Sanjay Ghodawat University Kolhapur



School of Engineering and Technology
Department of Electronics and Communication Engineering

B. Tech. Electronics & Communication Engineering

Curriculum Structure & Syllabus (R25)

Semester: III-IV

Structure for B Tech.: Second Year Electronics and Communication Engineering

Semester III: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	
UECPC301	Analog Circuit Design	3	-	-	3	-	-	3
UECPC302	Signals and Systems	3	-	-	3	-	-	3
UECPC303	Network Analysis and Synthesis	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor I	2	-	-	2	-	-	2
UXXOE01X	Open Elective I	2	-	-	2	-	-	2
UCMEM001	Engineering Economics	2	-	-	2	-	-	2
UECPC304	Analog Circuit Design Lab	-	2	-	-	1	-	1
UECPC305	Network Analysis and Synthesis lab	-	2	-	-	1	-	1
UECPC306	Circuit Simulation I		4	-	-	2	-	2
UECFP301	Community/Field Project		4	-	-	2	-	2
Total		**15**	**12**		**15**	**6**		**21**

Semester III: Evaluation Scheme

Course code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment				SEE	Term work	Practical Oral/POE	
		T1	T2	FET	Total				
UECPC301	Analog Circuit Design	10	10	5	25	50	-	-	75
UECPC302	Signals and Systems	10	10	5	25	50	-	-	75
UECPC303	Network Analysis and Synthesis	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor I	10	-	5	15	35	-	-	50
UXXOE01X	Open Elective I	10	-	5	15	35	-	-	50
UCMEM001	Engineering Economics	10	-	5	15	35	-	-	50
UECPC304	Analog Circuit Design Lab	-	-	-	-	-	25	-	25
UECPC305	Network Analysis and Synthesis lab	-	-	-	-	-	25		25
UECPC306	Circuit Simulation I	-	-	-	-	-	25	25	50
UECFP301	Community/Field Project	-	-	-	-	-	25	25	50
								Total	**525**

Programme Structure for B Tech.: Second Year Electronics and Communication Engineering

Semester IV: Teaching Scheme

Course code	Course Name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	
UECPC401	Electromagnetic Waves and Antennas	3	-	-	3	-	-	3
UECPC402	Digital Control System	3	-	-	3	-	-	3
UECPC403	Digital Circuit Design	3	-	-	3	-	-	3
UXXMM0XX	Multidisciplinary Minor-II	2	-	-	2	-	-	2
UXXOE02X	Open Elective II	2	-	-	2	-	-	2
UCMEM003	Project Management	2	-	-	2	-	-	2
UECPC404	Circuit Simulation II	-	4	-	-	2	-	2
UECPC405	Digital Circuit Design Lab	-	2	-	-	1	-	1
UECPC406	Digital Control System Lab	-	2	-	-	1	-	1
UHSAE008	Employability Skills	1	2	-	-	2	-	2
UHSVE005	AI Ethics and Governance	1	-	1	1	-	1	2
Total		**17**	**10**	**1**	**16**	**6**	**1**	**23**

Semester IV: Evaluation Scheme

Course code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment				SEE	Term work	Practical Oral /POE	
		T1	T2	FET	Total				
UECPC401	Electromagnetic Waves and Antennas	10	10	5	25	50	-	-	75
UECPC402	Digital Control System	10	10	5	25	50	-	-	75
UECPC403	Digital Circuit Design	10	10	5	25	50	-	-	75
UXXMM0XX	Multidisciplinary Minor-II	-	10	5	15	35	-	-	50
UXXOE02X	Open Elective II	-	10	5	15	35	-	-	50
UCMEM003	Project Management	-	10	5	15	35	-	-	50
UECPC404	Circuit Simulation II	-	-	-	-	-	25	-	25
UECPC405	Digital Circuit Design Lab	-	-	-	-	-	25	25	50
UECPC406	Digital Control System Lab	-	-	-	-	-	25	-	25
UHSAE008	Employability Skills	-	-	-	-	-	25	25	50
UHSVE005	AI Ethics and Governance	10	10	5	25	-	25	-	50
								Total	**575**

Exit Option:

- Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs.
- Students exiting the Second Year Programme after securing minimum 80 credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 4-8 credits in skill-based vocational courses (skill-based courses, internship, mini projects etc) offered during summer vacation after the second year.

Syllabus

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECPC301	Analog Circuit Design	Theory	Practical	Tutorial	Theory	Practical	Tutorial
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
UECPC301	Analog Circuit Design	T1	T2	FET	Total	Min pass	Marks	Min pass	
		10	10	5	25	40%	50	40%	75

Course Description

This course mainly focuses on various Analog Circuit design, implementation and applications viz. Amplifiers, Oscillators, and Power supplies. Mainly focused on giving hands-on practical exposure in conducting circuit design for a given analog circuit.

Pre-requisites: Basic Electrical and Electronics Engineering

Course Objectives

- To help the students in understanding various circuit characteristics and their applications.
- To develop skills in design of small signal amplifier circuit at low and high frequencies.
- To design oscillator circuits at Low and high frequencies.
- To train the students in analyzing fixed and variable power supply.

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

CO1 **Discuss**[2]basic classification and operation of Amplifier Circuits

CO2 **Analyze**[4]the performance parameters of different analog circuits.

CO3 **Design**[3] various oscillator circuits and power supply

CO4 **Recognize**[2]different analog circuit in industrial, real life, modern control system applications.

Course Contents

Module	Unit	Description	Hours
1.0		**Voltage Amplifiers**	**9**
	1.1	Amplifiers-Single stage RC coupled amplifier-its operation and frequency response using BJT and FET. Design of single stage RC coupled amplifier,	
	1.2	Derivation of h-parameters of CB,CE and CC configuration. Derivation for Av, Ai, Zi, Zo for CE configuration, Introduction to multistage amplifiers, Numerical expected. Operation and design of two stage Direct coupled amplifier Circuit.	
2.0		**Feedback Amplifiers**	**9**
	2.1	Feedback-types, block diagram of negative feedback amplifier, Types of negative feedback, effects of negative feedback.	
	2.2	Derivation for Av, Ai, Zi for voltage series, voltage shunt, current series, current shunt feedback amplifiers, numerical expected. Comparison between all feedback amplifiers.	
3.0		**Field Effect Transistors**	**9**
	3.1	Difference between BJT and FET, classification of FETs, construction, operation and characteristics of N-channel and P-channel JFET, parameters of JFET.	
	3.2	MOSFET-types, Construction, operation and characteristics of enhancement MOSFET and Depletion type MOSFET. Difference between MOSFET and JFET, biasing of JFET-Gate bias, self-bias voltage divider bias, CMOS as an inverter.	
4.0		**Oscillators**	**9**
	4.1	Oscillators-classification, positive feedback, Barkausen criteria, RC phase shift, Wein bridge oscillator :operation , design and derivation for frequency of oscillation	
	4.2	Generation of oscillations in LC elements. Hartley and Colipitt's Oscillator operation , design and derivation for frequency of oscillation: (BJT and FET), Pierce crystal Oscillator. Series and Parallel resonance circuit of crystal.	
5.0		**Power supply Design**	**9**
	5.1	Comparison between Un-regulated and regulated power supply, Design of Unregulated power supplies with and without filters .	
	5.2	IC Regulators: Fixed voltage regulators using 78XX and 79XX series, Variable regulator- LM317 and LM723 IC voltage regulators, Design aspects. SMPS – block diagram.	

Text Books

1 Allen Mottershed, Electronics devices and circuits,Prentice Hall India.

2 David A Bell, Electronic devices and circuits, Prentice Hall India

References

1. A. Salivahan, Electronics devices and circuits, Prentice Hall India.

2. Robert Boylsted, Louis Nashelky, Electronics devices and circuit theory, Pearson Education.

Internal Assessment (T1, T2 and FET):

1. T_1 (Test 1) should be based on first two modules and T_2 (Test 2) should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately.

Semester End Examination:

1. Question paper will be of 50 marks comprised of 5 questions, each carrying 10 marks.
2. The duration of semester end examination shall be 2 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECPC302	Signals and Systems	**Theory**	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
		03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (SEE)		Total (Marks)
UECPC302	Signals and Systems	**T1**	**T2**	**FET**	**Total**	**Min pass**	**Marks**	**Min pass**	
		10	10	5	25	40%	50	40%	75

Course Description

This is a core course in signal processing and is a pre-requisite for next semesters of signal processing related courses in electronics and communication engineering. This course covers types of signals and systems and also time domain and frequency domain analysis of signals and systems using various transforms.

Pre-requisites: Mathematics, Basics of Electrical & Electronics

Course Objectives

- To acquire the knowledge for different types of signals and systems.
- To understand concept of impulse response and convolution.
- To understand Fourier and z-transform representation of signal and system.
- To know the concept of correlation and spectral density.

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

CO1 **Classify**[2] different types of signals and system.

CO2 **Compute**[3] convolution of signals.

CO3 **Apply**[3] Fourier transform for analysis of CT and DT signals.

CO4 **Analyze**[4] system using z-transform.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Signals and Systems**	**9**
	1.1	Definition of signals and systems, Classification of signals: Continuous time and discrete time, even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power. Operations on signals. Elementary signals: exponential, sine, step, impulse, ramp, signum, sinc.	
	1.2	Systems Classification: linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable invertible. Introduction to control system: definition and types. Block diagram and signal flow graph and transfer function.	
2.0		**Time Domain Analysis of System**	**9**
	2.1	CT and DT LTI system, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method, computation of convolution sum by all methods, properties of convolution.	
	2.2	System properties in terms of impulse response, step response. Representation of systems using differential /difference equation. Differential equation of physical systems: mechanical and electrical system.	
3.0		**Frequency Domain Analysis using Fourier Transform**	**9**
	3.1	CT Fourier series and DT Fourier Series, existence of Fourier series, FS representation of CT signals using trigonometric and exponential Fourier series. Properties of Fourier series.	
	3.2	CT Fourier Transform, Discrete time Fourier transform, Existence of Fourier Transform, Properties of CTFT, Properties of DTFT, evaluation of magnitude and phase response of signals, FT of standard CT signals. Properties of Fourier transform.	
4.0		**System analysis using Z-transform**	**9**
	4.1	Need of Z-Transform, definition of unilateral and bilateral Z-Transform, Z-Transform of finite and infinite duration sequences, properties of Z-transform.	
	4.2	Inverse Z- Transform-long division method, PFE method, Z-Transform of standard signals, ROC for ZT, plotting poles and zeros of transfer function, causality and stability of systems.	
5.0		**Correlation and Spectral Density**	9
	5.1	Definition of Correlation and Spectral Density, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation,	
	5.2	Energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.	

Text Books

1. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, Prentice-Hall of India, Second Edition, 2002.
2. P. Ramesh Babu, R.Anadanatrajan “Signals & Systems”, SciTech publication , Fourth Edition, 2011.

References

1. B.P.Lathi, “Signals, Systems and Communication”, BS Publication, 2001.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley and Sons, Second Edition, 2004.

Internal Assessment (T1,T2 and FET)

1.T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules each for 10 marks.

2.FET shall be assessed for 5 marks separately.

Semester End Examination

1.Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.

2.The duration of Semester End Examination shall be Two hours.

3.The students need to solve all 5 questions.

4.Question No.1 will be compulsory and based on entire syllabus.

5.Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC303	Network Analysis & Synthesis	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UECPC303	Network Analysis & Synthesis	10	10	5	25	40%	50	40%	75

Course Description

This course provides an introduction to basic concepts for circuit analysis, and to develop a strong foundation that can be used as the basis for further study. It covers Nodal and Mesh analysis, theorem, graph theory, transform techniques, two port network and filter design.

Pre-requisites: Engineering Mathematics.

Course Objectives

- To understand fundamental concepts of Nodal, Mesh analysis and Network Theorems for the electrical circuit.
- To understand two port network parameters for the electrical network.
- To learn different methods for passive filters design.
- To know the stability and synthesis concepts of electrical network

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

CO1 **Analyze**[3] electrical circuits using Mesh and Nodal analysis.

CO2 **Apply**[4] suitable Network Theorem to analyze electrical circuits.

CO3 **Apply**[4] Two-Port network theory and stability techniques for electrical network.

CO4 **Design**[3] various passive filters.

Course Contents

Module	Unit	Description	Hours
1.0		**Network Theorems and Graph Theory**	**10**
	1.1	Active and passive components, Source transformation, Kirchhoff's laws, star and delta transformation, Nodal and Mesh analysis. Compensation theorem, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem	
	1.2	Graph of a network, Trees, co-trees and loops, Incidence matrix, Tie set and Cut set of a network,	
2.0		**Two Port Network**	**9**
	2.1	Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters for two port network	
	2.2	Condition for reciprocity and symmetry of a two port network, Interconnection of two port networks.	
3.0		**Filter Design**	**9**
	3.1	T and π type filter network calculations : characteristic impedance, attenuation constant , phase shift .	
	3.2	**Constant-K type:** low pass , high pass, band pass and band stop filters, **m-derived:** low pass , high pass, band pass and band stop filters,	
4.0		**Transient Response**	**7**
	4.1	Transient Behaviour of circuit elements under switching condition and their Representation	
	4.2	Evaluation of initial and final conditions in RL, RC and RLC circuits for DC and AC excitations.(transform of waveform synthesized with step and sinusoidal functions)	
5.0		**Network Functions and Network Synthesis**	**10**
	5.1	Network Functions Concept of driving point and transfer functions, Poles and zeros of network functions, Restrictions on pole and zero locations for driving point and transfer functions, Time domain response from pole-zero plots	
	5.2	Network synthesis Elements of reliability: Hurwitz polynomial. Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) -Synthesis of LC, RC and RL driving-point functions	

Text Books

1. Sudhakar A., Shyammohan S. P. "Circuits and Network" ; Tata McGraw-Hill New Delhi, 1994
2. M. L. Soni, J. C. Gupta, "A Course in Electrical Circuits Analysis", Dhanpat Rai, 1981 - Electric circuits

References

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall,3rd Edition.
2. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.

Internal Assessment (T1, T2 and FET):

1.T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.

2.FET shall be assessed for 5 marks separately.

Semester End Examination:

1.Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.

2.The duration of semester end examination shall be 2 hours.

3.The students need to solve all 5 questions.

4.Question No.1 will be compulsory and based on entire syllabus.

5.Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECMM011	Minor in Embedded System & IoT (Digital Electronics and Microprocessor)	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UECMM011	Minor in Embedded System & IoT (Digital Electronics and Microprocessor)	-	10	5	15	40%	35	40%	50

Course Description

A minor subject in Digital Electronics and Microprocessors typically covers fundamental concepts of digital logic design, including Boolean algebra, combinational and sequential circuits, and the architecture and programming of microprocessors. Students will learn to design and analyze digital circuits, understand microprocessor operation, and interface with memory and I/O devices.

Pre-requisites:-Number system, engineering mathematics

Course Objectives

- To provide students with a foundational understanding of digital logic, circuits, and microprocessors.
- To impart knowledge of number systems, Boolean algebra, combinational and sequential logic design.
- To design digital circuits and understand the fundamental concepts of microprocessors.
- To interface peripheral devices with Microprocessor.

Outcomes: After the successful completion of the course students will able to:

CO1 **Describe**[2] fundamental concepts of digital electronics.

CO2 **Illustrate**[2] designing various combinational and sequential logic circuits.

CO3 **Identify**[3] and mitigating hazards and timing issues in digital designs.

CO4 **Interface**[3] microprocessors with peripheral devices.

Theory Course

Module	Unit	Description	Hours
1.0		**Introduction to Digital Systems**	**6**
	1	Review of Number system and Logic Gates, universal Building blocks, Boolean algebra, Boolean function minimization using K-maps-2,3,4 variable K-map, Simplification of sum of products and product of summon term and Max term.	
2.0		**Combinational Logic Circuits**	**6**
	2	Combinational Logic circuit, Half Adder, Full Adder, Half subtracter, Full Subtracter, 3 bit binary Decoder, Decimal to BCD Encoder, Multiplexer and De-multiplexer	
3.0		**Sequential Logic Circuits**	**6**
	3	Sequential Logic Circuit, Flip Flops-SR flip flop(using Gates), Edge triggered flip flop, T-flip-flop,J-K Flip Flop, Master slave flip flop,counters-4 bit asynchronous and synchronous counter, shift register-SISO,SIPO,PISO,PIPO)	
4.0		**Introduction to Microprocessor**	**6**
	4	Intel 8086/8088 Microprocessor Family: Architecture and organization of 8086/8088 microprocessor family. 8086 Minimum mode and maximum Mode. Timing diagram, 8086 Interrupt structure	
5.0		**8086/8088 Microprocessor Instruction set and Programming**	**6**
	5	Instruction set of 8086, Addressing modes, Assembly language programming, Stacks, strings, procedure and Macros, Introduction to mixed language programming using C and Assembly language,	

Text Books:

1. Douglas V Hall: Microprocessor and Interfacing, McGraw Hill International Edition 1992
2. A. Anand Kumar, “Fundamentals of digital circuits” 1st edition, PHI publication, 2001

Reference Books;

1 Liu & Gibson: Microcomputer Systems - The 8086/8088 Family: Architecture, Programming and Design

2 Roth Kinney, “Fundamentals of Logic Designs”, 6th edition, CENGAGE learning.

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks which comprises of 5 questions, each carrying 7 marks
2. The duration of semester end examination shall be Three hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
UECMM021	Minor in Wireless Communication (Electronics Communication Systems)	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	**T2**	**FET**	**Total**	**Min pass**	**Marks**	**Min pass**	
UECMM021	Minor in Wireless Communication (Electronics Communication Systems)	-	10	5	15	40%	35	40%	50

Course Description

This course is a foundation course in electronics communication and is useful for other programs of engineering to understand the role of communication in day today life. It covers basics of communication with different modulation techniques.

Pre-requisites: Basics of Electrical and Electronics

Course Objectives

- To know the elements of communication system.
- To understand concept of modulation and need of modulation.
- To understand different modulation techniques.
- To understand the different kind of noise in communication system.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Illustrate**[2] principles of electronic communication.
- **CO2** **Describe**[2] modulation and demodulation technique.
- **CO3** **Compare**[3] different modulation techniques.
- **CO4** **Explain**[2] different types of data communication techniques.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Electronic Communication**	**6**
	1.1	Evolution of Communication, Elements of electronic communication systems: Information source, input-output transducer, transmitter, receiver, channel.	
	1.2	Electromagnetic frequency spectrum: various bands in spectrum and application areas.	
2.0		**Modulation**	**6**
	2.1	Definition of modulation, need of modulation in communication.	
	2.2	Types of modulation, analog modulation: Introduction to amplitude modulation and frequency modulation. Modulation Standards.	
3.0		**Demodulation**	**6**
	3.1	Definition of demodulation, Simplified block diagram of AM receiver, receiver parameters: Sensitivity, Selectivity, BW, fidelity.	
	3.2	Introduction to AM demodulation, FM demodulation.	
4.0		**Noise in communication System**	**6**
	4.1	Noise, Types of noise, signal to noise ratio, noise figure calculations expected	
	4.2	Noise temperature, Noise bandwidth	
5.0		**Data Communication**	6
	5.1	Components of data communication, Types of data communication: simplex, half duplex, full duplex.	
	5.2	Communication media: wired transmission media, wireless transmission media.	

Text Books

1. George Kennedy, Bernard Davis "Electronic Communication Systems", 5th Edition, TMH (2011)
2. Wayne Tomasi, "Electronic Communication System-Fundamentals through Advanced" 5th Edition, Pearson Education (2011)

References

1. Louis Frenzel "Principles of Electronic Communication System", 3rd Edition, TMH.
2. B.P.Lathi, "Analog and Digital Communication", OXFORD University Press.

Internal Assessment (T2 and FET):

1.T2 (Test 1) should be based on first two modules for 10 marks each.
2.FET shall be assessed for 5 marks separately.

Semester End Examination:

1. Question paper will be of 35 marks comprising of 5 questions on five topics, each carrying 7 marks.
2. The students need to solve all 5 questions.
3. The duration of Semester End Examination shall be 2 hours.

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECOE011	Open Elective-I Semiconductor Devices	02	--	-	02	--	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UECOE011	Open Elective-I Semiconductor Devices		10	5	15	40%	35	40%	50

Course Description

This course addresses electronic devices on a fundamental level which include semiconductor materials, p/n junctions, transistors, field-effect transistors, light emitters, photo-detectors and solar cells. It provides a broad background for advanced courses in electronics, photonics and integrated circuit design.

Pre-requisites: Knowledge of basic Electronics, basic electrical, atomic structure, types of materials

Course Objectives

- To help students understand the differences between conductors, semiconductors and insulators
- To study the effect of doping on a silicon crystal.
- To describe the differences between P material and N material.
- To understand the operation of Diode, transistors, FETs and optoelectronic devices.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** [**Identify**[2] different semiconductor devices.
- **CO2** **Describe**[3]operation and characteristics of semiconductor diodes and transistors
- **CO3** **Analyze**[3] various parameters of FET and MOSFET
- **CO4** **Compare**[2]the characteristics of optoelectronic devices.

Course Contents

Module	Unit	Description	Hours
1.0		**Fundamentals of Semiconductors**	**6**
	1.1	Definition of Electronics, difference between conductors, insulators and semiconductors, Intrinsic & Extrinsic semiconductors, Impurity atoms. doping, formation of P and N type semiconductors.	
2.0		**PN Junction Theory**	**6**
	2.1	Construction and operation of PN Junction diode, characteristics.	
	2.2	Applications of PN junction diode-Rectifiers-Half wave and full wave.	
3.0		**Bipolar Junction Transistors**	**6**
	3.1	Types of Transistors-NPN & PNP, Operation of Transistor, Configuration of transistors-CB,CE,CC	
	3.2	Input & output characteristics of CB & CE configuration, relation between current gains of transistor-α,β,γ. Numerical expected.	
4.0		**Field Effect Transistors**	**6**
	4.1	Difference between BJT and FET, construction ,operation and characteristics of JFET, Introduction to MOSFET-Enhancement and Depletion mode	
	4.2	Construction, operation and characteristics of MOSFET- Enhancement and Depletion mode	
5.0		**Opto-Electronic Devices**	**6**
	5.1	Construction, operation and characteristics of Photodiode, Phototransistor.	
	5.2	Construction, operation and characteristics of LED, LDR and Solar Cell	

Text Books

1. Robert F. Pierret, Semiconductor Device Fundamentals, Addison-Wesley, 1996.
2. V.K. Mehta, Principles of Electronics, S. Chand and Co.

References

1. B. L. Anderson & R. L. Anderson, Fundamentals of Semiconductor Devices, McGraw-Hill, 2005..
2. S Salivahanan, N Suresh Kumar, Electronics devices and Circuits, McGraw-Hill.
3. N.N.Bhargav, Basic Electronics and Linear Circuits, McGraw-Hill.

Internal Assessment (T1 and FET)

1. T1 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 7 marks
2. The duration of semester end examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCMEM001	Engineering Economics	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UCMEM001	Engineering Economics	-	10	5	15	40%	35	40%	50

Course Description

The course focuses on the economic aspects of engineering projects, providing insights into techniques and methods used in feasibility studies related to design and implementation. Its primary purpose is to build a solid understanding of engineering economy concepts and principles, while developing proficiency in rational decision-making methods for problems encountered in professional practice.

Pre-requisites: -mathematics

Course Objectives

- To highlight the role of economics in engineering practice by connecting financial principles with technica decision-making.
- To Introduce students to macroeconomic concepts such as GDP, GNP, NNP, and per capita income, Inflation, Economic Policies, Business cycle and their relevance to engineering projects.
- To develop analytical skills for investment evaluation through comparative methods that identify the most viable alternatives.
- To help students understand and apply depreciation techniques on engineering projects.
- **Course Outcomes:** After the successful completion of the course students will able to:
- **CO1: Recall**[1] the importance of economic principles in engineering practice and **relate**[2] their role in project feasibility.
- **CO2: Define**[1] and **explain**[2] national income concepts (GDP, GNP, NNP, per capita income) and methods of measurement, **Analyze**[4] the causes and effects of inflation and Business cycle.
- **CO3: Apply**[3]comparative economic methods to **analyze**[4]and select optimal alternatives in engineering decision-making.
- **CO4: Analyze**[4] different depreciation methods and **Evaluate**[5] working capital management techniques.

Course Description

Module	Unit	Description	Hours
1.0		**Fundamentals of Engineering Economics**	**06**
	1.1	Meaning, Nature, Scope and importance of Engineering Economics, Role of economics in engineering decision-making, Demand & Supply- Concepts, Time value of money, Cash flow, cash flow diagrams, simple Interest, and compound Interest.	
2.0		**Macroeconomics in Engineering**	**06**
	2.1	National income concepts: GDP, GNP, NNP, per capita income, Measurement of National Income, Inflation: types, causes, effects, and control measures, Monetary policy, and fiscal policy: tools and implications, Business cycles, and their relevance to engineering projects.	
3.0		**Evaluating Investment Choices**	**06**
	3.1	Present worth comparisons, Comparisons of assets with equal, unequal lives, comparison of deferred investments, Annual worth method, Rate of return method, Future worth method, NPV Method.	
4.0		**Decision Tools for Financial Viability**	**06**
	4.1	Payback period method- conventional and discounted payback period method, Benefit cost ration methods, break even analysis method.	
5.0		**Depreciation Dynamics & Working Capital Management**	**06**
	5.1	Definition, methods for calculating depreciation, straight line method, constant percentage method, sinking fund method, Meaning and need & components of working capital management.	

List of Textbooks:

1) Mankiw, **Microeconomics**, South-Western Cengage Learning
2) Chan S. Park, **Fundamentals of Engineering Economics,** Pearson Publication.
3) Dornbusch, Fischer & Startz, **Macroeconomics,** Mc Grow Hill Irwin.
4) R. R. Gupta, **Engineering Economics and Financial Management,** S. Chand Publishing House.

List of Reference Books:

1) Panneer Selvam, R, **"Engineering Economics,"** Prentice Hall of India Ltd, New Delhi, 2001

Internal Assessment (T1, T2 and FET)

1) T2 should be based on First to Fourth modules, for 10 marks.
2) FET shall be assessed for 5 marks separately.

End Semester Examination

1. Question paper will be of 35 marks comprised of 5 questions, each carrying 07 marks.
2. The duration of end semester examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2to Q.5) will be selected from all the modules.

Lab course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECPC304	Analog Circuit Design Lab	**Theory**	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
		-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total (Marks)
UECPC304	Analog Circuit Design Lab	**FEP**	**Min pass**	**Marks**	**Min pass**	
		25	40%	-	-	25

Course Outcomes: After the end of this lab course students will able to

CO1 **Design**[4]various analog circuits for the applications in process industries.

CO2 **Recapitulate**[5] different design techniques in analog circuits.

Note: All experiments are designed and implemented on the above said syllabus(Minimum 10)

Text Books:

1. Electronics devices and circuits, Allen Mottershed, Prentice Hall India.
2. Electronics devices and circuits, David A Bell, Prentice Hall India.

Reference Books:

1. Electronic devices and circuit theory, Robert Boylsted, Louis Nashelky,Pearson Education
2. Electronics devices and circuits-II, A.P.Godse and U.A.Bakshi,Technical Publications.

Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment graded from time to time.

2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

Lab course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC305	Network Analysis and Synthesis lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total (Marks)
		FEP	Min pass	Marks	Min pass	
UECPC305	Network Analysis and Synthesis lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** To understand fundamental concepts of Node and Mesh analysis and Network Theorems for circuit analysis.
- **CO2** To study two port network parameters for network analysis
- **CO3** To learn different passive filters design

List of Experiments

Note: All the experiments will be based on the course content of Network Analysis and Synthesis (Min 10)

Text Books

1. Sudhakar A., Shyammohan S. P. “Circuits and Network” ; Tata McGraw-Hill New Delhi, 1994
2. M. L. Soni, J. C. Gupta, “A Course in Electrical Circuits Analysis”, Dhanpat Rai, 1981 - Electric circuits

References

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall,3rd Edition.
2. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.

Evaluation Scheme

1.TERM WORK assessment shall be based on the overall performance of the student with every practical from time to time.

2.The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.

3.Based on above scheme grading and TERM WORK assessment should be done.

Lab course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC306	Circuit Simulation I	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		Total (Marks)
		FEP	Min pass	Marks	Min pass	
UECPC306	Circuit Simulation I	25	40%	25	40%	50

Course Outcomes: After the end of this course students will able to

CO1 **Utilize**[3] the Proteus software to simulate analog and digital circuits.

CO2 **Perform**[4] mathematical operations on data, generate signal graphs using Pspice

Note: All experiments are based on the above syllabus (Proteus software and Pspice) Min 10

Text Books	
1.	Energy Systems in Electrical Engineering, Muhammad H. Rashid, Florida Polytechnic University, Lakeland, USA
References	
1.	Dynamic Modeling of circuit Springer
2.	https://www.youtube.com/watch?v=AzElVPaS71U

Evaluation Scheme

1.FEP/POE assessment must be based on the overall performance of the student with every experiments graded from time to time.

2.The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.

3.Based on above scheme grading and FEP assessment should be done.

Lab Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECFP301	Community/Field Project	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		Total (Marks)
		Term Work	Min pass	Marks	Min pass	
UECFP301	Community/Field Project	25	40%	25	40%	50

Course Description

The objective of this course is to provide second-year engineering students with a solid foundation in statistical analysis and numerical techniques, enabling them to apply these methods effectively in engineering problem-solving and decision-making contexts.

Pre-requisites:-Applied Mathematics II.

Course Objectives

- To develop critical thinking and problem solving ability by exploring and proposing solutions to realistic/social problem.
- To emphasizes learning activities that are long-term, inter-disciplinary and student-centric.
- To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism
- To develop an ecosystem this may promote entrepreneurship and research culture among the students.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Solve**[3] real life problems by applying knowledge.
- **CO2** **Analyze**[4] alternative approaches, apply and use most appropriate one for feasible Solution.
- **CO3** **Classify**[4]hardware and software applications and identify unique features of various domains.
- **CO4** **Implement**[3]Electronicsengineering skills to meet challenges in the real world, mirroring what professionals do every day.

Course Contents

Preamble:

Field Project I is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world. FIELD PROJECT I, is more than just projects. With FIELD PROJECT I students "investigate and respond to an authentic, engaging, and complex problem, or challenge" with deep and sustained attention. FIELD PROJECT I is "learning by doing." The truth is, many in education are recognizing we live in a modern world sustained and advanced through the successful completion of projects. In short, if students are prepared for success in life, we need to prepare them for a project-based world. It is a style of active learning and inquiry-based learning. (Reference: Wikipedia). Project based learning will also redefine the role of teacher as mentor in learning process. Along with communicating knowledge to students, often in a lecture setting, the teacher will also to act as an initiator and facilitator in the collaborative process of knowledge transfer and development. The FIELD PROJECT I model focuses the student on a big open-ended question, challenge, or problem to research and respond to and/or solve. It brings what students should academically know, understand, and be able to do and requires students to present their problems, research process, methods, and results.

FIELD PROJECT I requires regular mentoring by faculty throughout the semester for successful completion of the

idea/project tasks selected by the students per batch. For the faculty involved in FIELD PROJECT I, teaching workload of 4 Hrs/week/batch needs to be considered. The Batch should be divided into sub-groups of 4 to 5 students. Idea implementation /Real life problem/Complex assignments / activities / projects. Under project based, learning is to be carried throughout semester and Credit for FIELD PROJECT I has to be awarded on the basis of internal continuous assessment and evaluation at the end of semester

Group Structure:

Working in supervisor/mentor monitored groups; the students plan, manage, and complete a task/project/activity which addresses the stated problem.

1. There should be team/group of 4-5 students
2. A supervisor/mentor teacher assigned to individual groups

Selection of Project/Problem:

The problem-based project oriented model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem/project within an articulated interdisciplinary or subject frame. A problem can be theoretical, practical, social, technical, symbolic, cultural, and/or scientific and grows out of students' wondering within different disciplines and professional environments.

A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases. By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project.

Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content, and structure of the activity.

• A few hands-on activities that may or may not be multidisciplinary.

• Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize, and present their learning.

• Activities may include- Solving real life problem, investigation, /study and Writing reports of in depth study, field work.

Assessment:

- The institution/head/mentor is committed to assessing and evaluating both student performance and program effectiveness.
- Progress of FIELD PROJECT I is monitored regularly on weekly basis. Weekly review of the work is necessary. During process of monitoring and continuous assessment and evaluation of the individual and the team performance is to be measured. FIELD PROJECT I is monitored and continuous assessment is done by supervisor /mentor and authorities.
- Students must maintain an institutional culture of authentic collaboration, self-motivation, peer-learning and personal responsibility. The institution/department should support students in this regard through guidance/orientation programs and the provision of appropriate resources and services. Supervisor/mentor and Students must actively participate in assessment and evaluation processes.
- Group may demonstrate their knowledge and skills by developing a public product and/or report and/or presentation.

1. Individual assessment for each student (Understanding individual capacity, role and involvement in the project)
2. Group assessment (roles defined, distribution of work, intra-team communication and togetherness)
3. Documentation and presentation

Evaluation and Continuous Assessment:

It is recommended that all activities should to be recorded regularly, regular assessment of work need to be done and proper documents need to be maintained at college end by both students as well as mentor (FIELD PROJECT I work book).Continuous Assessment Sheet (CAS) is to be maintained by all mentors/department and institutes.

Recommended parameters for assessment/evaluation and weightage:

1. Idea Inception and Awareness /Consideration of -Environment/ Social /Ethics/ Safety measures/Legal aspects (10%)
2. Outcomes of FIELD PROJECT I/ Problem Solving Skills/ Solution provided/ Final product (Individual assessment and team assessment) (40%)
3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents) (15%)

Text Books:

1. A new model of problem based learning. By Terry Barrett. All Ireland Society for higher education (AISHE). ISBN:978-0-9935254-6-9; 2017

2. Problem Based Learning. byMahnazmoallem, woei hung and Nada Dabbagh, Wiley Publishers. 2019.

3. Stem Project based learning and integrated science, Technology, Engineering and mathematics approach. By Robert RobartCapraro, Mary MargaretCapraro

Reference Books:

1. De Graaff E, Kolmos A., red.: Management of change: Implementation of problem-based and project-based learning in engineering. Rotterdam: Sense Publishers. 2007.

2. Project management core text book, 2 Indian Edition , by Gopalan.

3. The Art of Agile Development. By James Shore & Shane Warden

Evaluation Scheme

1. TERM WORK assessment must be based on the overall performance of the student with every assignment done on computer graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.

3.Based on above scheme grading and TERM WORK assessment should be done.

Second Year B.Tech Electronics and Communication Engineering (R-25)

Semester IV: Syllabus

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
UECPC401	Electromagnetic Waves and Antenna	03	--	-	03	--	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	**T2**	**FET**	**Total**	**Min pass**	**Marks**	**Min pass**	
UECPC401	Electromagnetic Waves and Antenna	10	10	5	25	40%	50	40%	75

Course Description

This course is a foundation course in electronics communication and is useful for other programs of engineering to understand the functioning of communication in day today life. It covers basics of electromagnetic waves, governing theorems/laws, their properties, and their propagation.

The other part of this course contains the study of different antenna parameters and antennas used in the electronics wireless communication.

Pre-requisites: Basics of linear algebra, Fundamentals of electric and magnetic field

Course Objectives

- To understand the vector calculations required for electromagnetics
- To study the concepts of electrostatics and magneto-statics,
- To describe the differences different types of antennas along with their applications.
- To understand the concepts of Electromagnetic wave Propagation

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Analyze**[4] introduce basic mathematical concepts related to electromagnetic vector fields.
- **CO2** **Understand** [1], knowledge on the concepts of electrostatics and magneto-statics, scalar and vector potential and its applications.
- **CO3** **Apply**[3]**,** Electromagnetic wave Propagation and antenna parameters and its design
- **CO4** **Compare** [2] different types of antennas along with their applications

Theory course

Module	Unit	Description	Hours
1.0		**Vector Algebra and Coordinate Systems**	**9**
	1.1	Vector algebra(review), Co-ordinate systems, del operator and its operations Three-dimensional coordinate systems – rectangular, cylindrical & spherical, transformation of coordinate systems vectors	
2.0		**Electrostatics and Magnetostatics**	**9**
	2.1	Electric field intensity, E due to point , line and surface charge, Flux density and Gauss law. Divergence theorem,	
	2.2	Biot-Savart's law, Ampere's law, Stroke's theorem, Vector magnetic potential	
3.0		**Maxwell's equations and Introduction to transmission lines**	**9**
	3.1	Static and Non-static Maxwell's field equation in point and Integral form,	
	3.2	Transmission line equation, Parameters of transmission line, Characteristics of Transmission line, Smith chart.	
4.0		**Electromagnetic wave Propagation**	**9**
	4.1	Ground wave propagation: Field strength, Roughness and Reflection factor of earth, Space wave propagation: Field strength, considerations in space wave propagations, Atmospheric effects in space wave propagation, reflection & refraction of waves by ionosphere Sky wave propagation: Field strength, fading and diversity techniques..	
5.0		**Antenna performance parameters, types and applications**	**9**
	5.1	Radiation Pattern, Antenna Gain, Directive gain, Directivity, Power gain, Antenna efficiency, Radiation resistance, Front to back ration, Antenna bandwidth, Return loss, Voltage standing wave ration (VSWR).	
	5.2	Antenna array, VLF-LF antenna, Effect of grounded antenna, resonant and non-resonant antenna, dipole antenna, harmonic, Rhombic antenna. Folded dipole antenna, Yagi Uda Antenna, Horn Antenna, Helical Antenna, Micro strip patch antenna.	

Books:

1. Engineering Electromagnetics by William.H. Hayt and J A Buck, TMH publications
2. "Antenna & Wave Propagation", K.D. Prasad Satyaprakash Publications

References:

1. Electromagnetic Field Theory and Transmission Lines ,GottapuSasibhushanarao, Wiley India 2013
2. 2.Electromagnetic Field Theory, Rakhesh Singh Kshetrimayum, Cengage Publishing – 2012.
3. 3.Electromagnetic with applications, J.D. Kraus (MGH Publications)- 4th Edition.

Evaluation Scheme

Internal Assessment (T1, T2 and FET):

1.T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.

2.FET shall be assessed for 5 marks separately.

Semester End Examination:

1.Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.

2.The duration of semester end examination shall be 2 hours.

3.The students need to solve all 5 questions.

4.Question No.1 will be compulsory and based on entire syllabus.

5.Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC402	Digital Control System	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UECPC402	Digital Control System	10	10	5	25	40%	50	40%	75

Course Description

This course provides a thorough understanding of the basics involved in analyzing and designing discrete-time control systems. It covers fundamental concepts such as sampling, stability, and system response in the discrete domain. Students will learn various techniques and tools used for modeling and designing controllers for digital systems. Overall, the course aims to equip learners with the knowledge required to handle modern control applications in digital environments.

Pre-requisites: Introductory control system**,** Network Analysis and Synthesis (Differential equations) systems.

Course Objectives

- To understand the concepts of digital control systems and assemble various components associated with it and advantages compared to the conventional type.
- To express mathematical models of physical systems into the standard state space form.
- To examine the stability of the system using different tests.
- To understand different compensator networks.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Describe**[3] the various control blocks and components of digital control systems.
- **CO2** **Describe**[2] mathematical models of physical systems.
- **CO3** **Design**[2] a digital controller/ compensator in frequency domain
- **CO4** **Design**[2] a digital controller/ compensator in time domain.

Course Contents

Module	Unit	Description	Hours
1.0		**Continuous Control Systems**	**9**
	1.1	Introduction, transfer function, Contineous control system models- time domain, frequency domain, stability, time response, frequency response, study of second order system,	
	1.2	close loop systems- cascade systems, transfer function of close loop control systems, steady-stae error, analysis of closed-loop systems in the frequency domain: Nyquist Plot and stability criterion, PI and PID controllers- PI controller and PID controller	
2.0		**Design of Discrete-Time Control System by Conventional Methods**	**9**
	2.1	Introduction, mapping between the s plane and the z plane, stability analysis of close loop system in the z plane, methods for testing absolute stability, the Jury stability test, Routh stability criteria, comments on stability of close loop control system,	
	2.2	Transient and steady state response analysis, design based on the root locus method, design based on the frequency-response method, Bode diagram, design procedure in the W plane.	
3.0		**State-Space Analysis**	**9**
	3.1	Introduction, concept of the state space model, state-space representations-direct form, canonical form, Jordan canonical form, solving discrete time state-space equations,	
	3.2	Pulse transfer-function matrix, discretization of continuous-time state-space equations	
4.0		**Time harmonic Response Analysis**	**9**
	4.1	Time response- Impulse time response of first-order and second-order systems, step response of first-order system, general form for the step response of discrete time system,	
	4.2	Correlation between analog and discrete time response, steady-state errors, harmonic response of discrete systems	
5.0		**Compensation of digital control systems**	**9**
	5.1	Introduction, indirect design methods- selection of sampling rate, direct design method- design via analytical methods, design using the root locus method of the characteristic equation , design in frequency domain,	
	5.2	PID digital controller- digital PID controller tuning, phase lead/lag digital compensators	

Text Books

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition

References

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003 .
2. Digital Control and State Variable Methods by M.Gopal, TMH .

Internal Assessment (T1, T2 and FET)

1. T1 should be based on first two modules and T2 should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately..

Semester End Examination

1. Question paper will be of 50 marks which comprises of 5 questions, each carrying 10 marks.
2. The duration of semester end examination shall be Two hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.

5 .Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC403	Digital Circuit Design	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total (Marks)
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UECPC403	Digital Circuit Design	10	10	5	25	40%	50	40%	75

Course Description

This course focuses on applying the techniques learned in the previous semester such as electronic components and circuit theory to develop/build digital gates and devices. The course will start with the fundamentals and evolution of digital electronics worldwide followed by study and illustrations of various digital electronics circuits and systems. Realising, designing digital components and their analysis for optimisation is also a measure part of this course followed by circuit simplification using Boolean algebra and Karnaugh(K-map) Maps.

Pre-requisites: Basic Electronics, Component Operations and Digital Number Systems.

Course Objectives

- To Analyze, optimize and simplify digital circuits using Boolean algebra and Karnaugh(K-map) Maps
- To design a complete digital system such as Adders, Sub tractors, Multiplexers -Demultiplexers, Encoders – Decoders.
- To design Sequential circuits like flip flops, counters and registers.
- To understand the concept of PLDs.

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

CO1 **Describe**[2] working of the gates and devices of different logic families.

CO2 **Solve**[3]the numerical using laws of Boolean algebra to simplify circuits and equations.

CO3 **Recognize**[2] different combinational and Sequential logic circuits.

CO4 **Apply**[3] the concept of PLDs .

Course Contents

Module	Unit	Description	Hours
1.0		**Digital Logic Families**	**9**
	1.1	Introduction to Digital Electronics, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit. Fan in, fan out, noise immunity,	
	1.2	TTL Logic Family –Specifications and ICs, CMOS Logic Family–Specifications and ICs. Comparison of TTL and CMOS logic family	
2.0		**Boolean algebra**	**9**
	2.1	Binary logic functions, Boolean laws, truth tables. Numerical based on Boolean Algebra, De-Morgan's theorems. Realization of switching functions using logic gates	
	2.2	Canonical logic forms, Sum of product (SOP) expressions, Product of sums expressions, Karnaugh(K-map) maps and Circuit Optimization/simplification - Two Variables, Three and Four Variables	
3.0		**Combinational Circuit Design**	**9**
	3.1	General approach, Decoders-BCD decoders, Multiplexers-DE multiplexers	
	3.2	Adders & Sub tractors, Comparators, Code converters (Binary to Gray & Gray to Binary, BCD to Excess 3 and vice versa).	
4.0		**Sequential Logic Circuit Design**	**9**
	4.1	1 Bit Memory Cell, Flips flop (JK, T and D), Timing Specifications & Waveforms	
	4.2	Asynchronous and Synchronous counters, Registers-SISO,SIPO,PISO,PIPO.	
5.0		**Programmable Logic Devices**	9
	5.1	Introduction of PLD: ROM as PLD, Programmable Logic array(PLA),	
	5.2	Sequential PLD(SPLD),Complex PLD(CPLD), Field Programmable Gate Array(FPGA).	

Text Books

1. R. P. Jain, "Modern digital electronics", 3rd edition, 12th reprint TMH Publication, 2007.
2. A. Anand Kumar, "Fundamentals of digital circuits" 1st edition, PHI publication, 2001

References

1. Roth Kinney, "Fundamentals of Logic Designs", 6th edition, CENGAGE learning.
2. Anil K. Maini, "Digital Electronic principles and Integrated Circuits" Wiley

Internal Assessment (T1, T2 and FET):

1.T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.

2.FET shall be assessed for 5 marks separately.

Semester End Examination:

1.Question paper will be of 50 marks comprised of 5 questions, each carrying 10 marks.

2.The duration of semester end examination shall be 2 hours.

3.The students need to solve all 5 questions.

4.Question No.1 will be compulsory and based on entire syllabus.

5.Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECMM012	Minor in Embedded System and IoT (Microcontroller,Architecture & Programming)	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UECMM012	Minor in Embedded System and IoT (Microcontroller,Architecture & Programming)	-	10	5	15	40%	35	40%	50

Course Description

This course focuses on the study of 8051 microcontroller. In this course, the internal architecture of the microcontroller 8051 will be discussed. The interfacing of external peripherals to both the microcontrollers is also included in this course. Programming in both assembly and Embedded C language is included in this course.

Pre-requisites: Digital Electronics and C programming knowledge is required

Course Objectives

- To understand the internal architecture of 8051 microcontroller.
- To interface external peripherals to microcontroller.
- To write assembly and Embedded C programs for 8051 microcontroller.
- To make use of internal peripherals and interface external peripherals of microcontrollers for developing small systems .

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

CO1 **Elaborate**[3]the internal architecture of 8051 microcontroller

CO2 **Interface**[3]external peripherals to microcontrollers

CO3 **Write**[4]assembly and Embedded C programs for microcontroller-based applications.

CO4 **Develop**[5]small systems for specific applications

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to 8051**	**6**
	1.1	Introduction to Microcontrollers, Intel MCS-51 family features.	
	1.2	8051 Memory Organization and Architecture, Registers and Pin-out diagram.	
2.0		**Instruction set and Assembly language programs.**	**6**
	2.1	8051 Flag bits and PSW registers, 8051 Register banks and Stack , Addressing modes in 8051	
	2.2	Data transfer instructions, Arithmetic Instructions ,Logical Instructions, JUMP, LOOP and CALL Instructions.	
3.0		**On Chip Peripherals in 8051**	**6**
	3.1	Interrupt structure, Port Structure and operation	
	3.2	Timer/Counter, Serial Port	
4.0		**Embedded C programming**	**6**
	4.1	C Data types ,Memory types and models, Pointers, Functions	
	4.2	Embedded C programs for Arithmetic and Logical Operations	
5.0		**Interfacing with 8051**	6
	5.1	LCD Interfacing , Stepper motor Interfacing.	
	5.2	ADC Interfacing, DAC Interfacing.	

Text Books

1. Muhammad Ali Mazidi, Rolin McKinlay and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd Edition, Pearson Education India, (2007).
2. The 8051 Microcontroller. ARCHITECTURE, PROGRAMMING, and APPLICATIONS. Kenneth J. Ayala.3rd Edition.

References

1. Raj Kamal, "Embedded Systems, Architecture, Programming and Design", Third edition, Tata McGraw Hill Education (2017).
2. Kenneth J.Ayla, 'The 8051 Microcontroller', 3rd edition, Cengage (2007)
3. John B. Peatman , "Design with PIC Microcontrollers", Pearson, 2002

Internal Assessment (T1 and FET)

1.T1 should be based on First and second module, for 10 marks.

2.FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 7 marks
2. The duration of Semester End Examination shall be 2 hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECMM022	Minor in Wireless Communication (Electromagnetic Waves and Antennas)	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UECMM022	Minor in Wireless Communication (Electromagnetic Waves and Antennas)	-	10	5	15	40%	35	40%	50

Course Description

This course is a foundation course in electronics communication and is useful for other programs of engineering to understand the functioning of communication in day today life. It covers basics of electromagnetic waves, governing theorems/laws, their properties, and their propagation.

The other part of this course contains the study of different antenna parameters and antennas used in the electronics wireless communication.

Pre-requisites: Basics of linear algebra, Fundamentals of electric and magnetic field.

Course Objectives

- To know the concept of electromagnetic waves and their propagation
- To understand electromagnetic wave theorems and laws.
- To understand different types of antenna performance parameters and antennas.
- To understand the concepts of Electromagnetic wave Propagation

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Illustrate**[2] principles of electronicmagnetic wave with its propagation.
- **CO2** **List**[2] basic laws and theorems of electric and magnetic fields.
- **CO3** **Describe**[3] performance parameters of an antenna.
- **CO4** **Compare**[3] different types of antennas along with their applications.

Course Contents

Module	Unit	Description	Hours
1.0		**Review of Vectors and Electrostatics**	**6**
	1.1	Coordinate systems, Del operator, curl, gradient of a scalar field, divergence of a vector	
	1.2	Electrostatic fields: Coulombs law & electric field, field due to distributed charges, Flux density, Gauss's law, divergence theorem, electric potential, electric dipole.	
2.0		**Magnetic Field and Maxwell's equations**	**6**
	2.1	. Biot Savart's law, Ampere's law, Stokes's theorem, Magnetic flux density, Faraday's law.	
	2.2	Maxwell equations for static field and time varying field	
3.0		**Electromagnetic wave Propagation**	**6**
	3.1	Ground wave propagation: Field strength, Roughness and Reflection factor of earth, Space wave propagation: Field strength, considerations in space wave propagations, Atmospheric effects in space wave propagation, reflection & refraction of waves by ionosphere	
	3.2	Sky wave propagation: Field strength, fading and diversity techniques. effect of earth magnetic field.	
4.0		**Antenna performance parameters**	**6**
	4.1	Radiation Pattern, Antenna Gain, Directive gain, Directivity, Power gain, Antenna efficiency, Radiation resistance, Front to back ration, Antenna bandwidth, Return loss, Voltage standing wave ration (VSWR).	
5.0		**Antenna types and applications**	**6**
	5.1	Antenna array, VLF-LF antenna, Effect of grounded antenna, resonant and non-resonant antenna, dipole antenna, harmonic, Rhombic antenna.	
	5.2	Folded dipole antenna, Yagi Uda Antenna, Horn Antenna, Helical Antenna, Micro strip patch antenna.	

Text Books

1. K.D.Prasad, Antenna and Wave Propoagation, Satya Prakashan , Tech India Publications, New Delhi, 2001.
2. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.

References

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Engineering, S.S Wali, Mahalaxmi Publishing house, 2nd Edition, 2000.
3. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

Internal Assessment (T2 and FET):

1.T2 (Test 1) should be based on first two modules for 10 marks.

2.FET shall be assessed for 5 marks separately.

Semester End Examination:

1.Question paper will be of 35 marks comprise of 5 questions, each carrying 7 marks.

2.The duration of Semester End Examination shall be 2 hours.

3.The students need to solve all 5 questions.

4.Question No.1 will be compulsory and based on entire syllabus.

5.Remaining question (Q.2 to Q.5) will be selected from all the modules.

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECOE021	Open Elective-II Sensors and Instrumentation	**Theory**	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
		02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		
UECOE021	Sensors and Instrumentation	**T1**	**T2**	**FET**	**Total**	**Min pass**	**Marks**	**Min pass**	**Total (Marks)**
			10	5	15	40%	35	40%	50

Course Description:

The Sensors and Instrumentation course examines the methods used to interface sensors with electronic instrumentation. It typically explores how sensors interface with electronic instrumentation, focusing on transducers that convert information into electrical signals.

Pre-requisites: Basics of Electrical and Electronic engineering

Course Objectives:

1.To understand the significance of measurement system

2.To provide basic knowledge of selection of sensors.

3.To explain design methodology of signal conditioning circuits

4.To compare different conversion elements in Instrumentation circuit

Course Learning Outcome(s)

At the end of this course students will able to:

CLO1 **Describe[2]** basics characteristics of measurement system .

CLO2 **Explain[2]** the principle and working of various sensors and transducers

CLO3 **Design[3]** signal conditioning circuit for various transducers

CLO4 **Compare[2]** different conversion elements used in Instrumentation circuit.

Course Contents

Module	Unit	Description	Hours
1.0		**Basic Concepts of Measurement**	
	1.1	Measurement, mechanical, electrical and electronic instruments, Elements of generalized measurement system, Transducers, Classifications of transducers-primary & secondary, active & passive, analog and digital transducers.	6
	1.2	Static Characteristics of Measurement Systems, Dynamic Characteristics of measurement, Need of Instrumentation, need of calibration, digital Storage Oscilloscope.	
2.0		**Sensors for Physical Variables**	
	2.1	Displacement sensors-Resistive, LVDT, capacitive transducers-basic principle, Pressure sensors-pressure sensing elements, Piezoelectric transducers-basic principle.	6
	2.2	Thermoelectric sensors-Thermistor, RTD ,thermocouple and Pyrometer-Construction and operation.	
3.0		**Signal Conditioning Elements**	
	3.1	Need for signal conditioning and the various techniques used including amplification, filtering, and conversion..	6
	3.2	Amplifiers: Operational amplifiers-block diagram, pin configuration of 741 Op-amp, inverting, non-inverting and differential amplifiers, Instrumentation amplifier: characteristics and applications of instrumentation amplifiers.	
4.0		**Conversion Elements**	
	4.1	Conversion: Exploring analog-to-digital (ADC) conversion-R-2R ladder Network, Successive approximation technique and digital-to-analog (DAC) converters-binary weighted type and their applications	6
5.0		**Miscellaneous Measurements**	
	5.1	Measurement of Humidity, Construction and operation of resistive hygrometer for humidity and moisture measurement,	6
	5.2	Liquid conductivity sensors, Light dependent resistors ,Electromagnetic sensor for flow measurement. Measurement of speed using tachometer	

Text Books:

1. Shawhney A. K., Electrical and Electronics Measurements and Instrumentation, Dhan- pat Rai & Sons, 1994.
2. Patranabis D., Sensors And Transducers, Prentice-Hall India, 2nd Ed., 2004.

Reference Books:

1.C.S.Rangan,G.R.Sharma,V.S.V.Mani, Instrumentation devices and systems, Tata Mc- Graw Hill.2nd edition,2006

2..Ramakant A Gayakwad,Op-Amps and Linear Integrated Circuits,3rd Edition,PHI,2002

Internal Assessment (T1, T2 and FET):

1.T1 should be based on first two modules and T2 should be based on next two modules,

for 10 marks each.

2.Fifth module will be assessed for 5 marks separately.

- End Semester Examination:

1 Question paper will comprise of 5 questions, each carrying 10 marks.
2 The duration of end semester examination shall be two hours.
3 The students need to solve all 5 questions.
4 Question No.1 will be compulsory without any choice.
5 Remaining question (Q.2 to Q.5) will be selected from all the modules

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCMEM003	Project Management	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					End Semester Exam (ESE)		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UCMEM003	Project Management	-	10	5	15	40%	35	40%	50

Course Description

This course presents the principles and techniques of managing engineering projects from the initiation phase, through planning, execution, control and closeout. Students will develop the analytical skills and awareness necessary on the management side of engineering projects.

Pre-requisites: -

Course Objectives

- To understand the principles of management and their application in engineering contexts.
- To analyze organizational structures, leadership styles, and decision-making processes.
- To apply project management techniques to engineering problems.
- To evaluate financial and economic aspects of engineering projects.
- To develop skills in strategic planning, innovation, and technology management.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**[2] the fundamentals of management and organizational behavior.
- **CO2** **Apply**[3] project planning and scheduling techniques in engineering projects.
- **CO3** **Analyze**[4] financial statements and cost estimation for engineering decisions.
- **CO4** **Evaluate**[5] leadership, motivation, and communication strategies in organizations.
- **CO5** **Analyze**[4]strategic plans for innovation and technology management

Course Contents

Module	Unit	Description	Hours
1.0		**Principles of Management and Organizational Behavior**	**06**
	1.1	Evolution of management thought. Functions of management: Planning, Organizing, Staffing, Directing, Controlling. Organizational structures and design. Motivation theories, leadership styles, communication in organizations	
2.0		**Project Management**	**06**
	2.1	Project life cycle. Project planning and scheduling (PERT, CPM, Gantt charts). Resource allocation and leveling. Risk management in engineering projects.	
3.0		**Financial and Cost Management**	**06**
	3.1	Basics of engineering economics. Cost estimation and budgeting. Break-even analysis. Financial statements and ratio analysis. Capital budgeting techniques	
4.0		**Decision-Making and Quality Management**	**06**
	4.1	Decision-making models and tools. Total Quality Management (TQM) and Six Sigma. Productivity measurement and improvement. ISO standards and quality audits.	
5.0		**Strategic Management and Technology Innovation**	**06**
	5.1	Strategic planning and competitive advantage. Technology management and innovation strategies. Change management in engineering organizations. Case studies in engineering management	

Textbooks:

- Pravin Kumar – Engineering Management
- Harold Koontz & Heinz Weihrich – Essentials of Management K.
- Anil Kumar –Engineering Management

References:

- Peter F. Drucker – Management: Tasks, Responsibilities, Practices
- James A. F. Stoner – Management
- Kerzner, H. – Project Management: A Systems Approach to Planning, Scheduling, and Controlling
- Samuel J. Mantel – Project Management in Practice.

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

End Semester Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of end semester examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

Lab course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UECPC404	Circuit Simulation II	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
		FEP	Min pass	Marks	Min pass	Total (Marks)
UECPC404	Circuit Simulation II	25	40%	25	40%	50

Course Outcomes: After the end of this course students will able to

CO1 **Utilize**[3] the MATLAB software to numerical computing and visualization in engineering.

CO2 **Perform**[4] mathematical operations on data, generate graphs and develop GUI's

List of Experiments

Note: All Experiments are based on MATLAB software on above syllabus

Text Books

1. "A Guide to MATLAB - for Beginners and Experienced Users", 2nd Ed., Brian R. Hunt, Ronald .Lipsman, Jonathan M. Rosenberg, Cambridge University Press, (2006).

References

1. "Matlab Programming", Kiranisingh. Y, Chaudhuri. B. B, 2007,Prentice-Hall Of India
2. "MATLAB Demystified", David McMahon, The McGraw-Hill Companies, (2007).
3. "MATLAB® for Engineers", 3rd Ed., Holly Moore, Pearson Education, Inc., (2012).

Evaluation Scheme

1. FEP/POE assessment must be based on the overall performance of the student with every experiments graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

Lab course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECPC405	Digital Circuit Design Lab	**Theory**	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tutorial**
		-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		
UECPC405	Digital Circuit Design Lab	**FEP**	**Min pass**	**Marks**	**Min pass**	**Total (Marks)**
		25	40%	25	40%	50

Course Outcomes: After the end of this lab course students will able to

CO1 **Assemble**[3] circuits of gates and devices of different logic families on breadboard & kits

CO2 **Test**[2] working of the gates and devices of different logic families.

Note: All experiments are based on the above syllabus (Min 10)

Text Books

1. R. P. Jain, "Modern digital electronics", 3rd edition, 12th reprint TMH Publication, 2007
2. A. Anand Kumar, "Fundamentals of digital circuits" 1st edition, PHI publication, 200

References

1. Roth Kinney, "Fundamentals of Logic Designs", 6th edition, CENGAGE learning.
2. Anil K. Maini, "Digital Electronics principles and Integrated Circuits" Wiley

In Semester Evaluation Scheme

1. FEP assessment must be based on the overall performance of the student with every assignment/practical graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and FEP assessment should be done.

Lab Course

Course code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
UECPC406	Digital Control System Lab	**Theory**	**Practical**	**Tutorial**	**Theory**	**Practical**	**Tut**
		-	02	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		
UECPC406	Digital Control System Lab	**FEP**	**Min pass**	**Marks**	**Min pass**	**Total (Marks)**
		25	40%	--	--	25

Course Description

This is foundation course in discrete domain modelling, analysis and design of digital controller to meet performance requirements.

Pre-requisites: Network Analysis and Synthesis, Signals and Systems

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**[2] the different transfer function in systems
- **CO2** **Analyse**[3] the various responses of system for different input.

List of Experiments

All the experiments will be based on the course content of **Digital Control System**

Text Books

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition

References

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003 .
2. Digital Control and State Variable Methods by M.Gopal, TMH .

Evaluation Scheme

1. TERM WORK assessment must be based on the overall performance of the student with every assignment/experiment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.

Based on above scheme grading and TERM WORK assessment should be done

Theory Course

Course Code	Course Name	Teaching Scheme (Hrs/Week)			Credits Assigned			Total Credits
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	
UHSAE008	Employability Skills	1	2	-	-	2	-	**2**

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		
		Term work	Min pass	Marks	Min pass	Total (Marks)
UHSAE008	Employability Skills	25	40%	25	40%	50

Course Description: Engineering education can no longer remain confined to technical knowledge alone. Employers today expect graduates not only to possess disciplinary understanding, but also to demonstrate communication ability, professional conduct, problem-solving capacity, workplace awareness, and increasing comfort with digital tools, including emerging AI-enabled environments. The shift is visible across sectors. Whether a student enters core engineering, IT services, analytics, manufacturing, design, operations, entrepreneurship, or higher studies, employability now depends as much on readiness for work as on academic performance.

A common employability course, therefore, is not an add-on. It is a foundational academic intervention. It prepares students to understand themselves better, communicate more effectively, work with others, think with structure, and present themselves with greater clarity in professional settings. It also introduces them to the changing nature of work, where digital literacy, responsible use of AI tools, and professional judgment are becoming increasingly relevant.

This course has been designed as a common offering for all engineering streams, keeping the content broad-based, practical, interactive, and immediately relevant. The intention is not to overload students with theory, but to build awareness, confidence, and observable workplace behaviors that will support both campus readiness and long-term career development.

Course Objectives:

1. To develop greater self-awareness regarding their strengths, interests, learning gaps, and professional aspirations.
2. To communicate more clearly and confidently in academic and workplace-like settings.
3. To demonstrate basic professional etiquette, ethical awareness, and responsible conduct.
4. To apply structured thinking to simple problems and participate effectively in team-based activities.
5. To gain familiarity with placement-oriented aptitude, workplace expectations, and early career preparation.
6. To understand the growing relevance of digital tools and AI in professional environments and use such tools with responsibility and awareness.

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

CO1:Explain the importance of employability skills in engineering careers;

CO2:Present themselves with greater confidence through self-introduction, written communication, and presentations;

CO3:Participate constructively in group discussions and team tasks;

CO4:Demonstrate basic aptitude readiness and structured problem-solving ability;

CO5:Prepare a basic résumé and articulate career goals;

CO6:Identify responsible and productive uses of digital and AI tools in learning and work contexts.

Course Contents

Module	Unit	Description	Hours
1.0		**Employability Awareness and Self-Discovery**	
	1.1	Faculty input on employability, workplace expectations, and factors beyond academic performance (attitude, communication, reliability);	04
	1.2	Structured self-assessment covering strengths, habits, communication gaps, and first impressions (worksheet-based activity);	
	1.3	Guided reflection with peer discussion to identify improvement areas and employability gaps;	
	1.4	Classroom discussion and preparation of a personal employability improvement statement (visible output);	
2.0		**Professional Mindset, Ethics and Responsibility**	
	2.1	Input on professional mindset: discipline, accountability, ownership, and workplace ethics;	04
	2.2	Case-based learning on missed deadlines, communication gaps, responsibility, and ethical dilemmas;	
	2.3	Role-play exercises demonstrating weak vs effective workplace behavior;	
	2.4	Reflection on "habits that influence professional credibility" and behavior correction strategies;	
3.0		**Analytical Thinking, Aptitude, Emotional Intelligence and Decision-Making**	
	3.1	Introduction to critical thinking: distinguishing facts vs assumptions, identifying problems, and structured analysis;	04
	3.2	Emotional intelligence in academic and workplace settings: empathy, listening, self-control, and response vs reaction;	
	3.3	Aptitude orientation: speed, accuracy, logical reasoning, and problem-solving strategies;	
	3.4	Practice exercises on reasoning and aptitude with focus on error analysis and improvement;	
	3.5	Decision-making in workplace scenarios: prioritization, judgment, and handling ambiguity;	
	3.6	Case-based activities integrating thinking, behavior, and decision-making with group discussion and reflection;	
4.0		**Career Readiness, Resume Building and Digital Presence**	
	4.1	Overview of career pathways: core engineering, IT, analytics, higher studies, and entrepreneurship; preparation of personal career planning sheet;	06
	4.2	Résumé structure workshop covering sections, clarity, and recruiter expectations;	
	4.3	Resume Writing I: ATS-friendly resume, keyword optimization, achievement-	

		based content, and project representation;	
	4.4	Resume Writing II: visual resume, video resume, and e-profile development (formats, scripting, and presentation guidelines);	
5.0		**Group Discussion and Team Interaction**	
	5.1	Introduction to group discussion norms and evaluation parameters (content, clarity, listening, structure, and collaboration);	06
	5.2	Practice group discussions on familiar topics (e.g., technology in student life, workplace expectations);	
	5.3	Techniques for entering, sustaining, and concluding discussions; building arguments and responding to others;	
	5.4	Observation of speaking balance, idea contribution, listening behavior, and team dynamics during GD;	
	5.5	Team reflection on communication effectiveness and group behavior; identification of strengths and improvement areas;	
	5.6	Feedback using GD rubric and preparation of individual improvement note;	
6.0		**Presentation Skills and Personal Interview**	06
	6.1	Introduction to interview process: types of interviews, employer expectations, and common mistakes;	
	6.2	Body language, confidence, listening skills, and professional conduct during interviews;	
	6.3	Common HR questions, behavioral responses, and answer structuring techniques (clarity, relevance, examples);	
	6.4	Mock interviews (triad format) with peer and teacher evaluation using structured rubric;	
	6.5	Presentation skills: structure (opening, flow, conclusion), clarity, voice modulation, and audience engagement;	
		Student presentations (2–3 minutes) followed by peer observation, faculty feedback, and improvement note	
7.0		**Digital Readiness, AI Awareness and Responsible Use (Only for Non-CSE and AIML Branches)**	02
	7.1	Faculty-led discussion on AI in workplace tasks and engineering contexts	
	7.2	Examples of AI-assisted writing, coding, research support	

Note: This course will be taught in PBL mode; hence, the focus will be on teaching applications of content in the syllabus in real life situations.

Theory Course

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UHSVE005	AI Ethics and Governance	1	-	1	1	-	1

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Term Work		
		T1	T2	FET	Total	Min pass	Marks	Min pass	Total (Marks)
UHSVE005	AI Ethics and Governance	10	10	5	25	40%	25	40%	50

Course Description

This course introduces students to the ethical, legal, and societal implications of Artificial Intelligence. It focuses on responsible AI development, fairness, accountability, transparency, and governance frameworks. Students will explore real-world challenges, regulatory policies, and ethical decision-making in AI systems.

Course Objectives:

- To introduce fundamental concepts of ethics, morality, and their relevance in Artificial Intelligence systems
- To analyze issues related to bias, fairness, and transparency in AI models and decision-making processes.
- To understand privacy, data governance, and security challenges in AI-driven systems
- To explore AI governance frameworks, policies, and regulatory requirements at national and global levels
- To examine societal and legal implications of AI and promote responsible and ethical AI practices

Course Outcomes: After the successful completion of the course students will able to:

CO1 **Explain[2]** fundamental concepts of AI ethics, including morality, responsibility, and ethical principles in AI systems

CO2 **Analyze[3]** bias, fairness, and transparency issues in AI models and propose appropriate mitigation techniques

CO3 **Apply[3]** concepts of data privacy, security, and governance to ensure responsible use of AI systems

CO4 **Evaluate[5]** AI governance frameworks, policies, and regulations for ethical AI deployment

CO5 **Analyze[4]** societal and legal impacts of AI applications

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to AI Ethics**	**6**
	1.1	Ethics vs. morality; importance of AI ethics; human-centered AI; responsibility in technology; key ethical concerns in AI systems; overview of ethical challenges in AI applications	
2.0		**Fairness, Bias and Transparency**	**6**
	2.1	Algorithmic bias; sources of bias in data and models; fairness definitions; bias detection techniques; bias mitigation methods (pre-processing, in-processing, post-processing); explainable AI (XAI); interpretability and transparency in AI systems	
3.0		**Privacy, Security and Data Governance**	**6**
	3.1	Data protection principles; informed consent; surveillance concerns; data minimization; differential privacy; data governance frameworks; security issues in AI; responsible data usage.	
4.0		**AI Governance and Regulation**	**6**
	4.1	National and international AI governance frameworks; standards and policy principles; AI regulations; responsible AI deployment; accountability, auditability, and institutional oversight	
5.0		**Societal and Legal Implications of AI**	**6**
	5.1	AI applications in healthcare, education, employment, policing, and public systems; ethics washing; AI safety and robustness; public trust; societal impact; legal responsibilities and compliance	

Text books

1. M. Coeckelbergh, AI Ethics, Cambridge, U.K.: MIT Press, 2024.
2. B. Mittelstadt and L. Floridi, The Ethics of Artificial Intelligence, Oxford, U.K.: Oxford University Press, 2023.

References

1. A. Narayanan and S. Kapoor, AI Snake Oil: What Artificial Intelligence Can Do, What It Can't, and How to Tell the Difference, Princeton, NJ, USA: Princeton University Press, 2024.
2. J. Mehan, Artificial Intelligence: Ethical, Social, and Security Impacts for the Present and the Future, 2nd ed., Ely, U.K.: IT Governance Publishing, 2024.
3. V. Dignum, Responsible Artificial Intelligence, Cham, Switzerland: Springer, 2023.

Internal Assessment (T1, T2 and FET)

1. T1 or T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 7 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.