.
CO2	AnalyzethepropertiesofbasicModulationtechniquesandapplythemtoDigitalCommunication
CO3	Analyze the impact of noise on digital communication system and its effect on signal quality.
CO4	FamiliarizestudentswithOptimumreceiverforAWGNandsymbolsynchronization

Detailed Syllabus

UNIT 1 Elements of a Digital communication system: Communication channels and their characteristics, mathematical models for communication channels, recent trends in digital communication, Deterministic and Random Signal Analysis,BandpassandLowpassSignalRepresentation, Signal spacerepresentation ofwaveforms, Vector Space Concepts, Signal Space Concepts, Orthogonal Expansions of Signals. **(10Hrs)**

UNIT2Digital modulation Schemes: Representations of digitally modulated signals, memoryless modulation methods, Linear Modulation with Memory, Non-linear Modulation Methods with Memory, Spectral Characteristics of Digitally Modulated Signals, Power Spectra of Linearly Modulated Signals, Power Spectra of CPFSK and CPM Signals, Power Spectra of Modulated Signals with Memory. **(15Hrs)**-

UNIT 3 Optimum Receivers for Additive White Gaussian Noise Channels: Waveforms and vector channel models, Optimum detection for the Vector AWGN channel. Implementation of the optimal receiver for AWGN channels, the correlation receiver, matched filter receiver, frequency domain interpretation of the matched filter, Probability of Error for Binary PAM, Probability of Error for M-ary PAM, Probability of Error for M-ary PSK. **(14 Hrs)**

UNIT 4 Carrier and symbol synchronization: Signal parameter estimation, the likelihood function, carrier recovery and symbol synchronization in signal demodulation, carrier phase estimation, maximum likelihood carrier phase estimation,phaselockedloop, effect ofnoiseon thephaseestimation, Decision- Directed Loops, Non-Decision Directed Loops, symbol timingestimation, maximum-likelihood timing estimation, non–decision direct demagnetization. **(13Hrs)**

UNIT 5 Spread Spectrum Signals for Digital Communication: Model of spread spectrum digital communication system, direct sequence spread spectrum signals, Error Rate Performance of the Decoder, some applications of DS Spread Spectrum Signals, Effect of Pulsed Interference on DS Spread Spectrum Systems, Generation of PN Sequences, Frequency hopped spread spectrum signals, CDMA system based on FHSS signals, Synchronization of spread spectrum systems.**(8 Hrs)**

Note: The Question paper will comprise of 7questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5 questions.

Suggested Books:

1. "Digital Communications", JGProakis&MSalehi,5thEditionMcGrawHill
2. "Digital Communication", Simon Haykins, John Wiley &Sons
3. "Principle of Communication systems", Taub & Schilling,Tata Mc GrawHill
4. "Digital Communications: Fundamentals and applications", Bernard Sklar, Prentice Hall Publications

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
Course Title: Digital System Design	3	-	1	4	75	25
CourseNo.: MECE102						
Durationof Exam:3HRS						

Course Overview

This course aims to understand optimize logic circuit designs using Karnaugh maps. This course also focuses on how to design of combinational and sequential digital logic circuits by using different types of modelling using VHDL Language.

Course Outcomes: By the end of the course, students will be able to:

CO1	Optimize logic circuits, using Karnaugh maps. Variable entered mapping and Tabulation method.
CO2	Understandthe critical andpracticalaspectsofallthe combinational&sequentialcircuits.
CO3	Analyze anddesignsequentialcircuitsbyusingthe conceptsof state table andstater education techniques.
CO4	Analyse and design of Asynchronous machines.

Detailed Syllabus

UNIT 1 Minimization and Design of Combinational Circuits: Minimization with theorems, Karnaugh Map, Variable-entered mapping and Tabulation method. MSI and LSI Circuits and Applications: Arithmetic circuits, Comparators, Multiplexers,Codeconverters, EXOR andAND-OR-INVERTGates,WiredLogic,Tri-StateBus System, FAN-IN FAN-OUT,PropagationDelay. **(12Hrs)**

UNIT 2 Sequential Machine Fundamentals: Need for sequential circuits, Distinction between Combinational and sequential circuits, Concept of Memory, Binary Cell, Fundamental of Sequential Machine Operation, Classification of Sequential Machines, Flip-Flop, Type of Traditional Clocked Flip-Flop, Design of Clocked Flop-Flops. Conversion of Flip- Flops. **(12Hrs)**

UNIT 3 Analysis and Design of Sequential Circuits: State Diagram,Analysis of Synchronous Sequential Circuits. Design of Synchronous sequential circuits, State Reduction, Minimizing the next state decoder, Design steps Leading to next State Decoders, Outputdecoderdesign. Counters,Designof SingleMode Counters,Multi-Mode Counters, Ripple Counters, Ring Counters, Shift Registers, Ring Counters using Shift Registers.**(14Hrs)**

UNIT 4 System Controllers Utilizing Combinational MSI/LSI Circuits: Introduction, Using MSI Decoder I System Controllers, Using MSI Multiplexers in system controllers, Read Only Memories, ROM'S PROMS and applications, Using the PROM for Random Logic, Programmed Logic arrays, Applications of PLA. **(12Hrs)**

UNIT 5 Asynchronous Finite-State Machines: Introduction, Asynchronous Analysis, The Design of Asynchronous Machines, Cyclesandraces, Hazards, Essential Hazards. **(8Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5questions.

Suggested Books:

1. "An Engineering Approach to Digital Design",Willian IFletcher,PHI.
2. "Logic and Computer Design Fundamentals" Morris Mano and CharlesR. Kima.

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
Course Title: Embedded System Design	3	1	-	4	75	25
CourseNo.: MECE103						
Duration of Exam:3HRS						

Course Overview: To understand the history & basicconcepts of embedded system, understandingof differenttypes of programming languages used for embedded systems. Study of PIC 16F8XX based processors: architecture, programming, and interfacing of ARM processor with memory &I/O devices. Study of RTOS.

Course Outcomes: By the end of the course, students will be able to:

CO1	Acquire a Basic knowledge about fundamentals of microcontrollers
CO2	To learn techniques and tools for programmable logic design
CO3	To understand memory and interfacingsensors with controllers
CO4	Acquire & implement the knowledge about Life cycle of embedded design and its testing.

Detailed Syllabus

UNIT 1: Definition of Embedded System. Embedded systems Vs Computing systems. Embedded system model. Major application areas. Purpose of embedded systems. Characteristics and quality attributes of embedded systems. Introduction to PIC 16F8XX Microcontroller, CPU architecture, register file structure, Instruction Set, Programs, Timers and Interrupts, Interrupt Service Routine, Features of Interrupts. Interrupt vector & Priority.**(12Hrs)**

UNIT 2: Interfacing: 16F8XX in PIC, I/O Interface, LCD interfacing, seven segment interfacing, I2CBus, DAC, ADC. **(8Hrs)**

UNIT3: Embedded Core Based Design: System on chip, Application specific Integrated circuit, Overview of Embedded Processors like LPC 2148 features and instruction set, interfacing of LPC2148 with LED, DC motor, buzzer, ultrasonic sensor, HC SR04, seven segment display, ADC, keypad, switches UART, etc., study of MIPS. Architecture. **(15Hrs)**

UNIT4: Data parallel issues e.g. SIMD, MIMD. Introduction to FPGA, Basics of FPGA, RTOS overview. Architecture of an RTOS, Important features of Linux, Locks and Semaphores, OperatingSystemTimers, andInterrupts.**(10 HRS)**

UNIT5: System Design using LPC2148: Applications of Embedded Systems in Embedded Networking Introduction to Wireless Sensor Networks, Architecture of Wireless Sensor Node, application of ultrasonic sensor **(15Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates Shall have to attempt any 5questions.

Suggested Books:

1. "Microcontrollers(TheoryandApplications)",AjayV.Deshmukh
2. "PIC Microcontroller", JohnB.Peatman
3. "ARM system architecture", Steve Furber, Addison Wesley
4. "Programming Embedded Systemin C/C++", M.Barr
5. ""Embedded Systems",RajKamal
6. "Embedded Systems",K.V.Shibu
7. "Embedded Systems Design, Elsevier Science(2003)",AndrewN.Sloss.
8. "ARM System Developer's Guide Designing and Optimizing System Software", MorganKaufmanPublication(2010).

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held-in December2023,2024,2025

Branch: ECE Semester:1st	L	T	P	C	External	Internal
Course Title: Research Methodology	3	1	-	4	75	25
Course No.: MHUM101						
Duration of Exam:3HRS						

Course Overview: Research Methodology is a hands-on course designed to impart education in the foundational methods and techniques of academic research in social sciences and business management context. Research scholars would examine and be practically exposed to the main components of a research framework i.e., problem definition, research design, data collection, ethical issues in research, report writing, and presentation. Once equipped with this knowledge, participants should be well-placed to conduct disciplined research under supervision in an area of their choosing. In addition to their application in an academic setting, many of the methodologies discussed in this course would be similar to those deployed in professional research environments.

Course Outcomes: By the end of the course, students shall be able to:

CO1	To develop understanding of the basic framework of research process by exploring various research designs and techniques.
CO2	To identify various data collection. processing and analysis methods.
CO3	To develop an understanding of the ethical dimensions of conducting applied research.
CO4	To develop and Practice the skills necessary to conduct, review and publish research.

Detailed Syllabus:

UNIT I Research Methodology: Introduction, Objectives of Research, Significance of Research, Research Methods versus Methodology, Types of Research-exploratory Research, Descriptive Research, Casual Research, Research process, Defining a Research Problem, Techniques involved in Defining a Problem. **(11 hrs)**

UNIT 2 Research Design: Need for Research Design, Features of Good Design, Different Research Designs, Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sample size Determination. Questionnaire Design and Testing, Measurement and scaling, Scaling Techniques. **(12 hrs)**

UNIT 3 Methods of Data Collection and Presentation: Methods of Data Collection, Collection of Primary and Secondary Data, Selection of appropriate method, Data Processing Operations, Diagrammatic and Graphical representation of data with Pie chart, Bar Diagram, Line Chart, Histogram, frequency Polygon , Ogive curves and Spread sheets. **(14hrs)**

UNIT 4 Statistical Tools: Measure of central tendencies- airthematic mean(for individual observation, discrete series and continuous series) Median , mode, quartiles, Deciles and percentile: Measures of Dispersion- range, quartile deviation, standard deviation, variance and coefficient of variance. **(12 hrs)**

UNIT 5 Techniques of Hypotheses: Hypotheses meaning and basic concepts, Flow diagram, Power of Hypotheses Test, Types of Hypotheses, limitations of the tests of Hypotheses, Chi-square Test, Correlation and Regression, Conversion of Chi to Phi, Caution in using Chi-square test. **(11 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

1. "Research Methodology", C.R. Kothari, Wiley Eastern.
2. "Formulation of Hypothesis", Wilkinson K.P, L Bhandarkar, Himalaya Publication, Bombay.
3. "Research in Education", John W Best and V. Kahn, PHI Publication
4."Intellectual Property in New Technological Age", A. Lemley, 2016.
5. Booth, Colombi and Williams. The Craft of Research, University of Chicago Press, Chicago & London. Second edition, 2003.
6 John W. Creswell. Research Design, Sage Publications, New Delhi, Third Edition, 2009.

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
Course Title NPTEL	3	-	-	3	-	100
Course No.: MOOC100						
Duration of Exam:3HRS						

The students shall register for a 12 week SWAYAM/NPTEL course offered by IIT ,out of the list of courses floated by SWAYAM around the time of commencement of the semester. However, the selected NPTEL course should not be similar to the regular courses offered as a part of the department curriculum. The choice of course needs to be duly endorsed by the Department Academic Committee.

The overall monitoring of the NPTEL course will be under the supervision of the teacher in charge of the department.

The NPTEL/SWAYAM certification course comprises of Assignments (25%) and Proctored Examination (Online examination MCQ's based =75%) conducted at the end of the semester by IIT as per the schedule.

The marks obtained by the students in the NPTEL/SWAYAM certification course will be tabulated by the concerned department.

NOTE: - *In case the student does not pass the certification exam or remains absent in the proctored examination, no certificate will be given to the candidate by NPTEL and the student will be deemed to have failed in that course. The student will have to register again for the next semester NPTEL course and pass the examination along with a certificate.*

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
Course Title Embedded System Laboratory	-	-	2	1	-	50
Course No.: MECE111						

Course Outcomes: By the end of the course, students will be able to:

CO1	Interface ARM controller with various applications.
CO2	Implement macros in any software.
CO3	Implement programmes on FPGA

List of Experiments:

1. Write a program to operate LED with the help of ARM controller
2. Write a program to control LED with a switch using ARM controller
3. Write a program to implement 8 bit binary counter using ARM
4. Write a program to interface seven segment display with ARM
5. Write a program to implement macros in any software
6. Write a program to implement ADC using ARM
7. Write a program to interface keypad with ARM
8. Write a program to use INT0 interrupt in ARM
9. Implementation on FPGA

NOTE: Additional Practical / Experiments will be performed based on the course content requirements.

M.Tech 1st Semester Electronics and Communication Engineering For Examinations to be held in December2023,2024,2025

Branch:ECE Semester:1st	L	T	P	C	External	Internal
CourseTitle: VHDL Programming Laboratory	-	-	2	1	-	50
Course No.: MECE112						

Course Overview: This course gives knowledge about the design, analysis, simulation of digital circuits used as building blocks in Very Large Scale Integration (VLSI) devices. This lab also provides hands-on experience on implementation of digital circuit designs using VHDL HDL language, which are required for development of various projects.

Course Outcomes: By the end of the course, students will be able to:

CO1	Design, simulate and verify with hardware description languages
CO2	Understand and the use of VHDL HDL - entities, architectures, processes, functions, common concurrent statements, and common sequential statements
CO3	Design of combinational and sequential digital logic circuits by using different types of modeling of VHDL HDL language.
CO4	Design and verification of basic digital components using VHDL.

List of Experiments:

1. Verification of combinational designs.
2. Verification of sequential designs.
3. Design and verification of full adder.
4. Design and verification of 4-bit adder.
5. Design and verification of 4-bit look ahead carry adder
6. Design and verification of 8-bit arithmetic circuit.
7. Design and verification of 8-bit ALU.
8. Design and verification of 1024x4 RAM.

NOTE: Additional Practical / Experiments will be performed based on the course content requirements.

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
CourseTitle:IoT and its Industrial Applications	3	1		4	75	25
CourseNo.: MECE201						
Durationof Exam:3HRS						

Course Overview:
In this course, student will explore various components of Internet of things such as Sensors, internetworking and cyber space. In the end they will also be able to design and implement IIoT circuits and solutions.

Course Outcomes: By the end of the course, students will be able to:

CO1	Attain knowledge of IoT, design, Architecture, communication protocols and sensors.
CO2	Implement the concepts Python programming tools, Res-pi and Arduino.
CO3	Analyse challenges in Iot and its applications in real time scenario.
CO4	While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.

Detailed Syllabus

UNIT 1: Introduction to IoT:
IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. **(8 Hours)**

UNIT 2: IoT to M2M:
IoT and M2M fundamentals, Devices and gate ways, Definitions, M2M Value Chains, IoT Value Chains, Difference between IoT and M2M. **(6 Hours)**

UNIT 3: Network and communication protocol:
IoT standards and protocol, Wireless medium access issues, MAC control survey, constrained application protocol (CoAP). Message queue Telemetry transport protocol (MQTT), AMQP, security ion IoT protocol, Sensor deployment and node discovery, Data handling and analyst, Cloud Platform for IoTs.**(8 Hours)**

UNIT 4 Sensors and Actuators Modules:
Concept, layout, working and different applications of sensors and actuators, Temperature Sensor, Pressure Sensor, Proximity Sensor, Accelerometer and Gyroscope Sensor, IR Sensor, Optical Sensor, Gas Sensor, Smoke Sensor. ultrasonic sensor, relay. **(8 Hours)**

UNIT 5 Developing IoT based systems:
Introduction to Python, Implementing IoT concepts with python, Introduction to Arduino and Raspberry Pi programming, Implementation of IoT sensors with Arduino and Raspberry, Smartphone (Cellular), Bluetooth, LoRaWAN, Zigbee and wifi interfacing with R-Pi and Arduino. Introduction to ESP8266. **(12 Hours)**

UNIT 6: Control & Supervisory Level of Automation
Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP & MES. **(8 Hours)**

UNIT 7: Application of IIOT
Health monitoring, IOT smart city, Smart irrigation, Robot surveillance. Home Appliances Control Using Blynk Application, IIoT based smart energy meter. **(10 Hours)**

Note: The Question paper will comprise of 7 questions of 15 marks each, uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5 questions.

Suggested Books:

1. "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, 1st Edition, Academic Press, 2014.
2. "Internet of Things (A Hands-onApproach)", Vijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014
3. "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",Francis da Costa, 1st Edition, Apress Publications, 2013
4. "Getting Started with the Internet of Things", CunoPfister, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
5. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
Course Title: Advanced Digital Signal Processing	3	1	-	4	75	25
CourseNo.: MECE202						
Duration of Exam:3 HRS						

Course Overview: This course aims to introduce fundamentals of discrete systems and digital signal processing. It will provide the advanced methods of designing and analyzing algorithms that will help the students in developing theabilitytoselect opportunealgorithms anduseitfor aspecific problem.

Course Outcomes: By the end of the course, students will be able to:

CO1	Understandtheprincipleof DFT,algorithmapproachesinFFT andits usein datareduction.
CO2	Demonstrate proficiency in designing and implementing advanced digital filters, including finite impulse response (FIR) infinite impulse response (IIR) filters using various design methods such as windowing, frequencysamplingmethod
CO3	Understand the effect of finite word length andapprehendmulti-rate signal processing and its application.
CO4	Recognize theconceptsofadaptivefiltersdesignanditsapplications.

Detailed Syllabus

UNIT1 Discrete and Fast Fourier Transform: Review of z-transform, Discrete Fourier Transform (DFT) and Discrete Time Fourier Transform (DTFT), Divide and Conquer approach, Introduction to FFT algorithms- Decimation in time and decimation in frequency algorithms. **(12Hrs)**

UNIT 2 Digital Filters Design: Design of FIR filters using window methods, frequency sampling method. Design of IIR filter using Impulse Invariant method, Bilinear transformation, Butter worth filters, Cheby shev filters, Realization structures. **(12Hrs)**

UNIT 3 Effect of Finite word length in Digital Filters: Introduction, rounding and truncations errors, Quantisation effects, Output noise power from Digital systems, Limit cycle oscillation, Product Quantisation, Scaling, Quantization errors in the computation DFT. **(10Hrs)**

UNIT 4 Multi-rate Digital Signal Processing: Sampling rateconversion, filters in sampling rate alteration systems, multi rate structure for sampling rate conversion, Polyphase Decomposition, Multistage decimator and interpolator, Digital filter banks, Quadrature mirror filter bank, Multilevel filter banks. **(12Hrs)**

UNIT 5 Adaptive Filters: Concepts of Adaptive filters, the Windrow LMS algorithm, Recursive Least square algorithm, Forward-Backward lattice method, Gradient adaptive lattice method, Applications of adaptive filters. **(12Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5questions.

Suggested Books:

1. "Digital Signal Processing", Saliahanan, VallavarajandGnanapriya,TataMcGrawHill.
2. "Digital Signal Processing: Principles, Algorithms and Applications", J.G. Proakis and D.G. Manolakis, Pearson Education.
3. "Signals and Systems",Alan V.OppenheimandAlanS.Wilsky,PHI
4. "Digital Signal Processing:Apracticalapproach",Ifeacher,andJervis,PearsonEducation.
5. "Digital Signal Processing:A computerbasedapproach",S.K.Mitra,TataMcGrawHill.
6. "Digital Signal Processing",J.S.Chitode,TechnicalPublications.

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
CourseTitle:Wireless and mobile communication CourseNo.: MECE203 Durationof Exam:3HRS	3	1		4	75	25

Course Overview

The course aims to equip students with a comprehensive understanding of wireless and mobile communication systems. It provides an overview of existing and emerging wireless communications networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies and multicarrier transmission techniques.

Course Outcomes: By the end of the course, students will be able to:

CO1	Demonstrate a solid understanding of the fundamental principles, concepts, and technologies underlying wireless and mobile communication systems.
CO2	Imbibe knowledge about Wireless Systems And Standards GSM channels, multiplex access scheme.
CO3	Understand the concepts of Handoff, dropped calls and cell splitting, Intersystem handoff.
CO4	Evaluate the performance and analyze the challenges of wireless channels, including fading, diversity, interference, multipath propagation, and channel capacity.
CO5	Understand and Analyse the features and technologies used in advance wireless standards, viz GSM, CDMA2000,4G and 5G.

Detailed Syllabus

Unit 1Wireless communication systems: Wireless network generations, Mobile Radio standards-AMPS, IS-95,GSM,UMTS, CDMA2000;Mobile Wireless systems: cordless and cellular telephone system; Fixed wireless networks-Wireless Local Loop & local Multi point Distribution system; Bluetooth; Mobile radio systems around the world, Overview of 2G 3G, 4G and 5G **(8hrs)**

Unit 2Fundamentals of cellular system: Cellular concept fundamentals- Cell structure, cluster, frequency reuse, basic cellular system: channel assignment strategies, Handoff strategies: concept, types, Hard, Soft, MAHO, Proper and improper handoff, Umbrella cell approach; interference and system capacity: cochannel interference and adjacent channel interference,improving coverage and capacity in cellular systems: mechanism for capacity improvement-cell splitting, cell sectoring, and micro cell zone concept. **(14hrs)**

Unit3Mobile Radio Propagation: Fading, Large scale path loss, reflection, Diffraction, Scattering, Outdoor Propagation model-Okumura Model, HataModel, Indoor Propagation Models; Small-scale multipath propagation, Types of small-scale fading, Rayleigh and Ricean distributions, Diversity Schemes.**(12 Hrs)**

UNIT 4Digital cellular mobile standards: Global system for Mobile communication (GSM): features and services, GSM radio aspect, GSM architecture, GSM channels; GSM call routing: Mobile terminated call and mobile originated call sequence, stages of call processing in GSM;IS-95;Multiplex access scheme, TDMA, FDMA, CDMA, OFDM **(14 hrs)**

Unit 5 Advance Wireless standards: Need for 3G and 4G technology; IMT-2000 Global standards: vision, compatibility, service and spectrum requirements; W-CDMA standard: features, architecture, CDMA2000, features, Next Generation mobile standards: features of 4G &4G LTE,VoLTE,4.5G,5G.

(12hrs)

Suggested Books:

1. "Mobile Communications", Jochen Schiller, Pearson Education
2. "Mobile and Personal Communication-System and Services", Raj Pandya, PHI
3. "Wireless Communications and Network", W. Stallings, Pearson Education
4. "Wireless Communications: Principles &Practice",T.S. Rappaport

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
CourseTitle:RF and Microwave Circuit Design CourseNo.:MECE2A1 Durationof Exam:3HRS	3	1	-	4	75	25

Course Overview: This course aims to provide comprehensive knowledge of high frequency circuit design principles and to develop the RF circuit design aspects. It will also refine the concepts related with micro-strip lines; their analysis, design, fabrication and test are addressed

Course Outcomes: By the end of the course students will be able to:

CO1	Recognize the significance of boundary conditions in transmission lines and waveguides.
CO2	Understand the fundamentals of semiconductors, followed by their circuit models and analyze the theory and application of microwave measuring instruments.
CO3	Analyse and design various transmission line structure, such as microstrip line, strip line and waveguides for efficient signal propagation at high frequency.
CO4	Design microwave passive devices with the knowledge of various simulation tools.

Detailed Syllabus:

UNIT 1 Review of boundary conditions: Waveguides and Cavity resonates (rectangular, circular & cylindrical) passive Circuits (design principles), impedance transformers, filters, hybrids, isolates. Detail discussion on S-matrix. **(10Hrs)**

UNIT 2 High frequency semi-conductor devices: Intel valley Scattering, Gunn diodes, IMPATT diodes, Step recovery diodes. Lumped elements: Equivalence circuits of Capacitors and Inductors, Design of lumped element resonators and circuits. Basic blocks in RF system and their VLSI implementation, Design of mixer, Basic topologies VCO and phase noise, Various RF Synthesizer architecture and frequency dividers, Design issues in integrated RF filters. Thin & Thick film technologies. **(15Hrs)**

UNIT 3 Design aspects: Transmission lines fir microwave circuits, Strip lines, Micro-strip lines, Slot line & Coupled lines. Characteristics impedance, Lumped parameters etc. Design considerations and implementation using simulation tools. Design of power dividers, combiners, and directional couplers **(10 Hrs)**

UNIT 4 Microwave measurements: SWR, Return loss, impedance, Scattering parameters, attenuation and familiarization with equipments such as vector network analyzer, Spectrum analyzer, power meters and their block diagrams discussion. Fabrication techniques in microwave**(15Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5 questions.

Suggested Books:

1. "Stripline- Loke Transmission lines for MICS", B.Bhat&S.koul, John Wiley
2. "Hand book of Microwave Technology, Vol.1", T.K. Ishii, Academics Press
3. "Microwave integrated Circuit", Y.Konishi, Marcel Dekker
4. "Microwave Circuit Analysis and Amplifier Design", S.Y.Liao, PHI
5. "RF Micro-Elements", B.Razavi, PHI

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
CourseTitle:VLSI Process Technology	3		-	4	75	25
CourseNo.: MECE2A2						
Durationof Exam:3HRS						

Course Overview: This course aims to understand the fabrication process of IC technology and the analysis of the operation of MOS transistor. This course also focuses on the physical design processes of VLSI design flow.

Course Outcomes: By the end of the course, students will be able to:

CO1	Identify the various design limits material used and understand the complexities and Processes involved in the ICs Fabrication Technology
CO2	To study various VLSI fabrication steps involved such as oxidation, lithography, etc.
CO3	Apply principles to Identify and Analyze the various steps for the fabrication of VLSI Chips
CO4	Study of Tools and Technologies involved in VLSI circuit Fabrication

Detailed Syllabus:

UNIT1:Crystal growth: Source of silicon; Single crystalline and Poly crystalline; Requirement of purity for electronics industry; Electronics grade silicon production; Crystal growth techniques; refining; Silicon Wafer Preparation & Crystal Defects; Epitaxial Process: Need of epitaxial layer; vapors phase epitaxy, chemistry of epitaxial process, transport mechanism doping & auto doping; selective epitaxy, epitaxial process induced defects, molecular beam epitaxy. **(15 Hrs)**

UNIT2: Oxidation: Importance of oxidation; types of oxidation techniques; growth mechanism & kinetics; factors affecting the growth mechanisms; silicon oxidation model, dry & wet oxidation; oxidation induced faults. **(08Hrs)**

UNIT3:Lithography: Basic steps in lithography; lithography techniques-optical lithography, electron beam lithography, x-ray lithography, ion beam lithography; resists and mask preparation of respective lithographic, printing techniques-contact, proximity printing and projection printing. **(10Hrs)**

UNIT4: Etching: Performance metrics of etching; types of etching- wet and dry etching; dry etching techniques-ion beam or ion-milling, sputter ion plasma etching and reactive ion etching (RIE); etching induced defects. **(07Hrs)**

UNIT5: Diffusion and Ion Implantation: Diffusion mechanisms; diffusion reactor; diffusion profile; diffusion kinetics; parameters affecting diffusion profile; Dopants and their behaviour, choice of dopants; Ion Implantation- impurity distribution profile, properties of ion implantation, low energy and high energy ion implantation. **(10 Hrs)**

UNIT6: Metallization: Desired properties of metallization for VLSI; metallization choices; metallization techniques –vacuum evaporation, sputtering. **(05 Hrs)**

UNIT7: Assembly Techniques & Packaging of VLSI chip: Introduction to packaging; packaging process; various package types, Prototype fabrication of MOSFETs (Enhancement and depletion mode), n-MOS, p-MOS, CMOS. **(05Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5 questions.

Suggested Books:

1. VLSI Technology by S.M. Sze, TMH.
2. VLSI Fabrication Principles by S.K. Gandhi, John Willey& Sons.
3. Micromachined transducer by G.T.A. Kovacs, McGraw Hill.
4. W. Wolf, "Modern VLSI Design", (3rd edition), Pearson,2002
5. James D. Plummer, Silicon VLSI Technology: Fundamentals, Practice and Modeling, Pearson Education,2000
6. Stephen A. Campbell, The Science and Engineering of Microelectronic Fabrication (2nd edition), Oxford University Press 2001
7. C.Y. Chang &S.M.Sze , ULSI Technology, McGraw Hill ,1996

M.Tech 2nd Semester Electronics and Communication Engineering For Examinations to be held in May 2024,2025,2026

Branch:ECE Semester:2nd	L	T	P	C	External	Internal
CourseTitle:Digital ASIC Design	3	1	-	4	75	25
Course No.: MECE2A3						
Durationof Exam:3HRS						

Course Overview: This course aims to understand Full Custom Design and SOC. This course will provide valuable design experience from architecture to digital circuits and also provides a deeper study of CMOS digital-circuit fundamentals including combinational logic, sequential state, and interconnect.

Course Outcomes: By the end of the course, students shall be able to:

CO1	Understand of ASIC and FPGA design flow, various design Methodologies and different types of programm Technologies and logic Devices
CO2	Understand the performance algorithms and its application to ASIC design
CO3	Design chip using the Full Custom Design Flow and Tool.
CO4	Understand the basics of System on Chip and on chip communication architectures for ASICs.

Detailed Syllabus

UNIT1: Introduction: ASIC and FPGA devices, ASIC and FPGA Design flows, Top-Down and Bottom-Up design methodologies, Hardware Description Languages, Design Automation Tools. HDL Support for Synthesis. Language concepts: Design Entity, Declaration statements, concurrent statements, sequential statements, data types, data objects, expressions, operands, if-else, for-loop, case statements, synthesis equivalents and constraints. **(15Hrs)**

UNIT2: Modelling Combi national Circuits: Control & Data partitioning, Synthesis concepts, non-synthesizable constructs, operators, expressions, conditional statements, post synthesis simulation, basic test bench. Logic and arithmetic equations, multiplexers, encoders, decoders, comparators, 12dders, subtractors, multipliers, ALUs, synthesis constraints. **(15Hrs)**

UNIT3: Modelling sequential circuits: Latches and Flip-flops, counters, mealy and Moore FSM, shifters, sequential adders, multipliers and dividers. Blocking and non-blocking statements. Static timing analysis, Procedures and timing control, procedural blocks, loops, Tasks and functions, Test bench modelling techniques, Path delay modelling, Timing analysis, User defined primitives, compiler directives, and system task. **(15Hrs)**

UNIT4: Implementation on FPGA. Unsigned integer, signed integer, fixed-point, floating-point arithmetic, Asynchronous considerations. Memory design: synchronous and asynchronous, single, dual and multi-port, Error detection and correction, compiler directives. **(15Hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidate shall have to attempt any 5 questions.

Suggested Books:

1. The Designer's Guide to VHDL by Peter J. Ashenden, Morgan Kaufmann Publishers.
2. A Verilog HDL Primer by J. Bhasker, Star Galaxy Press.
3. Verilog HDL: A Guide to Digital Design and Synthesis by Samir Palnitkar, Prentice Hall.
4. The Complete Verilog Book by VivekSagdeo, Kluwer Academic Publishers.
5. HDL Chip Design: A Practical guide for Designing, Synthesizing and Simulating ASICs and FPGAs using VHDL or Verilog by Douglas J. Smith, DoonePubns.
6. VHDL Coding Styles and Methodologies by Ben Cohen, Kluwer Academic Publishers.
7. A VHDL Primer by J. Bhasker, Prentice Hall.