An Autonomous Institute

Shree Warana Vibhag Shikshan Mandal's

Tatyasaheb Kore Institute of Engineering And Technology, Warananagar

NBA Accredited Institute

Department of Electronics & Telecommunication Engineering

Syllabus for T.Y. B.Tech. (w.e.f. 2025-26)

B.Tech. In Electronics &Telecommunication Engineering

Proposed Structure and Syllabus under Autonomy as per the NEP Policy 2020

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Department of Electronics & Telecommunication Engineering

❖ Vision

To prepare professionally competent Electronics & Telecommunication Engineer for Global Industrial requirements and social needs.

❖ Mission

- To offer excellent education with industry-aligned curriculum, effective teaching, and facilities, promoting global competence.
- To provide value-added courses through Industry-Institute interactions.
- To make students competent for higher studies and to develop entrepreneurial skills for enhancing their employability.
- To instill professional ethics, leadership, and a passion for lifelong learning with social, cultural, and environmental awareness.

PROGRAM EDUCATIONAL OBJECTIVES

Graduates will be able:

[1] Able to design and innovate electronic systems to solve real-world problems using scientific and engineering principles.

[2] Encouraged for interdisciplinary learning for success in professions, higher education, research, and entrepreneurship.

[3] Nurtured with leadership, management, and communication prowess, ethical values, teamwork, and a commitment to lifelong learning .

PROGRAM OUTCOMES:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES:

After successful Electronics and Telecommunication engineering graduates will be able to:

PSO 1 (Engineering Knowledge and Analysis):
Analyze specific engineering problems relevant to Electronics & Telecommunication Engineering by applying the knowledge of basic sciences, engineering mathematics and fundamentals.

PSO 2 (System Design):
Design Electronics and Telecommunication systems containing devices, software, and hardware using the significant analytical knowledge and modern tools.

PSO 3 (Application of the knowledge on society/environment):
Apply the contextual knowledge of Electronics and Telecommunication Engineering to assess societal, environmental, health, safety, legal and cultural issues with professional ethics and function effectively as an individual or a leader in a team to manage different projects as the process of life-long learning.

SWVSM'S

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Abbreviations

Sr.No.	Acronym	Definition
1	ISE	In-Semester Examination
2	ISE-I	In-Semester Examination-I
3	ISE-II	In-Semester Examination-II
4	ESE	End Semester Examination
5	ISA	In-Semester Assessment(Term Work)
6	L	Lecture
7	T	Tutorial
8	P	Practical
9	CH	Contact Hours
10	C	Credit

Course/Subject Categories

Sr. No.	Acronym	Definition
1	PCC	Professional Core Course
2	MDM	Multidisciplinary Minor
3	OE	Open Electives
4	HSSM	Humanities social science and Mgmt
5	ELC	Experiential Learning Courses
6	VSEC	Vocational and skill Enhancement course
7	AEC	Ability Enhancement Course

Course/Subject Code

ET	E	3	0	1
Branch Code		Semester	Course Number	

Course Term work and POE Code

ET	E	3	0	1	T/P/A
Branch Code		Semester	Course Number		T- Term Work P-POE A-Audit Course

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Third Year B. Tech. (Electronics and Telecommunication Engineering)

Semester-V

(To be implemented from 2025 -26)

Credit Scheme as per NEP Policy

Sr. No	Category	Sub Category	Course Code	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	Programme course	PCC	23UGPCCET501	Signal Processing	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
2		PCC	23UGPCCET502	Advanced Digital Communication	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
3		PCC	23UGPCCET503	Microcontrollers	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4	Programme Elective course	PEC-1	23UGPECET504	Programme Elective-1	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
5	Multi disciplinary	MDM-3	23UGMDMET505L	Multi Disciplinary Minor-3	4	--	--	4	4	ESE	60	24	40
										ISE	40	16	
6		OE-2	23UGOEET506	Open Elective (OE) - 2	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
7	Programme course	PCC	23UGPCCET502LP	Advanced Digital Communication Lab	--	--	2	1	2	ISA	25	10	10
										OE	25	10	10
8		PCC	23UGPCCET503LP	Microcontrollers Lab	--	--	2	1	2	ISA	25	10	10
										POE	25	10	10
9		PCC	23UGPCCET507P	Mini Project	--	--	2	1	2	OE	50	20	20
10		PCC	23UGPCCET501T	Signal Processing	--	1	--	1	1	ISA	25	10	10
11	Programme Elective course	PEC1	23UGPECET504T	Programme Elective-1	--	1	--	1	1	ISA	25	10	10
					19	02	06	21	27	--	800	320	320

PEC-1 : VLSI Design/ Operating System/ Data Base Management System

TATYASAHEB KORE INSTITUTE OF ENGINEERING & TECHNOLOGY
Autonomous
Warananagar

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Third Year B. Tech. (Electronics and Telecommunication Engineering)

Semester-VI

(To be implemented from 2025 -26)

Credit Scheme as per NEP Policy

Sr. No	Category	Sub Category	Course Code	Course Title	Teaching Scheme					Examination & Evaluation Scheme			
					L	T	P	C	CH	Component	Marks	Min for Passing	
1	Programme course	PCC	23UGPCCET601	Electromagnetic Waves & Antenna Theory	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
2		PCC	23UGPCCET602	Power Electronics	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
3		PCC	23UGPCCET603	Embedded System	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4	Programme Elective course	PEC-2	23UGPECET604	Programme Elective-2	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
5		PEC-3	23UGPECET605	Programme Elective-3	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
6	Multi disciplinary course	MDM-4	23UGMDMET606L	Multi Disciplinary Minor- 4	2	--	--	2	2	ISA	50	20	20
7	Skill Course	VSEC	23UGVSECET607L	Skill Course-2	2	--	--	2	2	ISA	25	10	10
8	Programme course	PCC	23UGPCCET601LP	Electromagnetic Waves & Antenna Theory Lab	--	--	2	1	2	ISA	25	10	10
										OE	25	10	10
9		PCC	23UGPCCET602LP	Power Electronics Lab	--	--	2	1	2	ISA	25	10	10
										POE	50	20	20
10		PCC	23UGPCCET603LP	Embedded System Lab	--	--	2	1	2	ISA	25	10	10
										OE	25	10	10
11	Programme Elective course	PEC-2	23UGPECET604T	Programme Elective-2	--	1	--	1	1	ISA	25	10	10
12		PEC-3	23UGPECET605T	Programme Elective-3	--	1	--	1	1	ISA	25	10	10
					19	2	6	21	27	--	800	320	320

PEC-2 : Image Processing/Robotics/ Real Time Operating System

PEC-3: Radar & Optical communication/ Computer Vision /Information Theory & Coding Techniques

CATEGORY : MULTIDISCIPLINARY

COURSE SEM –V

Sub Category	Course Code	Name of Course	
MDM-3	23UGMDMET505L	1	Microprocessors

Sub Category	Course Code	Name of Course	
OE-2	23UGOEET5061	1	Cyber Security
	23UGOEET5062	2	Biomedical Instrumentation

COURSE SEM –VI

Sub Category	Course Code	Name of Course	
MDM-4	23UGMDMET606L	1	Microcontrollers

CATEGORY : SKILL COURSES (SC)

COURSE SEM –VI

Vocational and Skill Enhancement Course (VSEC)			
Sub Category	**Course Code**	**Name of Course**	
VSEC-2	23UGVSECET6071L	1	Java Programming & Applications
	23UGVSECET6072L	2	Leadership Skill
	23UGVSECET6073L	3	Problem Solving & Analytical Skill

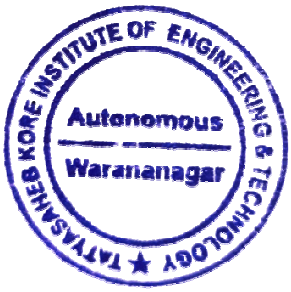
CATEGORY : PROGRAM ELECTIVES COURSES (PEC)

COURSE SEM-V

Sub Category	Course Code		Name of Course
PEC - 1	23UGPECET5041	1	VLSI Design
	23UGPECET5042	2	Operating System
	23UGPECET5043	3	Data Base Management System

COURSE SEM-VI

Sub Category	Course Code		Name of Course
PEC - 2	23UGPECET6041	1	Image Processing
	23UGPECET6042	2	Robotics
	23UGPECET6043	3	Real Time Operating System
PEC - 3	23UGPECET6051	1	Radar & Optical Communication
	23UGPECET6052	2	Computer Vision
	23UGPECET6053	3	Information Theory & Coding Techniques



23UGPCCET501- SIGNAL PROCESSING

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Define and classify Signals, Systems and their properties.
2	Analyze signals using Fourier Transform and Z Transform.
3	Model and construct CT and DT Systems using basic building blocks.
4	Design digital filters.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate use of Signals and Systems.	Understand
CO2	Calculate Fourier Transform for analysis of CT, DT signals and Z Transform for DT signals.	Apply
CO3	Implement the systems using different methods.	Remember
CO4	Design digital filters.	Create

Description:

Signal Processing is important for modern technologies and applications, including communications, image and audio processing and medical imaging. By manipulating and analyzing digital signals, DSP enables tasks like data compression, noise reduction, and signal enhancement, making it an essential field for engineers and scientists.

Prerequisites:	1	Fundamentals of Engineering Mathematics

Course Contents		
Unit No:1	**Introduction to Signal :-** Definition of Signal, Classification of Signals, CT & DT Signals, Properties of Signals:- Even and Odd, Periodicity, Deterministic Non-deterministic, Energy & Power Signals, Standard Test Signals:- Unit Step, Unit Impulse, Unit Ramp, Unit Parabolic, Exponential & Sinusoidal, Basic Operation on Signals, Modification of signal on Independent Variable.	**7 Hrs.**
Unit No:2	**Introduction to System :-** System Representation, Properties of CT & DT System:- Dynamicity, Causality, Linearity, Time Invariance, Stability, Impulse Response Representation, Convolution Integral, Convolution Sum, Circular Convolution, LTI System & its Properties.	**6 Hrs.**
Unit No:3	**Fourier Transform :-** Fourier Transform, Properties of Fourier Transform, Discrete Fourier Transform Inverse Discrete Fourier Transform using Direct Method & Twiddle Factor Method. Computational Complexity of DFT, Radix-2 DIT and DIF FFT Algorithms for DFT & IDFT Computation.	**7 Hrs.**
Unit No:4	**System Realization :-** Representation of Continuous Time System by Differential Equation. Representation of Discrete Time System by Difference Equation, Direct From I and Direct From II methods of Realization , Transfer Function in Z Domain.	**4 Hrs.**
Unit No:5	**Z-Transform :-** Introduction with Z- Transform, Unilateral Z- Transform , ROC & its Properties, Properties of Z- Transform, IZT using Long Division Method, PFE Method, Residue Method, Convolution Method.	**6 Hrs.**
Unit No:6	**Filter Design :-** Characteristics of FIR Filter. Design of FIR Filter using Fourier Series Method, Frequency Sampling Method, Windowing Method, IIR Filter, Design of IIR Filter Design using Impulse Invariance Method, BLT Method.	**6 Hrs.**

Text Books:	
1	"Signals and Systems", by Babu P R, Scitech
2	"Digital Signal Processing", by S Salivahanan ,A Vallavaraj, C Gnanapriya, Tata McGraw Hill

Reference Books:	
1	"Digital Signal Processing", by A Nagoor Kani, Mc Graw Hill Education
2	"Digital Signal Processing", by John G. Proakis,Pearson

23UGPCCET502- ADVENCED DIGITAL COMMUNICATION

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

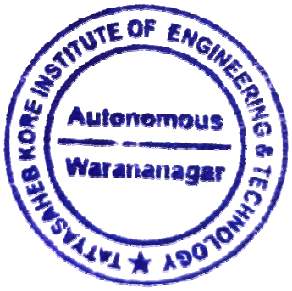
Course Objectives: The course aims to :	
1	Elaborate the different source coding techniques with the help of their block diagrams and function.
2	Explain the different digital modulation techniques.
3	Describe the base band transmission and reception system.
4	Understand the concept to f information theory in detail with different coding theorems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the basic concept of digital communication system.	Understand
CO2	Analyze various digital modulation and coding techniques.	Analyze
CO3	Understand the spread spectrum modulation principles.	Understand
CO4	Solve the problem based on information theory.	Solve

Description:

This course discusses the principles of digital communication which has applications in different telecommunication systems. It makes students acquainted with use of statistical techniques, source and channel coding, different modulation techniques.

Prerequisites:	1	Analog Communication
	2	Probability Theory and statistics



Course Contents		
Unit No:1	**DIGITAL SOURCE CODING:** Introduction to Digital Communication System, Sampling, Quantization Pulse Code Modulation(PCM), Differential Pulse Code Modulation (DPCM),Delta Modulation (DM), Adaptive Delta Modulation (ADM),Performance & Comparison of all these techniques	**6 Hrs.**
Unit No:2	**DATA FORMAT &MODULATION TECHNIQUES:** Data formats, Amplitude Shift Keying(ASK),Frequency Shift Keying(FSK),Phase Shift Keying(PSK),Binary Phase Shift Keying(BPSK),Quadrature Phase Shift Keying(QPSK),Minimum Shift Keying(MSK),Quadrature Amplitude Modulation (QAM), Comparison of all these techniques.	**6 Hrs.**
Unit No:3	**BASEBAND TRANSMISSION AND OPTIMUM RECEIVERS:** M-ary Signaling, eye diagram, ISI, scrambler, Unscrambler. Optimum Receivers-Matched Filters, Correlation receivers, Optimum detection using ML criteria.	**6 Hrs.**
Unit No:4	**RANDOM SIGNAL THEORY AND SPREAD SPECTRUM:** Discrete random variables, Continuous random variables, Probability Mass Function, Probability Density Function & statistical average, pseudo noise sequence, Discrete Sequence Spread Spectrum, Frequency Hopping Spread Spectrum	**6 Hrs.**
Unit No:5	**INFORMATION THEORY:** Information, Entropy, Information Rate, Joint Entropy, Conditional entropy, relation between Joint & Conditional Entropies, Mutual Information: Average Mutual Information, Expression for Mutual information, Relation between Mutual Information &Entropy	**6 Hrs.**
Unit No:6	**CHANNEL CAPACITY AND CODING:** Channel Capacity, Redundancy and Efficiency of channel, Classification of channels, Calculation of channel capacity of channels, Shannon's fundamental theorem, Shannons-Hartley theorem, Shannon Fano Coding, Huffman's Coding	**6 Hrs.**

Text Books:	
1	"Digital Communication", Simon Haykin, Jhon Wiley & Sons
2	"Communication Systems-Analog and Digital",S.D.Sapre,R.P.Singh,TataMc- GrawHill, 2nd edition
3	"Communication Engineering", J.S.Chitode,Technical Publications.
4	"Digital & Analog Communication", K.Sam Shanmugam,Wiley India.

	Reference Books:
1	"Electronic communications Systems",WayneTomasi,5th edition,Pearson publication
2	"Digital Communication", John G. Proakis McGraw HillInc2001.
3	"Information Theory, Coding & Cryptography",Arijit Saha,Surajit Mandal, Pearson Education,1st Edition,2013.

23UGPCCET503- MICROCONTROLLERS

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Understand fundamentals of 8051 and PIC Microcontroller Programming.
2	Analyze Real time requirements using ON-Chip resources of 8051.
3	Evaluate need of I/O peripherals to satisfy system design requirements.
4	Develop Embedded 'C' Programs for I/O Peripherals

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain Architecture of 8051, write various Programs and Perform experiment using ON-Chip resources of 8051.	Understand
CO2	Make use of assembly language as well as Embedded 'C' Programming to develop code for interfacing I/O Peripherals with 8051.	Apply
CO3	Elaborate about Pin connection, Architecture & SFR of PIC 18 family.	Remember
CO4	Build various programs using instruction set and apply instruction set to embedded 'C' logic for various code using PIC.	Evaluate

Description:		
The course has been designed to introduce fundamental principles of embedded systems and robotics. Embedded systems is now a days is everywhere in the field of communication engineering, home appliances, handheld electronics devises, automobiles ,agriculture etc.		
Prerequisites:	1	Digital Electronics and Programming skills

Course Contents		
Unit No:1	**INTRODUCTION TO MCS51:** Functional Pin out diagram, Architecture, Register Organization, Memory Organization, Reset Circuit, Machine Cycle, Oscillator Circuit, Addressing Modes, Instruction Set, Assembly Language Programming.	**6 Hrs.**
Unit No:2	**HARDWARE OVERVIEW:** Input / Output Ports, Interrupts, Timers/Counters, Serial Communication (Mode-1), (Structure, Related S.F.R and Programming).	**6 Hrs.**
Unit No:3	**INTERFACING & ASSEMBLY LANGUAGE PROGRAMMING:** Keyboard, Seven Segment display, ADC, DAC, stepper motor.	**6 Hrs.**
Unit No:4	**EMBEDDED 'C' PROGRAMMING FOR 8051:** Data types, Programs on Arithmetic & Logical operations, Input / Output Ports, Timer/Counter, Serial communication, ADC, LCD	**6 Hrs.**
Unit No:5	**OVERVIEW OF PIC MICROCONTROLLER 18 FAMILY:** PIC 18 Architecture ,PIC 18 pin connection, PIC 18 configuration registers, WREG, File registers and SFR, Access bank, Status register, Data formats and directives, PC and program ROM space, RISC architecture, Instruction with default access bank	**6 Hrs.**
Unit No:6	**INSTRUCTION SET AND I/O PROGRAMMING:** Arithmetic instruction signed number concepts and arithmetic operations, Logic and Compare instruction, Rotate and data serialization instruction, BCD and ASCII conversion, Branch Instruction and Looping, Call instruction and stack, PIC 18 time delay and instruction pipeline	**6 Hrs.**

Text Books:	
1	"The 8051 Microcontroller & Embedded Systems Using Assembly and C ", Muhammad Ali Mazidi, Janice Gillispie, Rolin D. McKinlay , 2nd Edition, Pearson Education.
2	"The PIC Microcontroller & Embedded Systems ,Using Assembly and C for PIC18 ", Muhammad Ali Mazidi, Rolin D. McKinlay , Danney Causey 1st Edition, Pearson Education,

Reference Books:	
1	"The 8051 Microcontroller", Kenneth Ayala, 3rd Edition , Cengage Learning India Private Limited
2	"Microcontrollers,Theory and applications", Ajay V Deshmukh Tata McGraw Hill Publication.
3	PIC Microcontroller Data sheets :- Microchips

MOOC / NPTEL Courses:	
	1. NPTEL Course "Microcontroller and Applications" Link of the Course: https://nptel.ac.in/courses/117/104/117104072/ https://nptel.ac.in/courses/108/105/108105102/

23UGPECET5041- VLSI DESIGN

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Understand the basic concept of VHDL.
2	Design & implement digital circuits (combinational & sequential) using VHDL.
3	Explain students the fundamental concepts of Hardware Description Language and design flow of digital system design.
4	Understand the concept of Programmable Logic Devices.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply Boolean laws/K-Map-method, to reduce a given Boolean function.	Understand
CO2	Design & realize combinational logic circuits using logic gates and VHDL Codes.	Analyze
CO3	Demonstrate the operation of flip-flops, counters , shift registers Synchronous sequential machine using Moore and Mealy machine.	Understand
CO4	Design combinational and sequential logic circuits using various description techniques in VHDL.	Solve

Description:		
This course discusses the principles of VLSI design, which has applications in Embedded systems. It makes students acquainted with use of VHDL coding, design of FSM and Programmable logic devices.		
Prerequisites:	1	Basic Electronics
	2	Digital Electronics

Course Contents		
Unit No:1	**INTRODUCTION TO VHDL**: Level of abstraction. Need of HDL,VLSI Design flow, Features and capabilities of VHDL, Elements of VHDL (Entity Architecture, Library, Package, and Configuration), Modeling styles in VHDL, Identifiers, operators , Data objects, data types, literals, Delay Models, Concurrent and sequential statement.	**7 Hrs.**
Unit No:2	**COMBINATIONAL LOGIC DESIGN :** Adder, Subtractor, Code converters (binary to gray & gray to binary, BCD to Excess 3 and vice versa, BCD to 7 segment display),Multiplexer and Demultiplexer , Encoder, Priority encoder, Decoder, Comparator , ALU, Barrel shifter. VHDL coding for combinational circuits.	**8 Hrs.**
Unit No:3	**SEQUENTIAL LOGIC DESIGN:** Latches, Clocked latches and Flips Flop (SR, JK, T and D), use of Preset and Clear, Excitation Table for flip flops, Shift registers (SISO, SIPO, PIPO and PISO). VHDL coding for Sequential circuits.	**7 Hrs.**
Unit No:4	**COUNTERS :** Counter – ripple counters, synchronous counters, Up/down counters, Ring counters, Johnson Counter, MOD-N counter. VHDL coding for Counter circuits.	**6 Hrs.**
Unit No:5	**FINITE STATE MACHINES:** FSM, Moore/Mealy machines, state diagram, state table, state assignment and state reduction, Sequence detector. VHDL coding for FSM.	**4 Hrs.**
Unit No:6	**SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES:** Programmable logic devices: PAL, PLA, CPLD and FPGA, Logic implementation using Programmable Devices (ROM, PLA)	**4 Hrs.**

Text Books:	
1	"Fundamentals of digital circuits", A. Anand Kumar, 4th edition, PHI publication,2016
2	"Fundamentals of Digital Logic with VHDL design", Stephen Brown and Zvonko Vranesic Tata Mc-graw Hil

Reference Books:	
1	"Digital Design Principles and Application", Wakerly Pearson Education
2	" Digital Design", M. Morris Mano, 3rd Edition , Pearson Education
3	"Principals of Digital System Design using VHDL", Roth John, Cengage Learning.
4	"Modern Digital Electronics", R. P. Jain, 3rd edition, 12th reprint TATA Tata McGraw Hill Publication, 2007

23UGPECET5042-OPERATING SYSTEM

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Make students understand basic concepts of operating system.
2	Understand features of process and operation management.
3	Understand what a process is and how processes are synchronized and scheduled.
4	Understand different approaches to memory management and I/O Management.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Learn basic concepts of Operating Systems its types & services.	Remember
CO2	Describe various features of process and operation management.	Understand
CO3	Present process synchronization and critical section problem with its solutions.	Understand
CO4	Illustrate the working of different scheduling schemes and basics of deadlock with their possible solutions.	Apply

Description:

This course is introduced to get the students familiar with the basic concepts of computer operating systems.

Prerequisites:	1	Digital Systems & Microprocessors

Course Contents		
Unit No:1	**Introduction:** Overview and Structure of Operating Systems Overview of Operating Systems, operations of an operating system, OS interaction with computers and user programs, Classes of an OS: Batch Processing, Multiprogramming, Time sharing system, Real-time OS, Distributed OS ,Operating System with Monolithic Structures ,Kernel based OS, Micro-kernel bases OS	**6 Hrs.**
Unit No:2	**Process Management:** Process and Program, Implementing Process: Process state and state transition, Process context and process control block, Context save, scheduling and dispatching, event handling, sharing, communication and synchronization, Introduction to threads	**6 Hrs.**
Unit No:3	**Process Synchronization:** Process Synchronization What is process Synchronization, Race Condition, The Critical section Hours problem, synchronization approaches: looping Vs blocking, H/W support for process synchronization, Classic process synchronization problems: Producer-consumer , Readers and writers, dining Philosophers, Semaphore	**6 Hrs.**
Unit No:4	**Scheduling:** Terminologies and concepts, Non- Pre-emptive scheduling: FCFS, SRN, HRN Pre-emptive scheduling: Round Robin, LCM, STG, Scheduling in practice: Long, medium and short term scheduler	**6 Hrs.**
Unit No:5	**Deadlock:** What is deadlock, Deadlock in resource allocation, handling deadlocks, Deadlock detection and resolution, Deadlock prevention, Deadlock avoidance	**6 Hrs.**
Unit No:6	**Memory Management:** Memory allocation to a process: Stack and Heap, Memory allocation Model Heap Management: Reuse of memory, Contiguous memory, Non Contiguous memory Paging, Segmentation. Virtual Memory Basics, Page replacement Policies	**6 Hrs.**

Text Books:	
1	"Operating Systems- A Concept-Based Approach", Dhananjay M. Dhamdhere (MGH International) 3rd Edition 2006

Reference Books:	
1	"Operating Systems –Concepts and Design", Milan Milenkovic TATA-McGraw Hill, 9th Edition
2	"Operating Systems: Internals and Design Principles", William Stallings AT&T Bell Labs, 8th Edition

23UGPECET5043 - DATA BASE MANAGEMENT SYSTEM

Lectures : 3Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to:	
1.	To understand fundamental concepts and algorithms of Database Systems.
2.	To familiarize students with SQL and DBMS.
3.	To learn database design techniques .
4.	To comprehend the mechanisms of data storage, indexing, transaction processing, and recovery techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the fundamentals of database management systems.	Understand
CO2	Design appropriate database for a given problem.	Create
CO3	Write SQL queries to design & manage the database.	Apply
CO4	Illustrate Transactions, Concurrency and Recovery apply to database system.	Understand

Description:		
This Course is designed to understand the internals of Database System, with elaboration from Database Design, Using Relational Database (using SQL) and the transaction concepts.		
Prerequisites:	1	Set Theory
	2	Operating System
	3	Data Structures

Course Contents		
Unit No:1	**INTRODUCTION TO DATABASES:** Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Specialty Databases, Database Users & Administrators, Structure of Relational Databases, Database Schema, Keys, Relational Query Languages, Relational Operations	**6 Hrs.**
Unit No:2	**DATABASE DESIGN:** **E-R Model:** The Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Reduction to Relational Schemas **Normalization:** Data Redundancies & Update Anomalies, Functional Dependencies, The Process of Normalization, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form	**6 Hrs.**
Unit No:3	**STRUCTURED QUERY LANGUAGE (SQL):** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, and Nested sub Queries, Modification of Databases	**6 Hrs.**
Unit No:4	**DATA STORAGE & INDEXING:** File Organization, Organization of records in File, Data Dictionary Storage, Basic Concepts indexing & hashing, Ordered Indices, B+ Tree Index files, Static Hashing.	**6 Hrs.**
Unit No:5	**TRANSACTION MANAGEMENT:** Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Lock-Based Protocols, Deadlock Handling, Timestamp-Based Protocols, Validation-Based Protocols	**6 Hrs.**
Unit No:6	**RECOVERY SYSTEM:** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Failure with Loss of Non-volatile Storage, Remote Backup Systems	**6 Hrs.**

Text Books:	
1	"Database System Concepts", A. Silberschatz, H.F. Korth, S. Sudarshan, 6th Edition, Mc Graw Hill Education
2	"Database Systems - A practical approach to Design, Implementation and Management" Thomas Connolly, Carolyn Begg, 3rd Edition, Pearson Education
Reference Books:	
1	"Database Systems – Design, Implementation and Management", Rob & Coronel 5th Edition, Thomson Course Technology
2	"Fundamentals of Database Systems", Ramez Elmasri, Shamkant B. Navathe, 4th Edition, Pearson Education
SWAYAM Courses:	
1	https://nptel.ac.in/courses/106105175 [IIT, Kharagpur]

23UGMDMET505L- MICROPROCESSORS

Lectures : 4 Hrs/Week
Credit : 4

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	To expose the students to architecture and instruction set of typical 8 bit microprocessor.
2	To become familiar with 8085 assembly language programming.
3	To study various peripherals for microprocessor based systems.
4	To expose the students to architecture and instruction set of typical 16 bit microprocessor.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Define various components and list out various features of microprocessors and peripherals.	Remember
CO2	Describe the internal block diagram of microprocessors and peripherals, addressing modes, instruction set and data transfer schemes.	Apply
CO3	Develop algorithm and assembly language programs to solve problems.	Apply
CO4	Explain & perform experiments based on interfacing microprocessor with memory and I/O devices.	Analyze

Description:		
The objective of the course is to expose to the students to the architecture and instruction set of typical 8-bit microprocessor. It also deals with Assembly Language Programming using a macro-assembler. Input-output techniques and important programmable support chips used in microprocessor based systems are discussed in detail		
Prerequisites:	1	Number systems codes and Digital systems design

Course Contents		
Unit No:1	**Microprocessor Architecture:** Microprocessor Architecture, Pin Functions, De-multiplexing of Buses and its Operations, Fetching, decoding and execution of an Instruction, Generation of control signal, Instruction cycle and machine cycles.	**10 Hrs.**
Unit No:2	**Instruction Set of 8085:** 8085 Programming Model, Instruction Classification, Instruction and Data Format, Addressing Modes. Data Transfer Operations, Arithmetic Operations, Logic Operations, Branch Operations.	**10 Hrs.**
Unit No:3	**Programming Techniques:** Looping, Counting and Indexing, Additional Data Transfer and 8 bit & 16-bit Arithmetic Instructions, BCD Addition, BCD Subtraction, Logic Operations: Rotate, Compare, Counters	**10 Hrs.**
Unit No:4	**Stacks and Subroutines & Interrupts:** Stack, Subroutine, Restart, conditional call, and return instructions; 8085 Interrupt, classification of interrupts, 8085 Vectored Interrupts	**4 Hrs.**
Unit No:5	**Programmable Interface Devices:** Concept of Peripheral I/O and Memory Mapped I/O. 8255 programmable peripheral interface (block diagram, modes),Interfacing of 8255 with typical I/O devices	**6 Hrs.**
Unit No:6	**Introduction to 8086 Microprocessor:** Difference between 8085 & 8086,Basic architecture, pin functions, Instruction set, Assembly language programming	**8 Hrs**

Text Books:	
1	"Microprocessor architecture, programming and its applications with 8085", Ramesh S. Gaonkar , Penram International Publications, 4th Edition.

Reference Books:	
1	"Microprocessor 8085 and Its Interfacing", Sunil Mathur ,PHI Learning Pvt. Ltd.
2	"Microprocessors and Programmed Logic", Short K. L, Pearson Education.
3	"Microprocessor and Interfacing-Programming and Hardware", Hall D. V, Tata McGraw-Hill Publishing Company Limited.

23UGOEET5061- CYBER SECURITY

Lectures	**:**	3 Hrs/Week	**Evaluation Scheme**
Credit	**:**	3	**ISE : 40 Marks**
			ESE : 60 Marks

Course Objectives: The course aims to :	
1	To provide a foundational understanding of cyberspace and its key components, including the structure of the internet and online communication.
2	To explore different types of malware and the common techniques used by hackers to exploit system vulnerabilities.
3	To introduce basic principles of encryption and various computer security technologies used to protect information systems.
4	To familiarize students with digital forensics, its applications, and the processes involved in investigating cybercrimes.

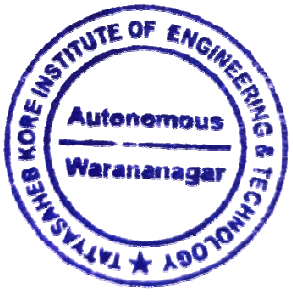
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain key concepts of cyberspace, including internet infrastructure and communication protocols.	Understand
CO2	Identify various malware types and analyze methods used by hackers to breach systems.	Apply
CO3	Apply basic encryption techniques and implement fundamental security measures for data protection.	Apply
CO4	Examine digital evidence and describe the initial stages of a digital forensic investigation.	Analyze

Description:		
This course introduces the fundamentals of cyber security, including cyberspace, malware, hacking techniques, encryption, and basic computer security tools. Students will also gain an introductory understanding of digital forensics and methods used to investigate cyber incidents.		
Prerequisites:	1	Fundamental knowledge in Computers.

Course Contents		
Unit No:1	**Introduction To Cyber Space:** Addressing Scheme in the Internet, Domain Name System (DNS), Cyber Crime, Kinds of Cyber Crime, Information Security, Cyber Security Models, Threats, Vulnerabilities and Risks, Computer Ethics and Security Policies, Tactics to Ensure Computer Security and Maintain Privacy.	**6 Hrs.**
Unit No:2	**Malware:** Introduction, Viruses, Trojan Horses, The Buffer-Overflow Attack, The Sasser Virus/Buffer Overflow, Spyware, Other forms of Malware, Detecting and Eliminating Viruses and Spyware.	**6 Hrs.**
Unit No:3	**Techniques Used by Hackers:** Introduction, Basic Terminology, The Reconnaissance Phase, Actual Attacks, Malware Creation, Penetration Testing.	**6 Hrs.**
Unit No:4	**Encryption:** Introduction, Cryptography Basics, Modern Methods, Public Key(Asymmetric) Encryption, PGP, Legitimate Versus Fraudulent Encryption Methods, Digital Signatures, Hashing, Steganography, Cryptanalysis, Cryptography Used on the Internet.	**6 Hrs.**
Unit No:5	**Computer Security Technology:** Introduction, Virus Scanners, Firewalls, Antispyware, IDS: IDS Categorization, Identifying an Intrusion, IDS Elements, Digital Certificates, SSL/TLS, Virtual Private Networks, Wi-Fi Security.	**6 Hrs.**
Unit No:6	**Introduction to Forensics:** Introduction, General Guidelines, Finding Evidence on the PC, Finding Evidence in System Logs, Getting Back Deleted Files, Operating System Utilities, Mobile Forensics: Cell Phone Concepts.	**6 Hrs.**

Text Books:	
1	"Computer Security Fundamentals", by Chuck Easttom, PEARSON, Third Edition.

Reference Books:	
1	"Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Nina Godbole and Sunil Belapure, Wiley INDIA.



23UGOEET5062- BIOMEDICAL INSTRUMENTATION

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand ::	
1	Understand the anatomy and physiology of Human body subsystems.
2	Understand the different diagnostic and therapeutic equipment.
3	Understand working principles of bioelectric signal recording machine.
4	Analyze the safety aspects of medical instrumentation.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand fundamentals of human physiology system.	Understand
CO2	Classify and indentify the different diagnostic and therapeutic equipment.	Analyze
CO3	Design the basic instrumentation system for measurement of different bio potentials.	Implement
CO4	Learn about the safety measurements for designing of biomedical instrumentation.	Solve

Description:		
This course is merging of biological systems of human body and electronics instrumentation suitable for acquiring, measuring and analyzing bio potentials for diagnosis of abnormalities of physiological systems of human body at primary level.		
Prerequisites:	1	Sensors , transducers and measurement, Communication Engineering

Course Contents		
Unit No:1	**ANATOMY AND PHYSIOLOGY:** Elementary ideas of cell structure, heart and circulatory system, central nervous system, Musclo-skeletal system, Respiratory system Body temperature .Artifacts in Bio signal Acquisition: Noise, Power line, Baseline, Skin Impedance and Motion Artifacts, Techniques to reduce the artifacts.	**6 Hrs.**
Unit No:2	**CLASSIFICATION OF BIOMEDICALEQUIPMENT:** Diagnostic, therapeutic and clinical laboratory equipment. Physiological pre-amplifier and specialized amplifiers, ECG lead systems details of ECG, EMG, and EEG machines	**6 Hrs.**
Unit No:3	**BIOELECTRIC SIGNALS AND THEIR RECORDING:** Bioelectric signals (ECG, EMG, ECG, EOG & ERG) and their characteristics, Bio electrodes, electrodes tissue interface, contact impedance, effects of high contact impedance, types of electrodes, electrodes for ECG, EEG and EMG.	**6 Hrs.**
Unit No:4	**TRANSDUCERS FOR BIOMEDICAL APPLICATION:** Resistive transducers - Muscle force and Stress (Strain gauge), spirometer (Potentionmeter) , humidity, Respiration (Thermistor) Inductive Transducers - Flow measurements, muscle movement (LVDT) Capacitive Transducers - Heart sound measurement, Pulse pick up Photoelectric Transducers - Pulse transducers, Blood pressure, oxygen Analyses ,Piezoelectric Transducers - Pulse pickup, ultrasonic blood flow meter, Chemical Transducer	**8 Hrs.**
Unit No:5	**MEDICAL INSTRUMENTS:** Introduction To Blood Pressure Measurement (noninvasive), Life saving Devices Pacemakers and Defibrillators, Bedside Monitors, Central Monitoring system, Stress Test System, X Ray, CT scan , Dental instruments	**5 Hrs.**
Unit No:6	**SAFETY ASPECTS OF MEDICAL:** Gross current, Micro Current shock, safety standards rays and considerations, safety testing instruments, biological effectsof X-rays and precautions	**5 Hrs.**

Text Books:	
1	"Introduction to Biomedical Equipment Technology", Joseph J. Carr and John M. Brown, 4th Edition, Prentice Hall, 2000.
2	"Biomedical Signal Analysis", R. Rangayan, Wiley 2002.
3	"Handbook of Biomedical Instrumentation", R.S.Khandpur, Tata McGraw Hill, New Delhi, 2003, Edition-II.
4	" Principles of Applied Biomedical Instrumentation", Goddes & Baker, John Wiley publication.

Reference Books:	
1	"Bio-signal and Biomedical Image Processing ",John L Semmlow, Marcel Dekker
2	"Introduction to Biomedical Equipment Technology ", Joseph J. Carr and John M. Brown, 4thEdition, Prentice Hall, 2000.

23UGPCCET502LP- ADVANCED DIGITALCOMMUNICATION LAB

Practical : 2 hrs/week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
OE : 25 Marks

Course Objectives: The course aims to :	
1	Elaborate the different source coding techniques with the help of their block diagrams and function.
2	Explain the different digital modulation techniques.
3	Describe the base band transmission and reception system.
4	Understand the concept to f information theory in detail with different coding theorems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the basic concept of digital communication system.	Understand
CO2	Analyze various digital modulation and coding techniques.	Analyze
CO3	Understand the spread spectrum modulation principles.	Understand
CO4	Solve the problem based on information theory.	Solve

Description:		
This course discusses the principles of digital communication which has applications in different telecommunication systems. It makes students acquainted with use of statistical techniques, source and channel coding, different modulation techniques.		
Prerequisites:	1	Analog Communication
	2	Probability Theory and statistics

List of Experiments			
Minimum 08 experiments to be perform from the below list:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Study of Pulse Code Modulation and Demodulation.	2	Knowledge
2	Study of Delta Modulation and Demodulation.	2	Knowledge
3	Study of Adaptive Delta Modulation and Demodulation.	2	Knowledge,
4	Perform Amplitude Shift Keying technique and Demodulation.	2	Knowledge, Evaluation
5	Perform Frequency Shift Keying technique and Demodulation.	2	Knowledge, Evaluation
6	Perform Phase Shift Keying technique and Demodulation.	2	Analysis, Evaluation
7	Perform Quadrature Phase Shift Keying technique and Demodulation.	2	Analysis, Evaluation
8	Study of Line Codes.	2	Knowledge, Evaluation
9	Write a MATLAB/ Simulink program to generate ASK, FSK and PSK waveforms.	2	Simulation
10	Study of Eye Diagram using oscilloscope.	2	Study

23UGPCCET503LP - MICROCONTROLLERS LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
POE : 25 Marks

Course Objectives: The objective of the course is to:	
1	Understand fundamentals of 8051 and PIC microcontroller Programming.
2	Analyze Real time requirements using ON-Chip resources of 8051.
3	Evaluate need of I/O peripherals to satisfy system design requirements.
4	Develop Embedded 'C' Programs for I/O Peripherals.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy Level**
CO1	Build various Programs and Perform experiment using ON-Chip resources of 8051.	Apply
CO2	Develop Embedded 'C' Programs for I/O Peripherals.	Apply
CO3	Describe Architecture of PIC microcontroller and write various Programs.	Understand
CO4	Select I/O peripherals to satisfy system design requirements.	Evaluate

Description:		
This has been designed to have hands on 8051 and PIC microcontroller programming.		
Prerequisites:	1	Digital Electronics
	2	Programming
	3	Use of IDE

List of Experiments			
Minimum 08 experiments to be perform from the below list:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Arithmetic & Logical operations using 8051 .	2	Understand
2	Data transfer operations using 8051 .	2	Understand
3	Interface Stepper motor using 8051 .	2	Understand, Apply
4	Interface relay using 8051.	2	Understand, Apply
5	Interface 7 segment display using 8051.	2	Understand, Apply
6	Interface LCD display using 8051.	2	Understand, Apply
7	Use of Timer & counter operation in 8051 using Embedded C.	2	Analysis
8	Interface LCD to 8051 using Embedded C .	2	Knowledge
9	Serial Communication with 8051 using Embedded C.	2	Knowledge
10	Develop logic in assembly programming to perform 8/16 bit arithmetic operations using PIC Microcontroller.	2	Understand
11	Develop logic in assembly programming to perform block transfer operation using PIC Microcontroller.	2	Understand
12	Develop logic in assembly programming to perform program memory table read operations.	2	Understand

23UGPCCET507P – MINI PROJECT

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
OE : 50 Marks

Course Objectives: The objective of the course is to:	
1	To learn and understand the characteristics of Microcontroller and its Architectures.
2	To develop skill of Microcontroller programming.
3	To develop skill of programming on chip resources using various platforms.
4	To understand the concept of Raspberry Pi.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy Level**
CO1	Identify, Initiate and manage a minor project.	Remember
CO2	Propose research problem and present it in a clear and distinct manner through different oral, written and design techniques.	Application
CO3	Construct the circuit using hardware and/or software.	Apply
CO4	Execute the project and comment upon the results of it.	Analyze

Description:

A project group shall consist of normally 3 students per group. The mini project will involve the design, construction, and debugging of an electronic system approved by the department. Each student should conceive, design and develop the idea leading to a project/product. The theme of the project should be based on courses studied in previous semester using microcontroller/Ardiuno/Raspberry Pi etc.

Each student must keep a project notebook/logbook. The project notebooks will be checked periodically throughout the semester, as part of in-semester-evaluation. The student should submit a soft bound report at the end of the semester. The final product as a result of mini project should be demonstrated at the time of examination.

23UGPCCET501T- SIGNAL PROCESSING

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Define and classify signals, Systems and their properties.
2	Analyze signals using Fourier Transform and Z Transform.
3	Model and construct CT and DT Systems using basic building blocks.
4	Design digital filters.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate use of Signals and Systems.	Understand
CO2	Calculate Fourier Transform for analysis of CT, DT signals and Z Transform for DT signals.	Apply
CO3	Implement the systems using different methods.	Remember
CO4	Design digital filters.	Create

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET5041T- VLSI DESIGN

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Understand the basic concept of VHDL.
2	Design & implement digital circuits (combinational & sequential) using VHDL.
3	Explain students the fundamental concepts of Hardware Description Language and design flow of digital system design.
4	Understand the concept of Programmable Logic Devices.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply Boolean laws/K-Map-method, to reduce a given Boolean function.	Understand
CO2	Design & realize combinational logic circuits using logic gates and VHDL Codes.	Analyze
CO3	Demonstrate the operation of flip-flops, counters , shift registers Synchronous sequential machine using Moore and Mealy machine.	Understand
CO4	Design combinational and sequential logic circuits using various description techniques in VHDL.	Solve

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET5042T- OPERATING SYSTEM

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Make students understand basic concepts of operating system.
2	Understand features of process and operation management.
3	Understand what a process is and how processes are synchronized and scheduled.
4	Understand different approaches to memory management and I/O Management.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Learn basic concepts of Operating Systems its types & services.	Remember
CO2	Describe various features of process and operation management.	Understand
CO3	Present process synchronization and critical section problem with its solutions .	Understand
CO4	Illustrate the working of different scheduling schemes and basics of deadlock with their possible solutions.	Apply

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET5043T- DATABASE MANAGEMENT SYSTEM

Tutorial : 1Hr./Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to:	
1	To understand fundamental concepts and algorithms of Database Systems.
2	To familiarize students with SQL and DBMS.
3	To learn database design techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the fundamentals of database management systems.	Understand
CO2	Design appropriate database for a given problem.	Create
CO3	Write SQL queries to design & manage the database.	Apply
CO4	Illustrate Transactions, Concurrency and Recovery apply to database system.	Understand

Description:		
This Course is designed to understand the internals of Database System, with elaboration from Database Design, Using Relational Database (using SQL) and the transaction concepts.		
Prerequisites:	1	Set Theory
	2	Operating System
	3	Data Structures

Minimum 6 tutorials to be conducted based on syllabus.

23UGPCCET601- ELECTROMAGNETIC WAVES & ANTENNA THEORY

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	The basic mathematical concepts of Vector calculus & co-ordinate systems and different laws in steady electric & magnetic fields.
2	Apply Maxwell's equations in different forms to develop wave equations and concepts of electromagnetic waves and transmission lines.
3	Define different terminologies of antenna & classify and explain measurement schemes of antenna parameters.
4	Design and simulate different types of antenna.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply the knowledge of vector algebra and co-ordinate system to solve the electromagnetic field problems.	Apply
CO2	Use and apply basics of electric and magnetic fields to solve the electrostatic and magneto static problems.	Apply
CO3	Understand antenna parameters in order to differentiate the applicability of each type of antenna.	Understand
CO4	Analyze the different types of antenna arrays and make use of them in wide areas of wireless communication.	Analyze

Description:

The course has been designed to understand the basic mathematical concepts related to electromagnetic vector fields in engineering applications. It aims to establish a firm understanding of the laws of steady electric and magnetic field to obtain solution of problem relating to electric field and magnetic field. Further course deals with application of Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

This course also discusses the different terminologies, parameters of antenna which has applications in different telecommunication and microwave systems. Students should clear understanding of antenna theory with applications.

Prerequisites:	1	Basic laws of physics
	2	Basic knowledge of Scalar and vector
	3	Communication engineering

Course Contents		
Unit No:1	**VECTOR ANALYSIS AND ELECTRIC FIELD:** Vector algebra, Different types of Co-ordinate systems, Gradient, Divergence and Curl, Coulomb's law, electric field intensity, (Numerical Expected), Electric Flux density, Gauss's law, divergence theorem, and Boundary conditions for electrostatic field.	**6 Hrs.**
Unit No:2	**MAGNETIC FIELD:** Biot-Savarts law (Numerical Expected), Magnetic field intensity due to infinite straight filament and finite length, field intensity on axis of circular loop (Numerical Expected) Ampere's circuital law, Stroke's Theorem, Boundary Conditions for magneto static field.	**6 Hrs.**
Unit No:3	**ELECTROMAGNETIC WAVES:** Maxwell's Equations in point form & Integral form. Wave equation in free space, Maxwell's equations for static field, time varying field & harmonically varying fields, Comparison of field & circuit theory. Skin depth, Reflection of plane wave, Group velocity and phase velocity	**6 Hrs.**
Unit No:4	**TRANSMISSION LINES:** Characteristic equation, Transmission line equations, Transmission line parameters, Terminated uniform transmission line, Characteristic impedance, propagation constant Reflection coefficient, VSWR, Smith chart, Applications of Smith Chart.	**6 Hrs.**
Unit No:5	**FUNDAMENTALS OF ANTENNA:** Radiation mechanism, Current Distribution, Antenna parameters - radiation resistance, pattern, beam area, radiation intensity, beam efficiency, directivity, and gain, antenna aperture, effective height, polarization, radio communication link	**6 Hrs.**
Unit No:6	**ANTENNA TYPES AND ARRAY:** Frequency independent and Broad band antenna, Mono pole, Dipole, Short Dipole, Yagi-Uda Antenna, Helical Antenna, Log-Periodic Antenna, Antenna Array Array :Array of two isotropic point sources (Different cases), principle of pattern multiplication	**6 Hrs.**

Text Books:	
1	"Electromagnetics", John D. Kraus Tata McGraw Hill Publication
2	"Engineering Electromagnetics", William Hayt, Buck, Tata McGraw Hill Publication.
3	"Antenna Theory", Constantine A. Balanis, 3rd edition, Wiley Publication

Reference Books:	
1	"Electromagnetic Fields & Radiation Systems", Jordan & Balmain, 2nd edition, PHI
2	"Electromagnetic field theory & Transmission lines", G.S.N. Raju, 1st edition, Pearson Education
3	"Antennas and Wave Propagation", G. S. N. Raju, 4th edition, Pearson publication
4	"Antennas and Wave Propagation", K.D. Prasad, 3rd edition, Satya prakashan publication

23UGPCCET602- POWER ELECTRONICS

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	Introduction to fundamental concepts of Power Electronics Systems.
2	Different performance characteristics of power devices like diode, MOSFET, IGBT, SCRs, TRIAC, DIAC and GTO.
3	Operation of different configurations of rectifier and inverter.
4	Basics and different controlling techniques of chopper and cycloconverter.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	To discuss characteristics, ratings and driver circuits of the power devices.	Understanding & Applying
CO2	To discuss different firing and commutation methods of SCR.	Analyzing
CO3	To analyze the operation of power electronics rectifier and inverter.	Evaluating
CO4	To analyze the operation of chopper and cycloconverter.	Evaluating

Description:		
This course provides basics of power electronics devices with switching on/off technologies. It also deals with power converters such as AC to DC, DC to DC and DC to AC with their analysis and performance parameters. Gate driver circuits are also discussed		
Prerequisites:	1	Basic knowledge of DC-AC circuits, semiconductor devices theory, linear algebra.

Course Contents		
Unit No:1	**POWER DEVICES :** Construction and V-I Characteristics, Dynamic Characteristics during turn on, turn off of SCR, SCR protections dv/dt, di/dt, Construction & V-I Characteristics of Diac, Triac, GTO, Power MOSFET and IGBT.	**6 Hrs.**
Unit No:2	**SCR TURN ON-OFF METHODS :** SCR Turn ON Methods (firing circuits) : Firing circuits using UJT, Diac and Triac triggering circuits, Cosine based firing , Need of Isolation. Pulse transformer & Opto-coupler based isolation techniques. SCR Turn OFF Methods: Class A to Class E.	**6 Hrs.**
Unit No:3	**PHASE CONTROLLED RECTIFIERS :** Single Phase Half wave, Full wave, Half controlled and Full controlled converters with R & RL Load, effect of Freewheeling Diode. Three-phase half controlled and full controlled converter, Calculations of performance parameters and Numerical expected	**6 Hrs.**
Unit No:4	**INVERTERS :** Principle and operation of single phase half bridge and full bridge inverters, Three Phase inverters (180, 120 degrees conduction modes of operation), Voltage control techniques, harmonic elimination methods -PWM Technique.	**6 Hrs.**
Unit No:5	**DC TO DC CONVERTERS:** Basic principles of chopper, step-down chopper, step-up chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, Morgan's chopper.	**6 Hrs.**
Unit No:6	**AC VOLTAGE CONTROLLER:** Single phase AC regulator, Introduction to cycloconverter, 1-phase to 1-phase, 3-phase to 1-phase, 3-phase to 3- phase: bridge configuration and circulating and non-circulating mode.	**6 Hrs.**

Text Books:	
1	"Power Electronics" ,P.S.Bhimbra , Khanna Publication
2	"Power electronics", P.C.Sen , MGH publication
3	"Power Electronics" ,M.D. Singh & Khan chandani, McGraw Hill publication

Reference Books:	
1	"Power Electronics" ,Ned Mohan, Wiley Pub. 3rd Edition
2	"Power electronics", Mohammad Rashid , 3rd edition Pearson Publication

23UGPCCET603- EMBEDDED SYSTEM

Lectures : 3 Hrs/Week
Credit : 2

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to :	
1	Understand and illustrate the characteristics of Embedded systems and its Architectures.
2	Study key features of Microcontroller LPC214X.
3	Develop the programming skills on chip resources of LPC214X.
4	Understand the concept of real time operating systems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Compare and apply important attributes of Embedded system.	Understand & Apply
CO2	Make use of ARM LPC2148 for assembly and C program to configure and use internal peripherals.	Apply
CO3	Design and develop small embedded system using embedded C programming and LPC2148 microcontroller.	Create
CO4	Elaborate Embedded system applications using RTOS.	Apply

Description:

The course has been designed to introduce fundamental principles of Embedded System Design commonly used in engineering applications. It aims to establish a firm understanding of the basic programming using Embedded c and assembly language for development of different Embedded System applications used in society. The course deals with the basic study of architecture of ARM and interfacing of different peripherals, The course focuses on Embedded System design of different practical systems.

Prerequisites:	1	Digital Electronics and Programming skills
	2	Assembly programming
	3	Embedded C programming

Course Contents		
Unit No:1	**INTRODUCTION:** Introduction to Embedded Systems, Classification of Embedded System, processor selection in Embedded System, Components of Embedded systems, Hardware and Software Systems Development tools: Assembler, cross compiler, Simulator, ICE, IDE.	**6 Hrs.**
Unit No:2	**INTRODUCTION TO ARM PROCESSOR:** ARM Core data flow model, registers, operating modes, pipeline, exceptions, interrupts & the vector table, ARM processor families ARM instruction set: conditional execution. Branch and Load/Store, software interrupt instruction, program status register instruction, Thumb instruction set introduction. Exception handling schemes	**6 Hrs.**
Unit No:3	**EMBEDDED NETWORKING:** Concept of data communication Bus: parallel and serial, Serial Bus communication protocols: RS232 standard, RS485, Serial Peripheral Interface (SPI), Inter Integrated Circuits (I2C). CAN Bus	**6 Hrs.**
Unit No:4	**ARM7TDMI-S MICROCONTROLLER LPC 2148:** Features, LPC 214X Device Information, Block Diagram, Memory Maps, Memory Acceleration Module-Block Diagram & Operation, System Control Block(SCB)-Register Description, Fosc. Selection Algorithm, external interrupt logic, phase locked loop, power control, Reset- Block Diagram& RSI register.	**6 Hrs.**
Unit No:5	**LPC 2148ON CHIP RESOURCES:** Features, Block diagram and SFR planning: Pin connect block, GPIO,UART & Architecture, I2C, SPI, Timer, PWM, ADC & DAC, Real time clock, Watchdog timer, Vectored interrupt controller, features of on chip USB	**6 Hrs.**
Unit No:6	**INTRODUCTION TO RTOS:** Architecture of kernel, task and task scheduler, ISR, Semaphores, Mutex, Mailboxes and Pipes, Message Queues, Timers, Memory Management	**6 Hrs.**

Text Books:	
1	"Embedded Systems :Architecture, Programming and Design", Rajkamal,TMH
2	"ARM system developers guide", Sloss, Symes,Wright,Morgan Kaufman (Elsevier) publication
3	"Embedded/ Real time systems: Concepts, Design and Programming",Dr.K.V.K. Prasad, Dreamtech press

Reference Books:	
1	"ARM assembly language: fundamentals and Technique", William Hohel , 2.ARM Architecture Reference Manual By: ARM
2	"ARM7TDMI Technical Reference Manual Revision", r4p1 By: ARM 4. LPC214x USER MANUAL By Philips/ NXP semiconductor
3	"An Embedded Software Primer", David E. Simon, Pearson Education
4	"Embedded systems A contemporary Design tool", James K. Peckol, Wiley

MOOC / NPTEL Courses:
http://www.ti.com/product/msp430f5529 http://www.ti.com/product/msp430f438 http://www.ti.com/product/msp430g2302-ep

23UGPECET6041 - IMAGE PROCESSING

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student :	
1	To describe basic concepts of digital image processing.
2	To describe and implement various methods for image enhancement and recognition.
3	To explain concept of image segmentation and compression.
4	To acquaint with MATLAB image processing toolbox to implement image processing techniques.

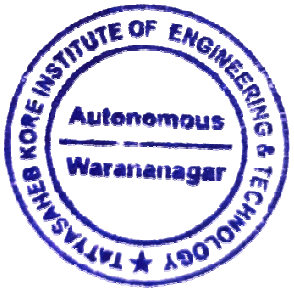
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the fundamental concepts in digital image processing.	Understanding
CO2	Apply gray level transformations, spatial filters and histogram processing for image enhancement.	Application
CO3	Select morphological operators for extracting image features.	Application
CO4	Examine image segmentation and compression used in digital image processing.	Analyze

Description:		
The course introduces fundamentals of a digital image, its acquisition, enhancement, recognition and compression.		
Prerequisites:	1	Signal Processing Techniques, MATLAB Programming

Course Contents		
Unit No:1	**INTRODUCTION :** Concept of digital image processing, steps in image processing, components of image processing system, Applications areas.	**6 Hrs.**
Unit No:2	**DIGITAL IMAGE FUNDAMENTALS:** Image sensing and acquisition, Basic concept of sampling and quantization, representations of digital image, spatial and gray level resolution, zooming and shrinking of image, Basic relationship between pixels.	**6 Hrs.**
Unit No:3	**IMAGE ENHANCEMENT IN SPATIAL DOMAIN:** Basic gray level transformations, image negation, log transformations, power law transformations, piece wise linear transformations, histogram processing, histogram equalization, histogram matching, Image enhancement using arithmetic and logical operations	**6 Hrs.**
Unit No:4	**SPATIAL FILTERS:** Smoothing spatial filters: smoothing linear, order statistic filters, sharpening spatial filters: Use of second derivatives for enhancement, Use of first derivatives for enhancement.	**6 Hrs.**
Unit No:5	**MORPHOLOGICAL IMAGE PROCESSING:** Dilation & erosion, opening and closing operation, Hit- or –miss transformation, Morphological algorithms: Boundary extraction, region filling, thinning and thickening.	**6 Hrs.**
Unit No:6	**EDGE DETECTION AND SEGMENTATION:** Detection of discontinuities: point, line and edge detection, Thresholding, Region based segmentation	**6 Hrs.**

Text Books:	
1	“Digital Image Processing”, Rafael C Gonzalez, Richard E.Woods, Pearson Publication
2	“Fundamentals of Digital Image Processing”, Anil Jain
3	“Digital Image Processing and Analysis”,B. Chanda , D. Dutta Mujumder
4	“Digital Image Processing”,S. Sridhar Oxford

Reference Books:	
1	“Digital Image Processing using Matlab”, Rafael C Gonzalez.
2	“Fundamentals of Digital Image Processing”, S.Annadurai, R. Shanmugalaxmi, Pearson Publication



23UGPECET6042 -ROBOTICS

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40Marks
ESE : 60Marks

Course Objectives: The course aims to :	
1	Introduce fundamental principles of robotics including kinematics, dynamics, and intelligent systems.
2	Explore machine learning and AI applications for autonomous robotic behavior.
3	Enable students to design algorithms for robot navigation, perception, and decision-making.
4	Address ethical considerations, societal impact, and sustainable practices in robotics.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the architecture, components, and classifications of intelligent robotic systems.	Understand
CO2	Apply kinematics and path planning concepts for motion and navigation.	Apply
CO3	Analyze machine learning models and computer vision techniques in robotics applications.	Analyze
CO4	Evaluate robotics solutions with respect to societal, ethical, and environmental factors.	Evaluate

Description:

This course offers an introduction to the interdisciplinary field of robotics, focusing on both theoretical foundations and practical applications. Students will explore the architecture of robotic systems, including sensors, actuators, and embedded control. Key topics include robot kinematics, dynamics, motion planning, machine learning integration, and computer vision. The course also introduces open-source robotic software tools and simulators such as ROS and OpenCV. Emphasis is placed on understanding the ethical, societal, and environmental implications of deploying intelligent robots in real-world settings. By the end of the course, students will be equipped to analyze, design, and evaluate basic robotic systems for industrial, service, and autonomous applications.

Prerequisites:	Linear Algebra, Programming in Python/C++/Any other Language, Basics of Control Systems and Microcontrollers.

Course Contents		
Unit No:1	**Introduction to Robotics and Intelligent Systems:** Definition and classification, anatomy of robots, sensors and actuators overview, types of robots, industrial, mobile, humanoid, introduction to intelligent robotics, current trends.	**6 Hrs.**
Unit No:2	**Kinematics and Dynamics:** Forward and inverse kinematics, transformation matrices, Denavit-Hartenberg parameters, velocity analysis, basics of dynamics using Newton-Euler methods.	**6 Hrs.**
Unit No:3	**Path Planning and Obstacle Avoidance:** Configuration space, A*, D*, RRT algorithms, potential field method, introduction to SLAM, occupancy grids and map generation.	**6 Hrs.**
Unit No:4	**Machine Learning and AI for Robotics:** Types of learning (supervised, unsupervised, reinforcement), ML algorithms (KNN, SVM), CNN basics, applications in object detection and robot decision-making.	**6 Hrs.**
Unit No:5	**Computer Vision and Perception:** Camera modelling, basic image processing with Open CV, object detection and tracking, 3D vision, sensor fusion and ROS integration.	**6 Hrs.**
Unit No:6	**Ethics, Safety, and Societal Impact:** Ethical challenges in autonomous robotics, bias, fairness, and transparency in AI, robotics and job automation, sustainability and environmental impact, role of engineers in responsible innovation.	**6 Hrs.**

Text Books:	
1	"Industrial Robotics: Technology, Programming, and Applications", by Mikell P. Groover, McGraw-Hill Education, 1st Edition, 2008.
2	"Introduction to Robotics: Analysis, Control, Applications", by Saeed B. Niku, Wiley, 3rd Edition, 2020.

Reference Books:	
1	"Introduction to Robotics: Mechanics and Control", by John J. Craig, Pearson Education, 4th Edition, 2017.
2	"Introduction to Autonomous Mobile Robots", by Roland Siegwart, Illah R. Nourbakhsh, and Davide Scaramuzza, MIT Press, 2nd Edition, 2011.
3	"Artificial Intelligence: A Modern Approach", by Stuart Russell and Peter Norvig, Pearson Education, 4th Edition, 2020.
4	"Mobile Robots: Inspiration to Implementation", by Joseph L. Jones, Anita M. Flynn, and Bruce A. Seiger, A K Peters, 2nd Edition, 1999.

23UGPECET6043- REAL TIME OPERATING SYSTEM

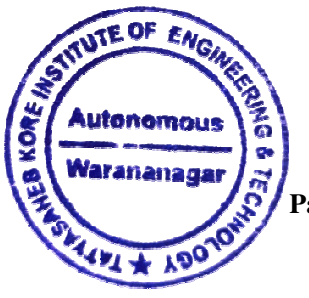
Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course has been designed to introduce fundamental principles of real time operating system	
1	Understand fundamental concepts and performance measures of real-time operating systems (RTOS).
2	Study the software engineering process and design methodologies for real-time systems.
3	Explore features and working principles of commercial RTOS and real-time databases.
4	Design and implement embedded systems using RTOS concepts and tools.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the concepts of real-time system and modeling.	Understand
CO2	Design architecture, present mathematical model of system.	Apply
CO3	Recognize the characteristics of real time system.	Remember
CO4	Analyze task scheduling, resources management, real time operating system and fault tolerance application of real time system.	Evaluate

Description: The course has been designed to introduce fundamental principles of real time operating system	
Prerequisites:	Natural Languages



Course Contents		
Unit No:1	**Basic Real- Time Concepts & Hardware Consideration:** Terminology, Real time design Issues, Example, Real –Time Systems, Brief History, basic Architecture, H/W Interfacing, CPU, Memory & I/O.	**6 Hrs.**
Unit No:2	**Real Time specification and design Techniques:** Natural Languages, Mathematical specification, flowcharts, structure charts, Pseudo code and programming design languages, finite state Automata , Data flow diagram petrinets, Warnier –Orr Notation, State charts Sanity in using graphical Techniques.	**6 Hrs.**
Unit No:3	**RealTimeKernels:**Pseudokernels,Interrupt–Drivensystem,PreemptivePriority System, Hybrid System, Task control block model, Process Scheduling ,RR scheduling, Cyclic Executives, Fixed Priority &Dynamic Priority scheduling.	**6 Hrs.**
Unit No:4	**Inter-taskcommunicationandSynchronization:**Bufferingdata,mailboxes, critical Regions, Semaphores, Event Flags And Signals, Deadlock	**6 Hrs.**
Unit No:5	**Real-Time Memory Management:** Process Stack Management, Run time ring buffer, Maximum stack size, Multiple-stack Arrangement, Memory management in task-control Block Model, Swapping, Overlays, Block Or Page Management, Replacement Algorithm, Memory Locking, Working Set, Real Time Garbage Collection, Contiguous File System, Selecting Real-Time Kernels.	**6 Hrs.**
Unit No:6	**System Performance Analysis And Optimization:** Response-time calculation, interrupt Latency, Time-Loading And Its Measurement, Scheduling Is Np-Complete, Reducing Response Times And Time-Loading, Analysis Of memory Requirements, Reducing Memory loading, I/O Performance. Real Time Applications: Real Time Systems On Complex Systems, Real Time Data Bases, Real time image processing, Real time process control.	**6 Hrs.**

Text Books:	
1	"Real Time Systems Design & Analysis",An Engineer's Handbook Second Edition - [PHI] P.A LAPLANTE
2	"Real Time Systems Design And Analysis", Third Edition (Wiley Publication) Phillip A. Laplante

Reference Books:	
1	"Real Time Systems", C.M.Krishna,K.G.Shin ,[McGraw Hill]
2	"Real-Time Systems And Their Programming Languages", Burns, Alan And Andy Wellings,(New York: Addison- Wesley)
3	"The Design of Real-Time Applications", M.Blackman, network: Johnwiley & Sons
4	"Embedded And Real Time System-Concepts, Design & Programming", Dr. K.V.K. Prasad (BlackBook)

23UGPECET6051- RADAR AND OPTICAL COMMUNICATION

Lectures : 3Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40Marks
ESE : 60Marks

Course Objectives: The course aims to :	
1	Understand the core concepts of radar and optical communication systems and their evolution.
2	Explore modern radar and optical technologies including MIMO radar, SDR, LiFi, FSO, and photonics.
3	Analyze and interpret radar/optical system performance using signal processing and simulation tools.
4	Evaluate the role of radar and optical systems in emerging domains such as IoT, 6G, and autonomous vehicles.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the fundamental principles and modern role of radar and optical systems.	Remember, Understand
CO2	Analyze the architecture and signal behavior in radar and optical communication systems.	Analyze
CO3	Apply simulation and signal processing techniques for radar and optical systems.	Apply, Evaluate
CO4	Evaluate use-cases of radar/optical systems in automotive, aerospace, and IoT sectors.	Evaluate

Description:

This course covers the fundamental and advanced aspects of radar and optical communication systems. It emphasizes simulation-driven learning, application in smart mobility and defense, and emerging technologies like MIMO radar, free-space optics, and photonic integrated circuits. The ethical, environmental, and societal implications of these technologies are explored through system evaluation frameworks.

Prerequisites:	1	Basic understanding of Signals & Systems, Electromagnetics, Analog & Digital Communication.

Course Contents		
Unit No:1	**Fundamentals of Radar and Optical Communication:** This unit introduces the historical background, basic principles, and core equations of radar systems, along with the evolution of optical communication from traditional fiber-based systems to integrated photonic technologies. A comparison between RF and optical communication paradigms is established, emphasizing their respective strengths and limitations. Applications in domains such as aerospace, automotive, defense, and healthcare are also introduced.	**6 Hrs.**
Unit No:2	**Radar Technologies and Systems:** This unit covers the types and classification of radar systems including continuous wave, pulsed, and frequency modulated continuous wave radar, and synthetic aperture radar. Subsystems such as transmitters, duplexers, antennas, and receivers are discussed in brief. Doppler effect, moving target indication, and pulse compression techniques are explored, along with advanced topics like MIMO radar and cognitive radar architectures.	**6 Hrs.**
Unit No:3	**Optical Fiber Communication:** The principles of light propagation in optical fibers are discussed, covering guided modes, fiber losses, and dispersion mechanisms. The design and working of optical transmitters and detectors such as LEDs, laser diodes, PIN and avalanche photodiodes are explored. Modulation formats like ASK, FSK, PSK, and QAM are introduced along with techniques such as WDM and DWDM for bandwidth optimization in high-capacity systems.	**6 Hrs.**
Unit No:4	**Advanced Radar Applications:** The unit focuses on the use of radar systems in modern applications such as Advanced Driver Assistance Systems (ADAS), autonomous navigation, and aerospace missions. Spaceborne and airborne radar platforms are studied. Signal processing techniques for clutter reduction and noise mitigation are covered, along with integration of radar systems with artificial intelligence and machine learning for enhanced detection and tracking.	**6 Hrs.**
Unit No:5	**Modern Optical Systems:** This unit covers advanced optical technologies including free-space optical communication and visible light communication systems such as Li-Fi. The structure and use of photonic integrated circuits are discussed along with their advantages in compact and high-speed optical networks. Applications in Internet of Things (IoT), sixth-generation wireless systems (6G), and smart cities are analyzed to show the relevance of optical systems in next-generation connectivity.	**6 Hrs.**
Unit No:6	**System Evaluation and Emerging Applications:** This unit presents a comparative framework for evaluating radar and optical systems in real-world contexts including reliability, latency, and deployment challenges. It emphasizes the ethical use of surveillance and sensing technologies, environmental considerations like energy efficiency and light pollution, and the broader societal impact of deploying communication infrastructure in urban and rural ecosystems.	**6 Hrs.**

Text Books:	
1	"Fundamentals of Radar Signal Processing", by M.A. Richards, McGraw-Hill Education, 2nd Edition, 2014.
2	"Optical Fiber Communications", by Gerd Keiser, McGraw-Hill Education, 5th Edition, 2021.

Reference Books:	
1	"Fiber-Optic Communication Systems", by Govind P. Agrawal, Wiley, 4th Edition, 2012.
2	"Radar Signals", by Nadav Levanon, Wiley-Interscience, 2004.
3	"Understanding Fiber Optics", by Jeff Hecht, Pearson Education, 5th Edition, 2005.
4	"Optical Fiber Communications: Principles and Practice", by John M. Senior, Pearson Education, 3rd Edition, 2009.

23UGPECET6052- COMPUTER VISION

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To introduce the fundamentals of computer vision and image processing.
2	To enable students to understand feature extraction and object recognition techniques.
3	To impart knowledge on 3D vision and motion estimation.
4	To provide practical insight into real-world vision applications using modern tools.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the fundamentals of computer vision, image formation, camera models, and utilize Open CV/Python tools for basic image processing tasks.	Understanding
CO2	Apply image preprocessing techniques such as filtering, edge detection, and morphological operations to enhance and extract image features.	Application
CO3	Analyze and implement feature detection, object recognition, and classification using classical and deep learning-based methods.	Analyze
CO4	Evaluate motion tracking and 3D vision techniques including optical flow, structure from motion, and stereo vision for real-world applications.	Evaluate

Description:		
Computer vision is a field of artificial intelligence (AI) that enables computers to interpret and understand visual information from the world, such as images and videos. It involves techniques for acquiring, processing, analyzing, and understanding visual data to automate tasks that typically require human sight, like object detection, image classification, facial recognition, and scene reconstruction. The goal is to enable machines to "see" and make decisions based on what they perceive.		
Prerequisites:	1	Basic understanding of linear algebra, calculus, probability, Proficiency in Python programming, image processing libraries and machine learning fundamentals

Course Contents		
Unit No:1	**Introduction to Computer Vision:** Overview and Applications of Computer Vision, Human vs. Computer Vision Image formation, Camera models (Pinhole, Orthographic),Image representation and color spaces, Introduction to Open CV/Python for vision tasks	**6 Hrs.**
Unit No:2	**Image Preprocessing and Filtering:** Image enhancement: Histogram equalization, Contrast adjustment. Spatial filtering: Smoothing, Sharpening (Mean, Gaussian, Median filters).Edge detection: Sobel, Prewitt, Canny. Morphological operations: Erosion, Dilation, Opening, Closing.	**6 Hrs.**
Unit No:3	**Feature Detection and Matching:** Keypoints and Descriptors: Harris Corner, SIFT, SURF, ORB, Feature matching: Brute-force matcher, FLANN-based matcher, Geometric, transformations: Translation, Rotation, Scaling, Homography and RANSAC	**6 Hrs.**
Unit No:4	**Object Detection and Recognition:** Object classification using template matching, Machine learning-based classification (SVM, k-NN basics), Deep learning overview: CNN architecture basics, Pre-trained networks and transfer learning (e.g., YOLO, MobileNet)	**6 Hrs.**
Unit No:5	**Motion Analysis and Tracking:** Optical flow (Lucas-Kanade, Horn-Schunck), Motion segmentation Object tracking techniques (Meanshift, Camshift, Kalman Filter basics) Background subtraction and foreground detection	**6 Hrs.**
Unit No:6	**3D Vision and Applications:** Stereo vision and depth estimation, Structure from motion (SFM) 3D reconstruction basics, Applications: Face recognition, Gesture recognition, Autonomous vehicles, Augmented Reality	**6 Hrs.**

Text Books:	
1	"Computer Vision: Algorithms and Applications", Richard Szeliski, Springer.
2	"Computer Vision", Shapiro and Stockman, , Prentice Hall

Reference Books:	
1	"Computer Vision: Models, Learning, and Inference", Simon Prince, Cambridge University Press.
2	"Learning Open CV", Gary Bradski & Adrian Kaehler, O'Reilly Media.

23UGPECET6053- INFORMATION THERORY & CODING TECHNIQUES

Lectures : 3 Hrs/Week
Credit : 3

Evaluation Scheme
ISE : 40 Marks
ESE : 60 Marks

Course Objectives: The course aims to make the student understand :	
1	To understand information theory, estimate information content of a random variable from its probability distribution.
2	To understand the types of communication channels, their capacities and construct efficient codes for data on imperfect communication channels.
3	To understand the need & objective of error control coding with encoding & decoding procedure.
4	To understand, analyze error detecting & correcting capability of different codes.

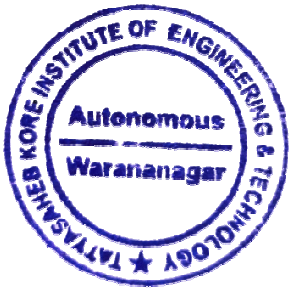
Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain basic concepts of information theory and entropy coding.	Explain
CO2	Mathematically analyze communication channel models & Channel capacity.	Analyze
CO3	Analyze the error detecting and correcting capability of different coding schemes.	Analyze
CO4	Design encoder and decoder for various coding techniques as per the need and Specifications.	Design

Description:

This course discusses the principles of digital communication which has applications in different telecommunication systems. It makes students acquainted with use of statistical techniques, source and channel coding, different coding techniques.

Prerequisites:	1	Digital Communication
	2	Probability Theory and statistics



Course Contents		
Unit No:1	**INFORMATION THEORY:** Introduction, Concept of information: Unit, Properties, Entropy (Average Information) : Definition, Mathematical expression of Entropy, Entropy of Binary Source, Properties and Information Rate, Joint Entropy, Conditional entropy, relation between Joint & Conditional Entropies, Mutual Information: Relation between Mutual Information & Entropy	**6 Hrs.**
Unit No:2	**CHANNAL CAPACITY AND CODING:** Channel Capacity, Redundancy and Efficiency of channel, Discrete memory less channel – Channel Matrix, Classification of channels: lossless Channel, Deterministic Channel, Noise free channel, Binary Symmetric Channel (BSC), Cascaded Channels and Binary Erasure Channel (BEC), Calculation of channel capacity of all channels, Shannon's fundamental theorem, Entropy Coding: Shannon Fano Coding, Huffman's Coding, Coding Efficiency Calculations	**6 Hrs.**
Unit No:3	**LINEAR BLOCK CODES:** Error Control Coding: Need, Objectives & Approaches of Error Control Coding Classification, Error Detection and Error Correction Techniques, Linear Block Code: Structure, Terms Related to Block Code, Matrix Description of Linear Block Code, Generator and Parity Check Matrices, Encoder and Syndrome decoder for (n, k) block Code.	**6 Hrs.**
Unit No:4	**CYCLIC CODES**: Algebraic structure, Properties, Polynomial representation of Codeword, Generator Polynomial, Generation of Code Vector in Nonsystematic and Systematic form, Generator and Parity check matrices in Systematic form, Encoding of Cyclic Code, Syndrome decoding for Cyclic code, Hardware Representation of (n, k) cyclic code. Cyclic Redundancy Check Code	**6 Hrs.**
Unit No:5	**BCH & RS CODE:** Binary Field Arithmetic, BCH Code: Properties, Primitive element and primitive polynomial, Primitive BCH Code, Construction of Galois Field GF (2^m), Addition & Multiplication of GF (2^m), Properties of Galois Field GF (2^m), Minimal & Generator Polynomial for BCH Code, Decoding of BCH Code, Reed¬ Solomon code: Introduction, Error correction capability of RS code, RS code in Nonsystematic & Systematic form, Decoding of RS code.	**6 Hrs.**
Unit No:6	**CONVOLUTIONAL CODE:** Introduction, Encoding of Convolutional Codes, Generation of Output code sequence : Time Domain Approach, Transform Domain Approach, Generator Matrix, Graphical Approach – Code Tree, State diagram and Trellis Diagram, Decoding of Codes : Maximum Likelihood Decoding -Viterbi Algorithm, Sequential Decoding .	**6 Hrs.**

Text Books:	
1	"Communication Systems Analog & Digital", R.P Singh & S.D.Sapre Mc-Graw Hill, IInd Edition, 2001.
2	"Information Theory & Coding", Muralidhar Kulkarni, K.S. Shivprakasha Wiley (India) Publication 2014
3	"Information Theory, Coding & Cryptography", Arijit Saha,Surajit Mandal, Pearson Education, Ist Edition, 2013.

Reference Books:	
1	"Communication Systems ",Simon Haykin, John Wiley & Sons, Inc, IVth Edition
2	"Information Theory Coding & Cryptography", Ranjan Bose, Tata McGraw Hill Publishing Company Ltd, IInd Edition 2008
3	"Introduction to Error Control Codes", Salvatore Gravano, Oxford University Press, 1st Edition, 2001

23UGMDMET606L - MICROCONTROLLERS

Lectures : 2 Hrs/Week
Credit : 2

Evaluation Scheme
ISA : 50 Marks

Course Objectives: The course aims to :	
1	To understand basic architecture of 8051 microcontroller.
2	To understand the instruction set and write programs in assembly language and embedded C.
3	To understand 8051 timers & Serial communication.
4	To interface 8051 microcontroller with common peripheral devices.

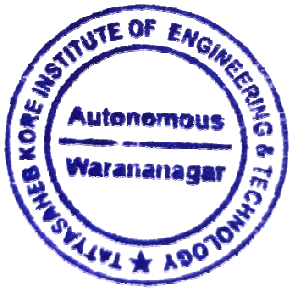
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the basic blocks of microcontroller i.e. CPU, Memory, I/O.	Remember
CO2	Write assembly language programs for target microcontroller.	Apply
CO3	Apply knowledge and demonstrate proficiency of designing hardware interfaces for memory and I/O as well as.	Apply
CO4	Derive specifications of a system based on the requirements of the application and select the Microcontroller.	Analyze,

Description:		
The course has been designed to introduce fundamental principles of embedded systems and robotics. Embedded systems is now a days is everywhere in the field of communication engineering ,home appliances, handheld electronics devises, automobiles ,agriculture etc.		
Prerequisites:	1	Digital Electronics and Programming skills.

Course Contents		
Unit No:1	**ARCHITECTUREOF 8051:** Comparison of Microprocessor and Microcontroller- Block diagram of Microcontroller– Functions of each block - Pin details of 8051, program counter , Flag bits and PSW Register, Data types and directives.	**6 Hrs.**
Unit No:2	**8051 MEMORY ORGANIZATION, INSTRUCTION SET:** Memory organization- Register banks and Stack. ,SFR map , SFR functions , Port organization. Addressing modes, accessing memory using various addressing modes. Arithmetic , Logical, Single Bit, Jump, Loop and Call Instructions and their usages, Programming.	**6Hrs.**
Unit No:3	**8051 TIMERS AND SERIAL PORT:** 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1. 8051 Serial Communication- Basics of Serial Data Communication, Simple Serial Port programming	**6 Hrs.**
Unit No:4	**8051 INTERRUPTS & APPLICATIONS:** 8051 interrupts. Interfacing to ADC, DAC, LCD & Steeper motor. Programming	**6 Hrs.**

Text Books:	
1	"The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2	"The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:	
1	"Microprocessor and Microcontroller", R.Theagarajan, Sci Tech Publication, Chennai
2	"Microcontrollers, Principles and Applications" Ajit Pal –PHI Ltd., -2011
3	"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.



23UGVSECET6071L- JAVA PROGRAMMING & APPLICATIONS

Lectures	**:** 2 Hrs/Week	**Evaluation Scheme**	
Credit	**:** 2	**ISA**	**:** 25 Marks

Course Objectives: The course aims to make the student understand:	
1	To introduce the concept of object-oriented programming using java.
2	To learn how to implement reliable and secure application using inheritance, exception handling and package concept.
3	To familiarize students with error handling using exceptions and Java's robust I/O stream mechanisms.
4	To develop the ability to interact with file systems, multi-threaded environments, and databases using Java.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Students will be able to articulate the principle of object-oriented problem solving & programming.	Remember
CO2	Students will be able to illustrate code reusability, security and abstraction using inheritance, package and interface.	Understand
CO3	Students will be able to apply exception handling, multithreading, and I/O stream operations in Java applications.	Apply
CO4	Students will be able to develop Java programs for file handling and database connectivity using collections and JDBC.	Develop

Description:		
This course introduces system software components such as assemblers, loaders, and compilers, with a focus on compiler phases including lexical analysis, syntax analysis, intermediate code generation, and optimization.		
Prerequisites:	1	C, C++, Operating Systems
	2	Microprocessor Architecture

Course Contents		
Unit No:1	**FUNDAMENTAL PROGRAMMING IN JAVA:** Java Buzzwords, The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, HotSpot, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays-Jagged Array, Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members, Static Fields and Methods, this keyword, Object Cloning, Class Design Hints.	**6 Hrs.**
Unit No:2	**INHERITANCE & INTERFACES:** Definition, Super classes, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes & Inner Classes, finalization and garbage collection. Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, and Default Methods.	**6 Hrs.**
Unit No:3	**PACKAGES & I/O STREAM:** Class importing, Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files. Developing and deploying (executable) Jar File. Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream, File Output Stream, Character Streams, Buffered Stream, Scanner, File, Random Access File.	**6 Hrs.**
Unit No:4	**EXCEPTION & COLLECTIONS:** Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions, finally clause, Advantages of Exceptions, Tips for Using Exceptions. Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework, Lambda Expressions and Annotations,	**6 Hrs.**

Text Books:	
1	"Core Java- Vol. I Fundamentals", Cay Horseman and Gary Cornell, Pearson, 8th Edition.
2	"JAVA-The Complete Reference", Herbert Schildt - Mcgraw Hill, Oracle Press, 10th Edition.

Reference Books:	
1	"Head First Java", Eric Freeman, Elisabeth Robson, Bert Bates Kathy Sierra, O'Reilly Publication - 3rd Edition.
2	"Core Java An Integrated Approach", (Black Book), bt Dr. R. Nageswara Rao
3	"Programming with Java", A primer by Balagurusamy, 6th Edition.

23UGVSECET6072L- LEADERSHIP SKILL

Lectures	**:** 2 Hrs/Week	**Evaluation Scheme**	
Credit	**:** 2	**ISA**	**:** 25 Marks

Course Objectives: The course aims to make the student understand :	
1	Develop Self-Awareness and Emotional Intelligence.
2	Understand Core Leadership Theories and Styles.
3	Enhance Communication and Team-Building Skills.
4	Apply Leadership Skills to Real-World Scenarios.

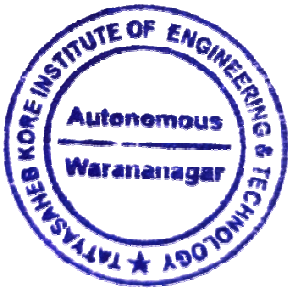
Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Demonstrate an understanding of key leadership theories and styles.	Understanding
CO2	Develop effective communication and interpersonal skills for leadership.	Applying
CO3	Apply critical thinking and problem-solving techniques in leadership situations.	Application
CO4	Exhibit the ability to lead diverse teams with emotional intelligence and cultural sensitivity.	Analyze

Description:		
Leadership skills are the abilities and qualities that enable a person to guide, motivate, and inspire a group toward achieving common goals. These skills include communication, decision-making, problem-solving, empathy, and the capacity to influence and support others effectively. Strong leadership skills help build trust, foster teamwork, and drive success in various personal and professional settings.		
Prerequisites:	1	Management Skills

Course Contents		
Unit No:1	**Leadership:** Definition and meaning, Importance, Leadership and Management, Leader vs Manager, Essential qualities of an effective leader	**5 Hrs.**
Unit No:2	**Theories of Leadership:** Trait theory, Behavioral theories, Contingency theory Types of Leaders, Leadership styles: Traditional, Transactional, Transformational, Inspirational and servant leadership and Emerging issues in leadership: Emotional Intelligence and leadership, Trust as a factor, Gender and Leadership	**8 Hrs.**
Unit No:3	**Personality:** Concept and Definition, Determinants of personality, Personality traits, Personality characteristics in organization, Self evaluation, Locus of control, Self-efficacy, Self-esteem, Self-monitoring: Positive and negative Impact.	**7 Hrs.**
Unit No:4	**Visionaries:** Organizational Context of Leadership and Personality, Contemporary Business Leaders.	**4 Hrs.**

Text Books:	
1	"Leadership: Theory and Practice" by Peter G. Northouse
2	"The Leadership Challenge" by James M. Kouzes and Barry Z. Posner

Reference Books:	
1	“Organisational Behaviour” , M.Parikh and R.Gupta , TataMcGraw Hill Education Private Limited
2	“Organisational Behavior”, D. Nelson, J.C Quick and P. Khandelwal, Cengage Publication.
3	"Leadership Skills for Managers" by Robert Lussier and Christopher Achua
4	"Developing the Leader Within You 2.0" by John C. Maxwell



23UGVSECET6073L- PROBLEM SOLVING & ANALYTICAL SKILL

Lectures	**:** 2 Hrs/Week	**Evaluation Scheme**	
Credit	**:** 2	**ISA**	**:** 25 Marks

Course Objectives: The course aims to make the student understand :	
1	To develop logical reasoning and problem-solving abilities.
2	To enhance critical and analytical thinking applicable to engineering contexts.
3	To build proficiency in structured problem-solving methods and strategies.
4	To apply analytical skills to real-world technical and non-technical problems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Apply structured approaches to solve complex problems.	Application
CO2	Demonstrate critical thinking and logical reasoning skills.	Understanding
CO3	Use appropriate tools and techniques for decision making and Analysis.	Analyze
CO4	Analyze engineering and real-life situations to identify problem patterns.	Analyze

Description:		
Problem-solving and analytical skills refer to the ability to identify issues, break them down into manageable parts, analyze relevant information, and develop effective solutions. Problem-solving involves recognizing challenges, thinking critically, and implementing logical steps to resolve them efficiently. Analytical skills focus on gathering and interpreting data, identifying patterns or trends, and making informed decisions based on evidence.		
Prerequisites:	1	Management Skills

Course Contents		
Unit No:1	**Introduction to Problem Solving:** Problem-solving process and cycle, Types of problems: well-structured vs ill-structured, Barriers to effective problem solving, Introduction to heuristics and algorithms, Role of problem solving in engineering and technology	**4 Hrs.**
Unit No:2	**Logical and Analytical Thinking:** Deductive vs inductive reasoning, Syllogisms and logical puzzles,Pattern recognition and series, Cause-effect analysis, Analytical frameworks (SWOT, Fishbone Diagram)	**5 Hrs.**
Unit No:3	**Quantitative Problem Solving:** Data interpretation (graphs, charts, tables), Basic statistics and probability in decision making, Optimization and estimation techniques, Time and work, distance and speed problems, Application in real-world and engineering contexts	**5 Hrs.**
Unit No:4	**Decision Making and Creative Problem Solving:** Decision-making models (Rational, Vroom-Yetton), Risk analysis and mitigation Divergent vs convergent thinking, Brainstorming, lateral thinking techniques (Six Thinking Hats), TRIZ methodology basics **Engineering Applications and Case Studies:** Applying problem-solving techniques in E&TC projects, Case studies from electronics, communication, and IoT systems, Troubleshooting methods and tools Engineering ethics in problem solving, Review and integration of course content	**10 Hrs.**

Text Books:	
1	"Thinking Mathematically" by John Mason, Leone Burton, and Kaye Stacey
2	"The Art and Craft of Problem Solving" by Paul Zeitz

Reference Books:	
1	Thinking, Fast and Slow by Daniel Kahneman
2	The 7 Habits of Highly Effective People by Stephen R. Covey
3	TRIZ for Engineers by Karen Gadd
4	"Critical Thinking: A Concise Guide" by Tracy Bowell and Gary Kemp

23UGPCCET601LP- ELECTROMAGNETIC WAVES & ANTENNA THEORY LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
OE : 25 Marks

Course Objectives: The course aims to make the student :	
1	The basic mathematical concepts of Vector calculus & co-ordinate systems and different laws in steady electric & magnetic fields.
2	Apply Maxwell's equations in different forms to develop wave equations and concepts of electromagnetic waves and transmission lines.
3	Define different terminologies of antenna & classify and explain measurement schemes of antenna parameters.
4	Design and simulate different types of antenna.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy Level**
CO1	Understand antenna parameters in order to differentiate the applicability of each type of antenna.	Understand
CO2	Analyze the different types of antenna arrays and make use of them in wide areas of wireless communication.	Analyze
CO3	Implement special types of antenna like Log-Periodic antenna and reflectors.	Analyze
CO4	Simulation and study various antennas using MATLAB and HFSS Software.	Apply

Description:

This course discusses the different terminologies, parameters of antenna which has applications in different telecommunication systems. Students should have clear understanding of basics of antenna, design and implement various antennas.

Prerequisites:	1	Basic laws of physics
	2	Communication engineering

List of Experiments			
Minimum 08 experiments to be perform from the below list:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Measurement of Current and Voltage distribution on the dipole antenna	2	Knowledge
2	To study and plot the radiation pattern of the simple dipole (λ/2, 3λ/2) antennas	2	Knowledge, Application
3	To study and plot the radiation pattern of the Yagi-Uda (simple 5 and 7 elements) antenna.	2	Knowledge, Application
4	To study and plot the radiation pattern of the Yagi-Uda (folded 3 and 5 elements) antenna.		Knowledge, Application
5	To study and plot the radiation pattern of the helical antenna.	2	Knowledge, Application
6	To study and plot the radiation pattern of the Log-Periodic antenna	2	Knowledge, Application
7	To study and plot the radiation pattern of phase array (λ/2, λ/4) antenna	2	Knowledge, Application
8	To study combined collinear array and broadside array antenna	2	Knowledge, Analysis
9	Write a program to find radiation pattern of Broadside array antenna using MATLAB	2	Knowledge, Analysis
10	Write a program to find radiation pattern of End fire array antenna using MATLAB	2	Knowledge, Analysis
11	Simulation of monopole antenna using HFSS software.	2	Knowledge, Analysis

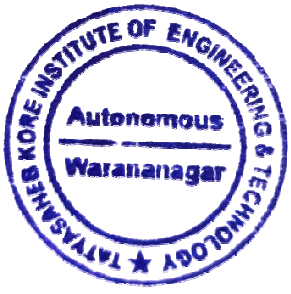
23UGPCCET602LP - POWER ELECTRONICS LAB

Practical	**:** 2Hrs/Week	**Evaluation Scheme**	
Credit	**:** 1	**ISA**	**:**25 Marks
		POE	**:** 50 Marks

Course Objectives: The course aims to:	
1	Introduction to fundamental concepts of Power Electronics Systems.
2	Different performance characteristics of power devices like diode, MOSFET, IGBT, SCRs, TRIAC, DIAC and GTO.
3	Operation of different configurations of rectifier and inverter.
4	Basics and different controlling techniques of chopper and cycloconverter.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	To discuss characteristics, ratings and driver circuits of the power devices.	Understanding & Applying
CO2	To discuss different firing and commutation methods of SCR.	Analyzing
CO3	To analyze the operation of power electronics rectifier and inverter.	Evaluating
CO4	To analyze the operation of chopper and cycloconverter.	Evaluating

Description:		
This course provides basics of power electronics devices with switching on/off technologies. It also deals with power converters such as AC to DC, DC to DC and DC to AC with their analysis and performance parameters. Gate driver circuits are also discussed		
Prerequisites:	1	Basic knowledge of DC-AC circuits, semiconductor devices theory, linear algebra.



List of Experiments			
Minimum 08 experiments to be perform from the below list:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment as per Bloom's**
1	Study of Ramp Pedestal Firing Circuit for SCR.	2	Knowledge
2	Study of AC Phase Control.	2	Knowledge
3	Study of AC Voltage Regulator using Antiparallel Thyristor.	2	Knowledge
4	Study of Light Dimmer (Using TRIAC & DIAC).	2	Knowledge
5	Study of SCR Commutation Methods.	2	Knowledge
6	Study of Half Wave Controlled Rectifier.	2	Knowledge
7	Study of Midpoint Controlled Rectifier.	2	Knowledge
8	Study of Fully Controlled Bridge Rectifier.	2	Knowledge
9	Study of Single-Phase Bridge Inverter.	2	Knowledge
10	Study of Step up & down Chopper.	2	Knowledge
11	Study of Jones Chopper.	2	Knowledge
12	Study of Single-Phase Preventer.	2	Knowledge
13	Study of Single phase to Single phase Cycloconverter	2	Knowledge
14	Simulation of Three Phase Controlled Rectifier, Inverter Circuit using MATLAB.	2	Knowledge

23UGPCCET603LP - EMBEDDED SYSTEM LAB

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks
OE : 25 Marks

Course Objectives:	
The objective of the course is :	
1	To learn and understand the characteristics of Embedded systems and its Architectures.
2	To develop skill of ARM programming.
3	To develop skill of programming on chip resources of LPC214X.
4	To understand the concept of real time operating systems.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy Level**
CO1	Determine and apply important attributes of Embedded system.	Apply
CO2	Make use of Model small applications of UART, I2C, SPI.	Apply
CO3	Develop small applications of GPIO, Timers, PWM, Real time clock, Watchdog using embedded C.	Create
CO4	Analyze Embedded system applications using RTOS.	Analyze,

Description:		
Course deals with understanding architecture of ARM, interfacing of different peripherals like buzzer, relay, stepper motor, DC motor using assembly and embedded C programming.		
Prerequisites:	1	Microprocessor and Microcontroller
	2	Assembly programming
	3	Embedded C programming

List of Experiments			
Minimum 08 experiments to be perform from the below list:			
Sr. No.	**Name of the experiment**	**Hrs.**	**Cognitive levels of attainment As per Bloom's**
1	Study on ARM architecture	2	Knowledge
2	Practical implementation of arithmetic operations using assembly language..	2	Knowledge
3	Practical implementation of data shift left side and right side using assembly language.	2	Knowledge, Application
4	Practical implementation of running Led using assembly language..	2	Knowledge, Analysis
5	Practical implementation of one's complement using assembly language	2	Knowledge
6	Practical implementation of factorial of given number using assembly language.	2	Analysis
7	Practical implementation of running Led using Embedded C	2	Analysis
8	Practical implementation of Buzzer interfacing	2	Knowledge, Evaluation
9	Practical implementation of relay interfacing	2	Knowledge, Analysis
10	Practical implementation of stepper motor interfacing	2	Knowledge, Application
11	Practical implementation DC motor interfacing	2	Knowledge, Application
12	Practical implementation of serial data transmission.	2	Knowledge
13	Practical implementation of serial data Reception	2	Knowledge, Application

23UGPECET6041T- IMAGE PROCESSING

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	To describe basic concepts of digital image processing.
2	To describe and implement various methods for image enhancement and recognition.
3	To explain concept of image segmentation and compression.
4	To acquaint with MATLAB image processing toolbox to implement image processing techniques.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain the fundamental concepts in digital image processing.	Understanding
CO2	Apply gray level transformations, spatial filters and histogram processing for image enhancement.	Application
CO3	Select morphological operators for extracting image features.	Application
CO4	Examine image segmentation and compression used in digital image processing.	Analyze

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET6042T- ROBOTICS

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Introduce fundamental principles of robotics including kinematics, dynamics, and intelligent systems.
2	Explore machine learning and AI applications for autonomous robotic behavior.
3	Enable students to design algorithms for robot navigation, perception, and decision-making.
4	Address ethical considerations, societal impact, and sustainable practices in robotics.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Describe the architecture, components, and classifications of intelligent robotic systems.	Remember, Understand
CO2	Apply kinematics and path planning concepts for motion and navigation.	Analyze
CO3	Analyze machine learning models and computer vision techniques in robotics applications.	Apply, Evaluate
CO4	Evaluate robotics solutions with respect to societal, ethical, and environmental factors.	Evaluate

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET6043T- REAL TIME OPERATING SYSTEM

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Understand fundamental concepts and performance measures of real-time operating systems (RTOS).
2	Study the software engineering process and design methodologies for real-time systems.
3	Explore features and working principles of commercial RTOS and real-time databases.
4	Design and implement embedded systems using RTOS concepts and tools.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the concepts of real-time system and modeling.	Understand
CO2	Design architecture, present mathematical model of system.	Apply
CO3	Recognize the characteristics of real time system.	Remember
CO4	Analyze task scheduling, resources management, real time operating system and fault tolerance application of real time system.	Evaluate

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET6051T- RADAR & OPTICAL COMMUNICATION

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	Understand the core concepts of radar and optical communication systems and their evolution.
2	Explore modern radar and optical technologies including MIMO radar, SDR, LiFi, FSO, and photonics.
3	Analyze and interpret radar/optical system performance using signal processing and simulation tools.
4	Evaluate the role of radar and optical systems in emerging domains such as IoT, 6G, and autonomous vehicles.

Course Outcomes:		
COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Understand the fundamental principles and modern role of radar and optical systems.	Remember, Understand
CO2	Analyze the architecture and signal behavior in radar and optical communication systems.	Analyze
CO3	Apply simulation and signal processing techniques for radar and optical systems.	Apply, Evaluate
CO4	Evaluate use-cases of radar/optical systems in automotive, aerospace, and IoT sectors.	Evaluate

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET6052T- COMPUTER VISION

Tutorial : 1Hrs/Week **Evaluation Scheme**
Credit : 1 **ISA : 25Marks**

Course Objectives: The course aims to :	
1	To introduce the fundamentals of computer vision and image processing.
2	To enable students to understand feature extraction and object recognition techniques.
3	To impart knowledge on 3D vision and motion estimation.
4	To provide practical insight into real-world vision applications using modern tools.

Course Outcomes:		
COs	**At the end of the successful completion of the course, the student will be able to**	**Blooms Taxonomy**
CO1	**Understand** the fundamentals of computer vision, image formation, camera models, and utilize Open CV/Python tools for basic image processing tasks.	Understanding
CO2	**Apply** image preprocessing techniques such as filtering, edge detection, and morphological operations to enhance and extract image features.	Application
CO3	**Analyze** and **implement** feature detection, object recognition, and classification using classical and deep learning-based methods.	Analyze
CO4	**Evaluate** motion tracking and 3D vision techniques including optical flow, structure from motion, and stereo vision for real-world applications.	Evaluate

Minimum 6 tutorials to be conducted based on syllabus.

23UGPECET6053T- INFORMATION THOEY & CODING TECHNIQUES

Tutorial : 1 Hrs/Week
Credit : 1

Evaluation Scheme
ISA : 25 Marks

Course Objectives: The course aims to :	
1	To understand information theory, estimate information content of a random variable from its probability distribution.
2	To understand the types of communication channels, their capacities and construct efficient codes for data on imperfect communication channels.
3	To understand the need & objective of error control coding with encoding & decoding procedure.
4	To understand, analyze error detecting & correcting capability of different codes.

Course Outcomes:

COs	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Explain basic concepts of information theory and entropy coding.	Explain
CO2	Mathematically analyze communication channel models & Channel capacity.	Analyze
CO3	Analyze the error detecting and correcting capability of different coding schemes.	Analyze
CO4	Design encoder and decoder for various coding techniques as per the need and Specifications.	Design

Minimum 6 tutorials to be conducted based on syllabus.

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