B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

CURRICULUM FOR

CHOICE BASED CREDIT SYSTEM

Regulations 2022

(Admitted in the Academic Year: 2023-2024)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

MAHENDRA ENGINEERING COLLEGE

(AUTONOMOUS)

MALLASAMUDRAM WEST, TAMIL NADU 637503

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Department of Electronics and Communication Engineering
Curriculum – R-2022

SEMESTER-V

Course Code	Course Name	Contact Periods	Hours/Week				Category
			L	T	P	C	
	Theory						
22EC14501	Embedded Systems	3	3	0	0	3	PC
22EC14502	Digital Signal Processing	4	3	1	0	4	PC
22EC14503	Transmission Lines and waveguides	4	3	0	0	3	PC
22CS15509	Advanced Java Programming	3	3	0	0	3	PE
	Open Elective -5	3	3	0	0	3	OE
22MC60001	Constitution of India	3	3	0	0	-	MC
	Practical						
22EC24501	Embedded Systems Laboratory	4	0	0	4	2	PC
22EC24502	Digital Signal Processing Laboratory	3	0	0	3	1.5	PC
22EN60002(R)	Interview Skills and Soft Skills	3	0	1	2	2	EEC
					Total	21.5	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)				
Syllabus				
Department	**Electronics and Communication Engineering**			
Semester V				
Course code	**Course Name**	**Hours/week**		
22EC14501	**EMBEDDED SYSTEMS**	**L**	**T**	**P**
		3	0	0
Objective(s)	• To understand the basic concepts of embedded systems • To learn the basic of embedded networking • To Learn the architecture and programming of PIC microcontroller • To familiarize the basic concepts of real time Operating system • To learn the application of real time embedded systems			
UNIT-I	**ARCHITECTURE OF EMBEDDED SYSTEMS**			
Categories of Embedded Systems-Specifications of Embedded systems -Recent trends in Embedded Systems - Hardware Architecture-Software Architecture-Communication software-Process of generation of executable image - development/testing tools				
UNIT-II	**EMBEDDED NETWORKING**			
Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.				
UNIT-III	**PIC MICROCONTROLLER**			
Introduction- PIC microcontroller- Architecture of PIC 16c6x/7x- FSR- Reset action Oscillatory connection- Memory organization- Instructions- Addressing modes I/O ports- Interrupts-Timers-ADC- Assembly language programming.				
UNIT-IV	**REAL-TIME OPERATING SYSTEM CONCEPTS**			
Architecture of the Kernel-task and task scheduler-Interrupt Service Routines Semaphores-Mutex-Mailboxes-Message Queues-Event Registers-Pipes-Signals Timers-Memory Management – Priority				

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Inversion Problem- Use of μC/OS-II	
UNIT-V	**EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT**
RFID Systems - GPS Navigation System - Automotive Application - Smart card System Application - ATM machine – Digital camera	
Total hours	**45** periods
Outcome(s):	• Outline the concepts of embedded systems • Explain the various bus architectures used in embedded systems • Describe the architecture and programming of PIC microcontroller • Apply the concepts of real time Operating systems in real time applications • Describe the real-time applications of embedded systems

TEXT BOOK :

1.Dr. K.V.K.K . Prasad, "Embedded/ Real time Systems : Concepts, Design and Programming" Dreamtech Press - 2015

2.Ajay V Deshmukh "Microcontroller Theory and Applications" TMH 2005

3.David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison Wesley Professional, 2007

REFERENCES:

1.Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rd Edition Cengage Learning, 2012

2.Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- from Design to Networking with C/C++", Prentice Hall, 1999

3.Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011

4.Raj Kamal, "Embedded Systems Architecture Programming and Design" 2nd Edition TMH,2008 Peatman, " Designing with PIC Micro Controller", Pearson 2003

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus			
Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**
V Semester			

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC14502	**DIGITAL SIGNAL PROCESSING**	3	1	0	4	**100**

Objective(s)	• Analyze the digital System using DFT and FFT • To study the frequency response and design techniques for IIR filters • To study the frequency response and design techniques for FIR filters • To Analyze the finite word length effects in signal processing • To Understand the fundamentals of digital signal processors

UNIT-I	**DISCRETE FOURIER TRANSFORM**	**9+3**

Introduction to DFT and properties of DFT, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods

UNIT-II	**IIR DIGITAL FILTERS**	**9+3**

Design stages of digital Butterworth and Chebyshev IIR filters, coefficient calculation methods for IIR filters -impulse invariant- Bilinear transform - pre warping – Direct, cascade and parallel realization structures for IIR filters.

UNIT-III	**FIR DIGITAL FILTERS**	**9+3**

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters using Rectangular Hamming and Hanning Windows – Frequency sampling method –Realization of FIR filters – Transversal, Linear phase and Polyphase structures.

UNIT-IV	**FINITE WORD LENGTH EFFECTS AND APPLICATIONS OF SPEECH SIGNAL PROCESSING**	**9+3**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Quantization noise –Truncation, Rounding- Rounding errors –Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.		
UNIT-V	**FUNDAMENTALS OF DIGITAL SIGNAL PROCESSORS**	**9+3**
Features of DSP processors –Fixed point Vs floating point DSP processor – Memory architecture of a DSP processor-Von Neumann – Harvard-VLIW –Multiply Accumulate Unit – pipelining – TMS320c5x family of DSPs –Addressing modes-Instruction Set-Assembly language Programs.		
	Total	**45+12=60**
Outcome(9)	• Analyze the digital System using DFT and FFT • Design the frequency response of IIR filters • Design the frequency response of FIR filters • Apply the signal processing concepts in speech signals. • Compare the performance of Digital Signal Processors	

TEXT BOOK :	
1	John G Proakis and Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Educations, 4th Edition, 2007
2	A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson Educations, 2004.
REFERENCES:	
1	E.C. Ifeachor and B.W. Jervis, "Digital signal processing – A practical approach", 2nd edition, Pearson Educations, 2002
2	S.K. Mitra, "Digital Signal Processing, A Computer Based Approach", Tata Mc GrawHill, 1998
4	Johny R. Johnson, "Introduction to Digital Signal Processing", PHI, 2006

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
V Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC14503	**TRANSMISSION LINES AND WAVEGUIDES**	3	0	0	3	**100**
Objective(s)	• To analyze the various types of filters • To calculate the various parameters of the transmission line • To understand signal propagation at Radio frequencies • To learn rectangular cross sectioned metallic guided structures, different modes of wave propagation, attenuation and obtain impedance • To solve wave equation in cylindrical coordinate system, and understand the various modes of wave propagation in cylindrical waveguide					
UNIT-I	**FILTERS**					**9**
The neper and decibel: Filter fundamentals - Design of filters: Constant K – low pass, high pass, band pass, m-derived - low pass, high pass and composite filter design, Attenuators –T section and Pi section filters.						
UNIT-II	**TRANSMISSION LINE THEORY**					**9**
Different types of transmission lines-Transmission line equation – Primary and secondary constants - Infinite line attenuation and phase constants- skin effect- wavelength- velocity of propagation- group velocity. Waveform distortion- distortion less transmission line telephone cable- inductance loading of telephone cables. Open and short circuit lines.						
UNIT-III	**LINE AT RADIO FREQUENCIES**					**9**
Standing waves and standing wave ratio on a line –Input impedance of a lossless line terminated by impedance– One eighth wave line – The quarter wave line and impedance matching – the half wave line. The Smith Chart – Application of the Smith Chart– Single stub matching.						

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT-IV	RECTANGULAR WAVEGUIDES	9
Rectangular wave guides: TE waves and TM waves– Dominant mode – cutoff frequency in wave guides – Impossibility of TEM waves in waveguides. Attenuation of TE and TM modes in rectangular waveguides - Wave impedances.		
UNIT-V	**CIRCULAR WAVEGUIDES AND RESONATORS**	**9**
Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides –wave impedances– Dominant mode in circular waveguide – Rectangular cavity resonators, Circular cavity resonator. Q factor of a cavity resonator for TE101 mode.		
	Total hours	**45**

Outcome	• Analyze the fundamental concepts of filters to solve problems in transmission lines effectively · • Compare the characteristics of transmission line parameters and circuits. • Analyze the line parameters of a transmission line at radio frequencies using the Smith chart · • Apply the vector calculus to understand the behavior of TE and TM waves in rectangular waveguides · • Describe the fundamentals of circular waveguides and resonators

TEXT BOOK :

1	Umesh Sinha, “Transmission lines and Networks”, Sathya Prakasham Publishers, 2005
2	M.E. Van Valkenburg, “Network Analysis”, 3rd edition., PHI, 2008.
3	John. D. Ryder, “Network lines and fields”, 2nd edition, PHI Learning, 2010.

REFERENCES:

1	Frankline F.Kuo, “Network Analysis and Synthesis”, Wiley Eastern 1996

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Computer Science and Engineering**	**Programme Code**			**1031**	
Program Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22CS15509	**ADVANCED JAVA PROGRAMMING**	3	0	0	3	**100**
Objective(s)	The student should be made : • To Understand the concepts of interfaces, threads, and swings using Java • To Learn how to establish network connectivity and write socket programming in Java • To Familiarize client side programming in Java • To Expose to develop server side programming in Java • To Learn how to handle java server pages in implicit objects					
Outcome(s)	Upon completion of this course, the Learners will be able to : • Explain the main concepts of interfaces, threads and swings in Java • Construct network connectivity using sockets and share data across networks • Develop client side programs in Java • Develop server side programs in Java • Design and Development of web application having collaboration of Servlets and JSPs.					
UNIT-I	**INTRODUCTION**					**9**
Java I/O streaming – filter and pipe streams – Byte Code interpretation - interfaces - Threading – Swing.						
UNIT-II	**ADVANCE NETWORKING**					**9**
Networking Basics, Introduction of Socket, Types of Socket, Socket API, TCP-IP: Client/Server Sockets, URL, UDP: Datagrams, va.net package classes: Socket, ServerSocket, InetAddress, URL, URLConnection, RMI Architecture, Client Server Application using RMI.						
UNIT-III	**CLIENT SIDE PROGRAMMING**					**9**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Client- Server computing – Sockets – Content and Protocols handlers –Developing distributed applications –RMI – Remote objects – Object serialization		
UNIT-IV	**SERVER SIDE PROGRAMMING**	**9**
Introduction to Java Servlets – Overview and Architecture – Handling HTTP get &post request – Session Tracking – Multi-tier application - Implicit objects –Scripting – Standard actions – Directives – Custom Tag libraries		
UNIT-V	**JAVA SERVER PAGES**	**9**
Introduction to JSP , Comparison with Servlet, JSP Architecture,JSP: Life Cycle, Scripting Elements, Directives, Action Tags, ImplicitObjects, Expression Language(EL), JSP Standard Tag Libraries(JSTL),Custom Tag, Session Management,Exception Handling, RUDApplication.		
	Total hours	**45**

TEXT BOOK :

1	Herbert Schildt, "Java The Complete Reference", McGraw-Hill Publications,2017 (Unit I to Unit V)
2	Hortsmann& Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2017..

REFERENCES:

1	Kogent solution Inc, "Java 6 Programming Black Book", Dreamtech press ,2007
2	Deital and Deital, Goldberg, "Internet &World Wide Web, How To Program". Fourth Edition, Prentice Hall, 2009
3	Deitel M. and Deitel P.J., "Java how to program", Prentice Hall, Eighth Edition, 2009.
4	Cay.S.Horstmann, Gary Cornell, " Core Java Volume –II Advanced Features",Prentice Hall, Eighth Edition, 2008.
5	Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 2003.
6	Duane A.Bailey, "Java Structures", McGraw-Hill Publications, 2007.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt.
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus			**Regulations 2024**
Department	**MATHEMATICS Open Elective -5**	**Open Elective for All B.E./B.Tech. Programmes**	

V Semester

Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum Marks**
		L	**T**	**P**	**C**	
22MA12501	**Interpretation, Analysis and Critical Thinking Skills**	2	1	0	3	**100**

Objectives	The students should be made do : • To develop the students logical thinking skills and apply it in the real life scenarios. • To learn the strategies of solving Quantitative ability problems. • To enrich the verbal ability of the students. • To strengthen the basic programming skills of placements. • Develop the skill of computation with sequences and series.
Outcomes	At the end of the course the students will be able to: • Identify the techniques to solve Image interpretation and Relationship. • Use Techniques to solve Logical Reasoning questions. • Interpret data, manipulate and summarize the information in order to answer Critical questions. • Identify the core skills associated with Critical Thinking. • Apply the basic concepts to solve problems on Surds, Pipes, Cisterns, Permutation and Combination.

UNIT-I	**VERBAL ABILITY**	**9**

Attention to details – Verbal Reasoning test – Types of image interpretation – Relationship – Classification - Solved Problems.

UNIT-II	**LOGICAL REASONING**	**9**

Sentence Completion and Para Jumbles – Logical connectives - Types of Logical Relationship – Types of Syllogism – Logical Deductions using Venn diagram.

UNIT-III	**DATA INTERPRETATION AND DATA SUFFICIENCY**	**9**

Ages – Problems on Ages – Concepts and basics – Set Theory– Set Operation – types of sets – solved problems – Calendars – Odd days – Leap year – counting of odd days, finding exact date – Data interpretation – Tabulation – Bar graphs – Pie charts – Line graphs – Data sufficiency based on problems.

UNIT-IV	**CRITICAL REASONING**	**9**

Surface area – Cuboids – Cube – Cylinder – Cone – Sphere – Hemisphere – Alligation – Mean Price – Rule of Alligation - Boats and Streams - Speed in Down Stream and upstream - Stream in still water - Rate of Stream - Critical Reasoning – Solved Problems.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT -V	ARITHMETICAL ABILITY	9
Indices and Surds – Law's of Indices - Law's of Surds - Pipes and Cisterns – Problems based on Inlet and Out-let, Part of tank filled, Time based problems - Permutation and Combination – Factorial – Number of Permutation – Number of Combination – Solved Problems.		
	TOTAL	**45 Hours**

TEXTBOOK :	
1.	"Quantitative Aptitude" – R.S.Aggarwal, S.Chand and Company Ltd, New Delhi, 2022.
2.	A Modern Approach to Verbal and Non-Verbal Reasoning by R.S.Aggarwal, S.Chand and Company Ltd, New Delhi, 2012 .

REFERENCES:	
1.	Test of Reasoning for Competitive Examinations, by Edgar Thorpe, Tata McGraw Hill Publication, 2010.
2.	Quantitative Aptitude for Competitive Examinations by Abhijit Guha, Tata McGraw Hill Publication 2010.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
V Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22MC60001	**CONSTITUTION OF INDIA**	3	0	0	-	**100**
Objectives	• To know about Indian constitution. • To know about central and state government functionalities in India. • To know about Indian society.					
UNIT-I	**INTRODUCTION**					**9**
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.						
UNIT-II	**STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT**					**9**
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.						
UNIT-III	**STRUCTURE AND FUNCTION OF STATE GOVERNMENT**					**9**
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.						
UNIT-IV	**CONSTITUTION FUNCTIONS**					**9**
Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.						
UNIT-V	**INDIAN SOCIETY**					**9**
Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of						

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.	
Total	**45**
Outcomes	• Summarize the features of the Indian Constitution and observe the fundamental duties, rights and responsibilities. • Explain the functioning of Indian parliamentary system at the Center and the responsibilities of important functionaries. • Describe the functioning of State Government and important functionaries. • Recognize Amendments in Indian Constitution and Judicial review. • Illustrate the composition and features of Indian societ

TEXT BOOKS:	
1	Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi
2	R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3	Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4	K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.
REFERENCES:	
1	Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2	U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar
3	R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus			
Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**
Semester-V			

Course Code	Course Name	Hours/Week			Credit	Maximum marks
		L	T	P	C	
22EC24501	**EMBEDDED SYSTEMS LABORATORY**	**0**	**0**	**3**	**2**	**100**

Objective(s)

- Learn the working of PIC microcontroller
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Know the characteristics of Real Time Systems
- Write the programs to interface memory, I/Os with processor and study the performance of interrupt

LIST OF EXPERIMENTS

Embedded System Design using PIC Microcontroller

1	Study of PIC evaluation board
2	Flashing of LEDs with PIC
3	Interfacing LCD
4	Interfacing keyboard
5	Interfacing sensors
6	Read and Write to internal EEPROM
7	Interfacing real time clock using I^2C serial communication protocol
8	Generation of Pulse Width Modulation (PWM) using CCP module

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

9	Interfacing stepper motor
10	Interfacing GSM module through RS232
11	Interfacing Zigbee Transceivers
Embedded System Design using ARM Processors	
12	Study of ARM evaluation board
13	Interfacing LCD
14	Mini Project
Total hours	**45 Periods**
Outcome	• Develop programs in PIC for a specific applications • Analyze and Interface A/D and D/A convertors with PIC system • Analyze the performance of programmes for interfacing keyboard, display, motor and sensor.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus			
Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**
Semester-V			

Course Code	Course Name	Hours/Week			Credit	Maximum Marks
		L	T	P	C	
22EC24502	**Digital Signal Processing Laboratory**	**0**	**0**	**2**	**1**	**100**

Objective(s)	• To generate Various Signals using MATLAB Program • To study the Various Addressing Modes of DSP and • To Design and implement FIR ,IIR filters and Adaptive Filter

LIST OF EXPERIMENTS

	USING MATLAB
1	Sampling and Reconstruction
2	Linear and Circular Convolution, Correlation of two sequences
3	Calculation of FFT of a signal
4	Design of FIR filters
5	Design of IIR filters
6	Computation of Quantization error
	USING TMS320C5X/TMS320C 67XX/ADSP 218X
7	Study of various addressing modes of DSP using simple programming examples
8	Implementation of Linear and Circular Convolution
9	Waveform generation
10	Implementation of FIR filter
11	Implementation of IIR filter

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

12	Implementation of Adaptive filter	
	Total	**45**
Outcome(s)	• Implement Sampling, Linear and Circular Convolution. • Implement FFT, Filters and quantization error • Demonstrate the Liner & circular convolution, waveform generation and Filters using digital signal processors.	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt.
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
V Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EN60002	**Interview Skills and Soft Skills**	0	1	4	3	**100**
Objective(s)	• To improve the learners reading fluency skills through extensive reading • To encourage the students to enrich their writing skills for academic and professional purposes • To help the learners obtain speaking skills in both formal and informal situation. • To equip them with presentation skills needed for academic as well as workplace contexts. • To make them acquire interview skills to face challenges in the career aspects					
UNIT-I						**9**
Reading Comprehension - Reading Passages with Multiple Choice Questions - Reading for Gist, Sentence Correction, Paragraph Writing – Narrative, Descriptive, Expository, Persuasive, Content Writing						
UNIT-II						**9**
Job Application – Cover Letter and Resume, Etiquette – E-mail and Telephone, Listening Comprehension, Listening Dialogues – Workshop						
UNIT-III						**9**
Self Introduction and Introducing others, Greeting, Apologies, Request – Formal and Informal, Group Discussion – Useful Phrases, Do's and Don'ts, Mock Group Discussion, Role Play, Situational based dialogues						
UNIT-IV						**9**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Presentation Skills – PPT Preparation, Importance of Verbal and Non-verbal Communication, Extempore, Public Speaking, Stage Presentation – Mock Presentation		
UNIT-V		**9**
Interview skills – Face to Face interview, Telephonic Interview, Mock Interview – Frequently Asked Interview Questions		
	Total hours	**45**
Outcomes	• Analysis the content and apply knowledge and skills efficiently wherever necessary. • Create profile and other essential documents. • Demonstrate soft skills effectively at the time of interview and workplace	

TEXT BOOK :	
1	Raman, Meenakshi & Sangeeta Sharma, Technical Communication: Principles and Practice, Ed.III, Oxford University Press, New Delhi. 2015
REFERENCES:	
1	Anderson, Paul V., Technical Communication: A Reader-Centered Approach. Cengage, New Delhi. 2008.
2	Muralikrishna, & Sunita Mishra, Communication Skills for Engineers, Pearson, New Delhi.2011.
3	Sharma, Sangeetha & Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning, New Delhi. 2009
4	Smith-Worthington, Darlene & Sue Jefferson, Technical Writing for Success, Cengage, Mason, USA, 2007

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

SEMESTER- VI
(R 2022)

Course Code	Course Name	Contact Periods	Hours/Week				Category
			L	T	P	C	
	Theory						
22MBAT6S06	Management Skills and Quality Management	3	3	0	0	3	HS
22EC14601	Digital Communication	3	3	0	0	3	PC
22EC14602	Antenna and Wave Propagation	4	3	0	0	3	PC
22EC14603	VLSI Design	3	3	0	0	3	PC
22EC34604	Introduction to Artificial Intelligence (Integrated Course)	3	2	0	2	3	PC
22EE13601	Control Systems	3	3	0	0	3	ES
.	**Practical**						
22EC24601	Digital Communication Laboratory	3	0	0	3	1.5	PC
22EC24602	VLSI Design Laboratory	3	0	0	3	1.5	PC
22EC46601	Internship	4	0	0	4	2	EEC
					Total	23	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	Management Studies			Programme Code		1041
Semester VI						
Course code	Course Name	Hours/week			Credit	Maximum marks
22MBAT6S06	Managerial Skills and Quality Management	L	T	P	C	100
		3	0	0	3	
Objective(s)	• To develop the necessary skills in learner to manage self and others in the group. • To understand the quality is linked to the present and future needs of the customer, the antidote to manage competition • To understand the need for quality of products to retain customers • To study the tools used to analysis and documentation • To learn the different quality standards like ISO					
UNIT-I	INTRODUCTION TO MANAGERIAL SKILLS					9
Self Awareness – Self Portrait – Self Assessment- Continuous Learning - learning styles- Multiple Intelligence – 360 degree evaluation – Techniques- Case Study						
UNIT-II	STRESS FACTORS TIME & CAREER PLATEAUING					9
Meaning – Symptoms – Works Related Stress – Individual Stress – Reducing Stress – Burnout- Environmental issues –Psychological fall outs – Learning to keep calm – Preventing interruptions- Case Study						
UNIT-III	INTRODUCTION TO QUALITY MANAGEMENT					9
Customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality- Case Study						
UNIT-IV	TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT					9
Quality functions development (QFD) – Benefits- QFD process. Failure mode effect analysis (FMEA) failure rate, FMEA stages, design, process and documentation. Seven old (statistical) tools. Seven new management tools. Bench marking- Case Study						
UNIT-V	QUALITY SYSTEMS ORGANIZING AND IMPLEMENTATION					9

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Introduction to ISO 9001:2015 – Quality management- Quality Audits. TQM culture, Leadership – quality council, employee involvement, motivation, empowerment, recognition and reward- Case Study.	
Total	**45**

Outcome(s)	• Equip with behavioral competencies, developing their managerial skills • Explain the importance of quality management • Explain the quality linked to the present and future needs of the customer • Familiarize with the tools used for quality function developments • Explain the needs and functions of standards to ensure quality of service

TEXT BOOK :	
1	David A.Whetten and Kim S.Cameron, Developing Management Skills, – PHI 2011.
2	James R Evans, Quality Management, Cengage Learning India private limited 2010.
REFERENCES:	
1	Mcgrath E.H., S.J., Basic Managerial Skills for all, 9th Edition, PHI 2012
2	Amitava Mitra, Fundamentals of Quality Control & Improvement, Wiley Publications, 2012.
3	Christine Avery & Diane Zabel, Quality Management Sourcebook, Routledge Publications, 2013.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Electronics and Communication Engineering	Programme Code	1041

Semester VI

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
22EC14601	Digital Communication	3	0	0	3	100

Objective(s)

- To know the principles of sampling & various waveform coding schemes
- To learn the various baseband transmission and reception schemes
- To understand the various passband signaling schemes
- To Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation
- To know the fundamentals of channel coding

UNIT-I	SAMPLING & WAVEFORM CODING	9

Sampling process – Low pass sampling – Aliasing- Signal Reconstruction –Quantization – Uniform & non-uniform quantization – quantization noise- Logarithmic Companding of speech signal -PCM- Noise considerations in PCM Systems- Prediction filtering and DPCM -Delta modulation – ADPCM & ADM principles-Linear Predictive Coding.

UNIT-II	BASEBAND TRANSMISSION OF DIGITAL SIGNALS	9

Discrete PAM signals - Power Spectra of Discrete PAM signals – Inter Symbol Interference - Nyquist's criterion for Distortion less Base band Binary Transmission - Correlative level coding - Duo binary and modified duo binary signalling – Eye patterns – Baseband M-ary PAM Systems – Adaptive Equalization for data transmission.

UNIT-III	PASSBAND TRANSMISSION OF DIGITAL SIGNALS	9

Digital Modulation Formats - Pass band Transmission model - Coherent Binary Modulation Techniques: Generation – Detection - Signal space diagram - Bit error probability - Power spectra and waveforms of BPSK, BFSK, QPSK and MSK schemes – Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Introduction to M-ary Modulation techniques - Synchronization: Carrier and symbol synchronization

UNIT-IV	SPREAD SPECTRUM COMMUNICATION	9

Head of the Department
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Spread spectrum technologies - spreading techniques - PN sequences - Direct sequence spread spectrum systems - Frequency hopping spread spectrum systems - Hybrid systems - Demodulation schemes - RAKE Receivers - Use of spread spectrum with code division multiple access.		
UNIT-V	**ERROR CONTROL CODING**	**9**
Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability Linear block codes: encoding and syndrome decoding. Cyclic codes: encoder and decoder for systematic cyclic codes. Convolution codes, code tree and Trellis diagram, Viterbi and sequential decoding, Burst error correction, Turbo codes.		
	Total hours	**45**
Outcome(s)	• Analyze Design and implement sampling and various waveform coding schemes • Design and implement base band transmission schemes • Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency • Analyze the performance of Spread spectrum systems • Design error control coding schemes	

TEXT BOOK :

1	S. Haykin, "Digital Communications", John Wiley, 2005

REFERENCES:

1	B. Sklar, "Digital Communication Fundamentals and Applications", 2nd Edition, Pearson Education, 2009
2	B.P.Lathi, "Modern Digital and Analog Communication Systems" 3rd Edition, Oxford University Press 2007.
3	H P Hsu, Schaum Outline Series - "Analog and Digital Communications", TMH 2006
4	J.G Proakis, "Digital Communication", 4th Edition, Tata Mc Graw Hill Company, 2001.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Semester VI						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC14602	**Antenna and Wave Propagation**	3	0	0	3	**100**
Objective(s)	• To study radiation from a current element and antenna fundamentals • To study antenna arrays • To study aperture antennas • To learn special antennas such as frequency independent and broadband antennas • To study wave propagation in different layers of atmospheres					
UNIT-I	**RADIATION PROPERTIES AND ANTENNA FUNDAMENTALS**					**9**
Concept of vector potential- Retarded vector potential-Solution of wave equation- Fields associated with Hertizian dipole- Antenna characteristics: Radiation pattern- Beam solid angle-Directivity- Gain-Input impedance- Polarization- Bandwidth- Reciprocity principle-Effective length and effective aperture- Relation between effective area, effective length and gain-Antenna temperature.						
UNIT-II	**WIRE ANTENNAS AND ANTENNA ARRAYS**					**9**
Wire antennas: Short dipole - Radiation resistance and Directivity-Half wave Dipole- Radiation resistance and Directivity –Marconi antenna- Small loop antennas. Antenna Arrays: Expression for electric field from two, three and N element arrays- Linear arrays: Broad-side array and End-Fire array-Uniform linear array-Method of Pattern Multiplication.						
UNIT-III	**APERTURE ANTENNAS**					**9**
Magnetic Current and its fields- Uniqueness theorem - Field equivalence principle - Duality principle-Method of Images- Pattern properties- Slot antenna- Horn Antenna- Reflector Antenna-Lens Antenna.						
UNIT-IV	**SPECIAL ANTENNAS AND ANTENNA MEASUREMENTS**					**9**
Special Antennas: Rhombic Antenna- Yagi-Uda Antenna-Helical Antenna-Axial mode helix-Normal mode helix - Log periodic Dipole Array - Microstrip Patch Antennas. Antenna Measurements: Radiation Pattern measurement, Gain and Directivity Measurements, Anechoic Chamber measurement.						
UNIT-V	**RADIO WAVE PROPAGATION**					**9**
Ground wave propagation: Attenuation characteristics for ground wave propagation- Calculation of						

Head of the Department
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

field strength at a distance - **Space wave propagation**: Reflection characteristics of earth- Duct propagation-**Sky wave propagation**: Structure of the ionosphere- Effective dielectric constant of ionized region- Mechanism of refraction- Refractive index- Critical frequency- Skip distance- Attenuation factor for ionospheric propagation- Maximum usable frequency- Fading and Diversity reception.	
Total	**45**
Outcome(s)	• Explain the concepts of radiation with antenna fundamentals through mathematical formulation • Interpret the performance characteristics of antenna arrays • Describe the different types of aperture antennas • Apply the idea about antennas for special applications with its measurement • Summarize the different propagation mechanisms namely ground, space and sky waves

TEXT BOOK :

1	E.C.Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education, second edition, 2015.
2	A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press, 2007.

REFERENCES:

1	John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications",Tata McGraw-Hill Book Company, 3rd edition, 2007.
2	G.S.N.Raju, Antenna Wave Propagation, Pearson Education, 2009.
3	Constantine A. Balanis, Antenna Theory Analysis and Desin, John Wiley, 2012.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	Electronics and Communication Engineering				Programme Code	1041
Semester-VII						
Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
22EC14703	VLSI DESIGN	3	0	0	3	100
Objective(s)	• To use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect • To apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects • To understand the characteristics of CMOS circuit construction and to create models of moderately sized CMOS circuits that realize specified digital functions • To introduce the concepts and techniques of modern integrated circuit design and testing • To learn the concepts of modeling a digital system using Verilog HDL					
UNIT-I	MOS TRANSISTOR THEORY					9
A brief History - MOS transistor theory, Threshold voltage equations, Body effect - MOS Devices equation - NMOS and PMOS transistors in Enhancement mode & Depletion mode, Determination of Pullup and Pulldown ratio for nMOS inverter - Latchup						
UNIT-II	CMOS TECHNOLOGY AND CIRCUITS					9
CMOS Transistor - MOS transistor switches - VI characteristics, DC transfer characteristics - CMOS Fabrication, CMOS Circuits - Inverter - NAND gate, NOR gate, compound gates, multiplexers, Stick Diagram, Design rules and Layout.						
UNIT-III	CIRCUIT CHARACTERISTICS AND LOGIC DESIGN					9

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Switching Characteristics - CMOS gate Transistor Sizing - Power Dissipation - Charge Sharing - Scaling of MOS circuits - CMOS Logic Structures - CMOS Complementary Logic- Pseudo nMOS Logic-Dynamic CMOS Logic-Clocked CMOS Logic - CMOS Domino Logic- Cascade Voltage Switch Logic		
UNIT-IV	**CMOS TESTING**	**9**
Need for testing - Logic Verification - Manufacturing Test Principles - Design for Testability - Boundary Scan Test - System Level Test Techniques- Layout Design for Improved Testability.		
UNIT-V	**VERILOG HDL**	**9**
Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level, switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop		
	Total hours	**45** periods
Outcome(s)	• Summarize the basic concepts of MOS technology which will form the foundation for fabrication of various monolithic components on an IC • Analyze the various steps involved in the CMOS fabrication process and construct the CMOS logic circuit, layout for gates using design rules • Examine the types of CMOS logic family and power dissipation in CMOS circuits • Outline the different levels of testing in CMOS circuits • Construct HDL code for basic and advanced digital integrated circuits	

TEXT BOOK :

1	N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2nd edition, 2002
2	D.A Pucknell & K.Eshraghian "Basic VLSI Design", Third edition, PHI, 2003
3	J.Bhasker, "Verilog HDL primer", BS publication, 2001

REFERENCES:

1	Weste and Harris, "CMOS VLSI design", 3rd edition, Pearson Education- 2005
2	Uyemura J.P, "Introduction to VLSI circuits and systems", Wiley 2002
3	Wayne Wolf, "Modern VLSI design", Pearson Education, 2003

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Semester VI						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC34604	**Introduction to Artificial Intelligence(Integrated Course)**	2	0	2	3	**100**
Objective(s)	• To study the fundamentals of Artificial intelligence and learn different search strategies • To understand various knowledge representation techniques • To learn AI concepts with statistical learning methods • Become familiar with basic principles of AI toward problem solving, knowledge representation, and learning. • To prepare students to become Familiarity with the Python programming in AI environment.					
UNIT-I	**Introduction and Problem Solving**					**9**
Foundations of Artificial Intelligence-Neuroscience, psychology, control theory. Emergence of Intelligent agent. Intelligent agent - Agents and Environments - Structure - Problem solving agents, uninformed search strategies - Breadth first search - Depth first search - Depth limited search - Bidirectional search - Searching with partial Information. Informed search and exploration, Adversarial search- Alpha - Beta pruning.						
UNIT-II	**Knowledge and Reasoning**					**9**
Knowledge based agent, Reasoning pattern in proportional logic, Agent based on proportional logic. First-order logic - Syntax and semantics, Inference in first order logic - Forward and backward chaining, knowledge representation- Ontological Engineering, action situation and events, Truth maintenance system.						
UNIT-III	**Learning**					**9**
Learning from observation - Inductive learning - Decision trees - Explanation based learning Statistical Learning methods - Reinforcement Learning.						
	List of Experiments					**18**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

	Write a program in prolog to solve 4 Queens problems Write a program Wumpus World problem Write a program to solve Traveling salesman problem Write a program to implement a Tic-Tac-Toe game. Write a program to implement Hill claiming Algorithms Write a Program to Implement Breadth First Search. Write a Program to Implement Depth First Search	
Total hours	45	
Outcome(s)	• Describe the basics of Artificial Intelligence agents and Use appropriate search algorithms for any AI problem • Analyze knowledge representation techniques and problem solving strategies to common AI applications • Interpret relevant AI concepts with statistical learning methods • Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning • Apply various AI search algorithms	

TEXT BOOK :	
1	S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, Pearson Education, 2003
2	S. Sumathi, Surekha Paneerselvam, Computational Intelligence Paradigms: Theory & Applications Using MATLAB, CRC Press, 2009
3	M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Publishing House, New Delhi ,2018.
REFERENCES:	
1	David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : A logical approach", Oxford University Press, 2004
2	G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002
3	J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 2003

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**			**Programme Code**		**1041**
Semester-VI						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC24601	**Digital Communication Laboratory**	**0**	**0**	**3**	**2**	**100**
Objective(s)	• To visualize the effects of sampling and TDM • To simulate and implement Digital Modulation schemes • To simulate Error control coding schemes					
LIST OF EXPERIMENTS						
1	Pulse Code Modulation and demodulation					
2	Digital Modulation & Demodulation – ASK, PSK, FSK					
3	Generation & detection of QPSK					
4	Time Division multiplexing					
5	Generation & detection of Delta Modulation					
6	Generation & detection of Adaptive Delta Modulation					
7	Line Coding					
SIMULATION USING MATLAB/SIMULINK						
8	Simulation of DPSK, QPSK and QAM generation schemes					
9	Simulation of Linear Block and Cyclic error control coding schemes					
10	Simulation of Spread Spectrum System using DSSS					
11	Simulation of Spread Spectrum System using FHSS					
12	Simulation of Convolutional coding scheme					
13	Mini project					

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Total	**45**

Outcome(s)	• Analyze and Design the Concept of different Digital Modulation techniques such as ASK,FSK,PSK and QPSK and its implementation using Trainer Kit and MATLAB • Design and Analyze the concept of PCM , DM , ADM and its implementation using Trainer Kit • Design and Analyze the concept of line coding and its implementation using Trainer Kits

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	Electronics and Communication Engineering			Programme Code		1041
Semester-VI						
Course Code	Course Name	Hours / Week			Credit	Maximum marks
		L	T	P	C	
22EC24603	VLSI DESIGN LABORATORY	0	0	3	2	100
Objective(s)	• To understand the architecture and design concepts underlying modern complex VLSIs and System on chips • To educate students with the knowledge of MOS transistor with their design • Design of combinational logic circuits and sequential logic circuits using HDLs					

LIST OF EXPERIMENTS	
1	Synthesis of Half Adder and Full Adder with two half adders using all the modeling description in Verilog HDL and Identification of critical paths and estimation of power consumption
2	Synthesis of Half Subractor and Full Subractor with two half subractor using all the modeling description in Verilog HDL and Identification of critical paths and estimation of power consumption
3	Design and Simulation ALU using Verilog HDL
4	Synthesis of 2 x 4 Decoder and 4 x 2 Encoder using all the modeling description in Verilog HDL with and without pipelining
5	Design and Simulation of 4x1 Multiplexer and 1x4 Demultiplexer using all the modeling description in Verilog HDL
6	Design and Simulation of Binary to Gray and Gray to Binary code converter using all the modeling description in Verilog HDL
7	Synthesis of D flip flop, T flip flop, JK flip flop, SR flip flop using Verilog HDL and Identification of critical paths and estimation of power consumption
8	Synthesis of Shift Registers using Verilog HDL
9	CMOS Circuit Design (DC and Transient Analysis) • CMOS Inverter • CMOS NAND and NOR Gates
	Total 45

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Outcome(s)	• Design entry & simulation of combinational circuit verification with test bench & functional • Design entry & simulation of sequential circuits with test bench and conduct functional verification tests • Design a schematic and simple layout for CMOS Inverter, parasitic extraction and simulation

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Department of Electronics and Communication Engineering

Curriculum – R-2022

SEMESTER-VII

Course Code	Course Name	Contact Periods	Hours/Week				Category
			L	T	P	C	
	Theory						
22EC14701	RF and Microwave Engineering	3	3	0	0	3	PC
22EC14702	Optical Fiber Communication	3	3	0	0	3	PC
	Professional Elective - 1	3	3	0	0	3	PE
	Professional Elective - 2	3	3	0	0	3	PE
	Professional Elective - 3	3	3	0	0	3	PE
	Professional Elective - 4	3	3	0	0	3	PE
	Practical						
22EC24701	Microwave and Optical Laboratory	3	0	0	3	1.5	PC
22EC36701	Project Work Phase- I	8	0	0	8	4	EEC
						Total	22	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Semester-VII						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
22EC14701	**RF & MICROWAVE ENGINEERING**	**L**	**T**	**P**	**C**	**100**
		3	0	0	3	
Objective(s)	• To understand the basics required for circuit representation of RF networks • To deal with the issues in the design of microwave amplifier • To deal with the microwave generation techniques • To deal with the microwave measurement methods • To learn the fabrication steps of MMICs					
UNIT-I	**TWO PORT NETWORK THEORY**					**9**
Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.						
UNIT-II	**RF AMPLIFIERS AND MATCHING NETWORKS**					**9**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, VSWR, Impedance matching using discrete components - Two component matching Networks.		
UNIT-III	**MICROWAVE GENERATION**	**9**
Review of conventional vacuum Triodes, High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator and Traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backward wave Crossed field amplifier and oscillator.		
UNIT-IV	**MICROWAVE MEASUREMENTS**	**9**
Measuring Instruments: Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Q-factor, Scattering coefficients and parameters, Attenuation.		
UNIT-V	**MMIC FABRICATION PRINCIPLES**	**9**
MMIC Fabrication Principles: Etching, Cleaning, Lithography, Device and circuit fabrication, Thermal Considerations - basics, transistor thermal design, heat sink design.		
	Total	**45**
Outcomes	• Explain the two port network parameters with its properties • Apply the concepts of multi- port RF networks and RF transistor amplifiers through mathematical formulation • Produce the microwave signals using microwave components • Utilize the microwave components and circuits with standard microwave bench for measurement • Follow the fabrication steps of MMICs	

TEXT BOOK :

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt.
Tamil Nadu 637 503

1	Reinhold Ludwig and Gene Bogdanov, “RF Circuit Design: Theory and Applications”, Pearson Education Inc., 2011.
2	Samuel Y. Liao, “Microwave Devices and Circuits ", 3rd Edition Prentice Hall, 2000.
3	Robert E Colin, “Foundations for Microwave Engineering”, John Wiley & Sons Inc, 2005.
REFERENCES:	
1	David M. Pozar, “Microwave Engineering”, Wiley India (P) Ltd, New Delhi, 2008.
2	Thomas H Lee, “Planar Microwave Engineering: A Practical Guide to Theory”, Measurements and Circuits”, Cambridge University Press, 2004.
3	Mathew M Radmanesh, “RF and Microwave Electronics”, Prentice Hall, 2000.
4	Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2005.
5	I. D. Robertson, S. Lucyszyn, “ RFIC and MMIC design Technology”, IEE Publications, 2001, ISBN: 0- 85296- 786 -1.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**

Semester-VII

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC14702	**Optical Fiber Communication**	3	0	0	3	**100**

Objective(s)	• To study about the various optical fiber modes, configuration and transmission characteristics of optical fibers • To learn about the various optical sources, detectors and transmission techniques • To explore various idea about optical fiber measurements and various coupling techniques • To enrich the knowledge about optical amplifiers and networks

UNIT-I	**INTRODUCTION TO OPTICAL FIBERS**	**9**

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure

UNIT-II	**SIGNAL DEGRADATION**	**9**

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Material Dispersion, Wave guide Dispersion, Polarization Mode dispersion, Intermodal dispersion, Design Optimization of SM fibers-RI profile and cut-off wavelength

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT-III	OPTICAL SOURCES AND DETECTORS	9
Sources: Direct and indirect Band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED, LASER Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects. **Detectors**: PIN photo detector-Avalanche photo diodes-Photo detector noise-noise sources-SNR-detector response time-Avalanche multiplication noise-temperature effects-comparisons of photo detectors		
UNIT-IV	**FIBER OPTIC RECEIVER , MEASUREMENTS AND COUPLING**	**9**
Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit. Fiber Attenuation measurements- Dispersion measurements –Fiber cut-off Wave length Measurements – Fiber Numerical Aperture Measurements. Source to Fiber Power Launching-Lensing Schemes for Coupling Management-Fiber to Fiber Joints-Fibers- Fiber Splicing-Optical Fiber connectors.		
UNIT-V	**OPTICAL AMPLIFIERS & NETWORKS**	**9**
WDM concepts, overview of WDM operation principles, Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. Optical Networks: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings -High speed light wave Links.		
	Total hours	**45**
Outcomes	• Realize basic elements in optical fibers, different modes and configurations • Analyze the transmission characteristics associated with dispersion and polarization techniques • Design optical sources and detectors with their use in optical communication system • Construct fiber optic receiver systems, measurements and coupling techniques • Describe optical amplifier and networks	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

TEXT BOOK :	
1	Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition, 2010.
2	John M. Senior , "Optical Fiber Communication", 2nd Edition, Pearson Education, 2007
REFERENCES:	
3	Rajiv Ramaswami, "Optical Networks", Second Edition, Elsevier, 2004.
4	Govind P. Agrawal, "Fiber-optic communication systems", 3rd edition, John Wiley & sons, 2004
5	J.Gower, "Optical Communication System", Prentice Hall of India, 2001

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus - Professional Elective - 1			
Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
22EC15001	DIGITAL IMAGE PROCESSING	3	0	0	3	100

Objective(s)	• To provide the student with the fundamentals of digital image processing • To analyze the digital image using different types of filters • To acquire the basic knowledge of image segmentation and image restoration • To understand digital image standards and image compression • To apply the computer algorithms to perform image processing on digital images

UNIT-I	IMAGE FUNDAMENTALS AND TRANSFORMS	9

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, Color image fundamentals,Color models, Image Transforms: Cosine, Hadamard, Haar,KL transform and their properties.

UNIT-II	IMAGE ENHANCEMENT	9

Histogram Equalization and specification techniques, Basics of spatial Filtering- Smoothing spatial filters and Sharpening spatial filters, Smoothing and sharpening Frequency Domain Filters-Homomorphic filtering.

UNIT-III	IMAGE RESTORATION AND IMAGE FUSION	9

Image degradation model, Noise models, Restoration-Spatial Filtering, Constrained Least square filtering, inverse filtering, Wiener Filtering.Overview of image fusion, pixel fusion,Multiresolution

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

based fusion- Region basedfusion.		
UNIT-IV	**IMAGE SEGMENTATION**	**9**
Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.		
UNIT-V	**IMAGE COMPRESSION**	**9**
Huffman coding, arithmetic coding, Lossless and Lossy predictive coding, JPEG - MPEG Standards.Introduction to M Function Programming using MATLAB-Reading, Displaying, Writing Images using MATLAB-Data Classes, Image Types using MATLAB.		
	Total hours	**45** periods
Outcome(s)	At the end of this Course the students' will be able to • Explore the basic concept of digital/color image and 2-D transforms in image processing • Apply image processing techniques in both the spatial and frequency (Fourier) domains • Analyze the constraint in image restoration and image fusion with various techniques • Design image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation • Compare the performance of various Image Compression techniques	

TEXT BOOK :	
1	Gonzalez.R.C& Woods. R.E., "Digital Image Processing", 3rd Edition, Pearson Education, Indian edition published by Dorling Kindersely India Pvt. Ltd. Copyright © 2009, Third impression 2011
REFERENCES:	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

1	Gonzalez.R.C& Woods. R.E., "Digital Image Processing using MATLAB", 2nd Edition, McGraw Hill Education (India) Pvt Ltd 2011 (Asia)
2	Madan, " An Introduction to MATLAB for Behavioural Researchers", Sage Publications, 2014

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus - Professional Elective - 2						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC13011	**FPGA AND ASIC DESIGN**	3	0	0	3	**100**
Objective(s)	• To give basic knowledge of ASIC internals • To impart knowledge on ASIC types and tools used in the design • To learn the architecture of different types of FPGA • To focus on the semi custom IC Design and introduces the principles of design logic cells, I/O cells and interconnect architecture					
UNIT-I	**OVERVIEW OF ASIC AND PLD**					**9**
Types of ASICs - Design flow – CAD tools used in ASIC Design – Programming Technologies: Antifuse – static RAM – EPROM and EEPROM technology, Programmable Logic Devices: ROMs and EPROMs – PLA –PAL. Gate Arrays – CPLDs and FPGAs						
UNIT-II	**ASIC PHYSICAL DESIGN**					**9**
System partition -partitioning - partitioning methods – interconnect delay models and measurement of delay - floor planning - placement – Routing: global routing - detailed routing - special routing - circuit extraction - DRC						
UNIT-III	**LOGIC SYNTHESIS, SIMULATION AND TESTING**					**9**
PLA tools -EDIF- CFI design representation. Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation						
UNIT-IV	**FIELD PROGRAMMABLE GATE ARRAYS**					**9**

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Field Programmable gate arrays- Logic blocks, routing architecture, Design flow technology - mapping for FPGAs, Xilinx XC4000 - ALTERA's FLEX 8000/10000, ACTEL's ACT-1,2,3 and their speed performance **Case studies**: Altera MAX 5000 and 7000 - Altera MAX 9000 – Spartan II and Virtex II FPGAs -Apex and Cyclone FPGAs		
UNIT-V	**SoC DESIGN**	**9**
Design Methodologies – Processes and Flows - Embedded software development for SOC – Techniques for SOC Testing – Configurable SOC – Hardware / Software co design Case studies: Digital camera, Bluetooth radio / modem, SDRAM and USB		
	Total hours	**45**
Outcomes	• Analyze the design flow of different types of ASIC and FPGA • Analyze the design of different types Programming Technologies for CPLDs and FPGAs • Compare the different types of programming technologies and logic devices • Perform partitioning, floor planning, placement and routing including circuit extraction of ASIC • Development and implementation of SOC	

TEXT BOOK :	
1	M.J.S.Smith, " Application - Specific Integrated Circuits", Pearson Education- 2004
2	M. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, New York, 1995
REFERENCES:	
1	Wolf Wayne, "FPGA Based System Design", Pearson Education, 2005
2	Design manuals of Altera, Xilinx and Actel
3	Jan M. Rabaey, Anantha Chandrakasan & Borivoje Nikolic, "Digital Integrated Circuits", 2nd Edition Prentice-Hall publication 2000
4	R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus - Professional Elective - 3						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC13019	**High Speed Networks**	3	0	0	3	**100**
Objective(s)	• To introduce the concepts of ATM • To learn the developments in traffic management models in networks • To enable the students to know techniques involved to support real-time traffic and congestion control					
	• To introduce the architecture of differentiated and integrated services • To provide the different levels of quality of service (QoS) to different applications					
UNIT-I	**HIGH SPEED NETWORKS**					**9**
ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11						
UNIT-II	**CONGESTION AND TRAFFIC MANAGEMENT**					**9**
Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks						
UNIT-III	**TCP AND ATM CONGESTION CONTROL**					**9**
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management -Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.						

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT-IV	INTEGRATED AND DIFFERENTIATED SERVICES	9
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services		
UNIT-V	**PROTOCOLS FOR QOS SUPPORT**	**9**
RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details –RTP – Protocol Architecture, Data Transfer Protocol, RTCP		
	Total	**45**
Outcome	• Explain the principle of ATM and protocols for ATM • Analyze the techniques involved to support real-time traffic management • Classify the process involved in TCP and ATM congestion control • Compare the architecture of integrated services and differentiated services • Examine the performance of different protocols for QoS support	

TEXT BOOK :	
1	William Stallings, "High Speed Networks and Internet", Pearson Education, 2nd edition, 2002
REFERENCES:	
1	Warland, PravinVaraiya, "High performance communication networks",2nd Edition, Jean Harcourt Asia Pvt. Ltd., 2001
2	IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003
3	Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus - Professional Elective - 4						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
VII Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC15041	**INTRODUCTION TO IOT**	3	0	0	3	**100**
Objective(s)	• To understand the concepts of the Internet of Things (IoT) and communication protocols. • To learn IoT networks, sensors and actuators for machine-to-machine communication. • To learn Python programming to create basic IoT projects using Raspberry Pi. • To know the IoT architectures, cloud and fog computing concepts for SDN. • To understand IoT applications in smart cities, smart grids and industries.					
UNIT-I	**INTRODUCTION TO IOT & CORE TECHNOLOGIES**					**9**
Introduction to IoT, Evolution of Connected Devices IPv4, IPv6, Sensors – Types, Characteristics, Errors, Actuators – Types, Characteristics, Basics of IoT Networking Connectivity Technologies- 6LoWPANs – Features, Addressing, packet format, Routing, RFID, MQTT, CoAP, XMPP, AMQP, - Communication Protocols, IEEE 802.15.4-ZigBee. HART & Wireless HART, NFC, Bluetooth, L2CAP, Piconet, Z Wave, ISA 100.11A, Wireless Sensor Networks, Sensor Web, Node Behavior in WSNs, Social Sensing in WSNs, Application						
UNIT-II	**ADVANCED SENSING & ARDUINO PROGRAMMING**					**9**
Target Tracking-Wireless Multimedia Sensor Networks, Nanonetworks, Optimal Geographical Density Control, Stationary Wireless Sensor Networks, Mobile Wireless Sensor Networks, - Components, Human-centric Sensing, UAV Networks, FANETs, Machine to Machine Communication, Sensor Nodes.Interoperability in Internet of Things, Device Interoperability, Introduction to Arduino Programming, Arduino IDE, operators, Integration of Sensors and Actuators with Arduino						
UNIT-III	**PYTHON PROGRAMMING ON RASPBERRY PI**					**9**
Introduction to Python Programming, operators, functions, File Read Write Operations, Image Read Write Operations, Networking in Python, Introduction to Raspberry Pi, Basic Initial Configuration, GPIO, PiCam, Capture Image using Raspberry Pi- Implementation of IoT with Raspberry Pi, Remote Data Logging, Sending Data to a Server, Data Processing.						

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT-IV	IOT ARCHITECTURE, SDN & CLOUD COMPUTING	9
IoT Architecture, SDN for IoT, Wireless Sensor Network, Software Defined Network – OpenFlow Protocol, ODIN, Ubi-Flow, Mobi-Flow, Cloud Computing – Fundamentals, Characteristics, Service Models, IaaS, PaaS, SaaS, Cloud Computing – Service Management and Security, Case Studies. Cloud Computing – Practical, Sensor-as-a service, Sensor cloud, Optimal Composition of Virtual Sensor, Dynamic and Adaptive Data Caching Mechanism, Dynamic Optimal Pricing for Sensor-Cloud Infrastructure, Fog Computing, Architecture of Fog, Requirements of IoT		
UNIT-V	**SMART APPLICATIONS & DATA ANALYTICS**	**9**
Smart cities - IoT Challenges in Smart Cities, Data Fusion, Smart Parking, Energy Management, Smart Home – HAN, Connected Vehicles, VANET, Intelligent Connected Vehicles- Smart Grid - Operation Centers, Communication, Security, Energy Management and CloudApplication, Industrial Internet of Things, Transportation & logistics, Challenges, Data Handling and Analytics – Big Data, Data Handling Technologies, Data Handling using Hadoop		
	Total	**45**Hrs
Outcome	• Describe basic IoT technologies, protocols, and device characteristics. • Explain the architecture of wireless sensor networks for tracking applications. • Develop basic IoT applications using Python programming on Raspberry Pi for data capture and remote communication. • Apply IoT system architectures and SDN technologies for optimal IoT service delivery. • Summarize the challenges of IoT in smart cities, including smart parking, energy management, and smart homes.	

TEXT BOOK :	
1	S. Misra, A. Mukherjee, and A. Roy, 2020. Introduction to IoT. Cambridge University Press.
2	S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
3	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014
REFERENCES:	
1	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3	Oliver Hersent , David Boswarthick and Omar Elloumi " The Internet of Things", Wiley,2016.
4	Adrian McEwen and Hakim Cassimally"Designing the Internet of Things "Wiley,2014.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	**Electronics and Communication Engineering**	**Programme Code**	**1041**

Semester-VII

Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC24701	**MICROWAVE & OPTICAL LABORATORY**	**0**	**0**	**3**	**2**	**100**

Objective(s)

- Understand the working principle of optical sources, detector, fibers and microwave components
- Develop understanding of simple optical communication link
- Learn about the characteristics and measurements in optical fiber
- Know about the behavior of microwave components
- Practice microwave measurement procedures

LIST OF EXPERIMENTS

MICROWAVE EXPERIMENTS

1	Gunn Diode – Characteristics
2	Frequency Measurement
3	VSWR measurement using Double Minimum Method
4	Impedance measurement using Slotted section

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

5	Directional Coupler – Directivity and Coupling Coefficient Calculation
6	Antenna Gain Measurement for Horn antenna
7	Reflex Klystron – Mode characteristics
8	Isolator and Circulator – S - parameter measurement
OPTICAL EXPERIMENTS	
9	DC Characteristics of LED
10	DC Characteristics of LASER Diode
11	DC Characteristics of PIN Photo diode
12	Numerical Aperture Determination for Fibers
13	Fiber optic Analog and Digital Link
14	Attenuation and bending losses Measurement in fibers
Total hours	**45**
Outcome	• Construct experiment to measure performance characteristics of devices by selecting appropriate equipment's • Experiment with optical components and study its characteristics • Use microwave bench and perform the characteristics of microwave components

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Department of Electronics and Communication Engineering
Curriculum – R-2022

SEMESTER-VIII

Course Code	Course Name	Contact Periods	Hours/Week				Category
			L	T	P	C	
	Theory						
	Professional Elective - 5	3	3	0	0	3	PE
	Professional Elective - 6	3	3	0	0	3	PE
	Practical						
22EC36801	Project Work Phase- II	17	0	0	14	7	EEC
					Total	13	

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Professional Elective - 5						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22EC13029	**COMPUTER ARCHITECTURE**	3	0	0	3	**100**
Objective(s)	• To make students understand the basic structure and operation of digital computer • To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations • To expose the students to the concept of pipelining • To familiarize the students with hierarchical memory system including cache memories and virtual memory • To expose the students with different ways of communicating with I/O devices and standard I/O interfaces					
UNIT-I	**OVERVIEW & INSTRUCTIONS**					**9**
Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.						
UNIT-II	**ARITHMETIC OPERATIONS**					**9**
ALU – Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism						
UNIT-III	**PROCESSOR AND CONTROL UNIT**					**9**
Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.						
UNIT-IV	**PARALLELISM**					**9**
Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware						

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

multithreading – Multicore processors		
UNIT-V	**MEMORY AND I/O SYSTEMS**	**9**
Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, TLBs – Input/output system, programmed I/O, DMA and interrupts, I/O processors		
	Total hours	**45** periods
Outcome	• Explain the concepts of arithmetic and logic unit • Perform arithmetic operations using algorithms • Design and analyze pipelined control units • Compare the performance of various parallel processing architectures • Analyze the performance of memory systems	

TEXT BOOK :	
1	David A. Patterson and John L. Hennessey, "Computer Organization and Design", Fifth edition, Morgan Kauffman / Elsevier, 2014
REFERENCES:	
1	V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, Mc Graw-Hill Inc, 2012.
2	William Stallings "Computer Organization and Architecture-Designing for Performance", Tenth Edition, Pearson Education, 2016.
3	Vincent P. Heuring, Harry F. Jordan, "Computer Systems Design and Architecture", Second Edition, Pearson Education, 2008.
4	Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", Second edition, Mc Graw Hill, New Delhi, 2017.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE (AUTONOMOUS) – SYLLABUS							
DEPARTMENT	**ELECTRONICS & COMMUNICATION ENGINEERING**				**PROGRAMME CODE &NAME**		**1041**
Professional Elective - 5							
COURSE CODE	**COURSE NAME**	**HOURS/WEEK**			**CREDIT**		**MAXIMUM MARKS**
22EC13017	**COGNITIVE RADIO COMMUNICATION**	**L**	**T**	**P**	**C**		**100**
		3	**0**	**0**	**3**		
OBJECTIVES:	• To learn the design of the wireless networks based on software defined radio • To understand the essential functionalities and requirements in designing software defined radios and their usage for cognitive communication • To understand the evolving paradigm of cognitive radio communication • To know the enabling technologies of cognitive radio for its implementation • To understand the concepts of next generation wireless networks and their associated challenges						
UNIT I	**INTRODUCTION OF SDR**						**(9 Hrs)**
Definitions and potential benefits, software radio architecture evolution – foundations, technology tradeoffs and architecture implications, Antenna for Cognitive Radio							
UNIT II	**SDR ARCHITECTURE**						**(9 Hrs)**
Essential functions of the software radio, architecture goals, quantifying degrees of programmability, top level component topology, computational properties of functional components, interface topologies among plug and play modules, architecture partitions.							
UNIT III	**INTRODUCTION TO COGNITIVE RADIOS**						**(9 Hrs)**
Marking radio self-aware, the cognition cycle, organization of cognition tasks, structuring knowledge for cognition tasks, Enabling location and environment awareness in cognitive radios – concepts, architecture, design considerations.							
UNIT IV	**COGNITIVE RADIO ARCHITECTURE**						**(9 Hrs)**
Primary Cognitive Radio functions, Behaviors, Components, A–Priori Knowledge taxonomy, observe – phase data structures, Radio procedure knowledge encapsulation, components of orient, plan, decide phases, act phase knowledge representation, design rules							

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

UNIT-V	NEXT GENERATION WIRELESS NETWORKS	(9 Hrs)
XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design		

Total	**45 Hrs**
OUTCOMES	• Describe the basics of the software defined radios • Explain the hardware and software architecture of software defined radio • Explain the wireless networks based on the cognitive radios • Demonstrate the cognitive radio architecture • Summarize the concepts behind the wireless networks and next generation networks

TEXT BOOK :	
1	• Alexander M. Wyglinski, MaziarNekovee, And Y. Thomas Hou, " Cognitive Radio Communications And Networks - Principles And Practice", Elsevier Inc. , 2010.
2	• E. Biglieri, A.J. Goldsmith., L.J. Greenstein, N.B. Mandayam, H.V. Poor, "Principles of Cognitive Radio", Cambridge University Press, 2013.
REFERENCES:	
1	Kwang-Cheng Chen and Ramjee Prasad, " Cognitive Radio Networks" , John Wiley & Sons, Ltd, 2009.
2	Khattab, Ahmed, Perkins, Dmitri, Bayoumi, Magdy, "Cognitive Radio Networks - From Theory to Practice", Springer Series: Analog Circuits and Signal Processing, 2009.
3	J. Mitola, " Cognitive Radio: An Integrated Agent Architecture for software defined radio", Doctor of Technology thesis, Royal Inst. Technology, Sweden 2000.
4	Simon Haykin, "Cognitive Radio: Brain –empowered wireless communications", IEEE Journal on selected areas in communications, Feb 2005

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Electronics and Communication Engineering**				**Programme Code**	**1041**
Professional Elective -						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
22EC13004	**MULTIMEDIA SYSTEM AND**	**L**	**T**	**P**	**C**	**100**
	APPLICATIONS	3	0	0	3	
Objective(s)	• To understand the basic ideas of compression algorithms related to multimedia components – Text, speech, audio, image and Video. • To understand the compression algorithms and standards for text compression • To understand the algorithms and standards for image compression • To learn appropriate algorithms of compression in audio processing applications • To understand and implement compression standards in video processing detail					
UNIT-I	**FUNDAMENTALS OF MULTIMEDIA**					**9**
Introduction To multimedia – Graphics, Image and Video representations – Fundamental concepts of video, digital audio – Storage requirements of multimedia applications – Need for compression – Taxonomy of compression Algorithms - Overview of source coding, source models, scalar and vector quantization theory – Evaluation techniques – Error analysis and methodologies						
UNIT-II	**TEXT COMPRESSION**					**9**
Huffmann coding - Adaptive Huffmann Coding - Arithmetic coding - Shannon- Fano coding - Dictionary techniques - LZW family algorithms						
UNIT-III	**IMAGE COMPRESSION**					**9**
Image Compression: Fundamentals — Compression Standards – JPEG Standard – Sub-band coding – Wavelet Based compression – Implementation using Filters – EZW, SPIHT coders – JPEG 2000 standards – JBIG and JBIG2 standards.						
UNIT-IV	**AUDIO COMPRESSION**					**9**
Audio compression Techniques – μ-law, A-Law companding – Frequency domain and filtering – Basic sub-band coding – Application to speech coding – G.722 – MPEG audio – progressive encoding – Silence compression, Speech compression – Formant and CELP vocoders.						
UNIT-V	**VIDEO COMPRESSION**					**9**
Video compression techniques and Standards – MPEG video coding I: MPEG-1 and MPEG-2 video coding II: MPEG-4 and MPEG-7 – Motion estimation and compensation techniques – H.261 Standard – DVI technology – DVI real time compression – Current Trends in Compression standards.						
Total hours	45 periods					

Head of the Department
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Outcome	• Explain the fundamental concept of image and video representations • List the requirement and performance of text compression algorithms • Implement the image compression algorithms for simple applications • Summarize the requirements and standards for audio compression • Compare the performance of various algorithms for video compression in real time applications

TEXT BOOK :	
1	Khalid Sayood : Introduction to Data Compression, Morgan Kauffman Harcourt India,2nd Edition, 2000.
2	David Salomon : Data Compression – The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001
REFERENCES:	
3	Yun Q.Shi, HuifangSun : Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards, CRC press, 2003.
4	Peter Symes : Digital Video Compression, McGraw Hill Pub., 2004
5.	Mark Nelson : Data compression, BPB Publishers, New Delhi,1998.

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Electronics and Communication Engineering	Programme Code	1041

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
22EC13014	WIRELESS SENSOR AND AD HOC NETWORKS	3	0	0	3	100

Objective(s)	• Learn Ad hoc network and Sensor Network fundamentals • Understand the different routing protocols • Learn the basics of sensor network architecture and design issues • Understand the transport layer and security issues possible in Ad hoc and Sensor networks • Learn functions of various sensor programming platforms and tools

UNIT-I	**AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS**	**9**

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV)

UNIT-II	**SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES**	**9**

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture – Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit

UNIT-III	**WSN NETWORKING CONCEPTS AND PROTOCOLS**	**9**

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – S-MAC, The Mediation Device Protocol, Contention based protocols – PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols Energy Efficient Routing,

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous)
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503

Challenges and Issues in Transport layer protocol		
UNIT-IV	**SENSOR NETWORK SECURITY**	**9**
Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks		
UNIT-V	**SENSOR NETWORK PLATFORMS AND TOOLS**	**9**
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming		
	Total hours	**45** periods

Outcome(s):	• Explain the basics of Ad hoc networks and Wireless Sensor Networks • Apply sensor network architectures knowledge to identify the suitable routing algorithm based on the network and user requirement • Apply the knowledge to identify appropriate physical and MAC layer protocols • Analyze the transport layer and security issues possible in Ad hoc and sensor networks • Familiar with the OS used in Wireless Sensor Networks to build basic modules

TEXT BOOK :

1	C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols‖, Prentice Hall, PTR, 2004
2	Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006

REFERENCES:

1	Feng Zhao, Leonidas Guibas, ―Wireless Sensor Networks: an information processing approach‖, Elsevier publication, 2004
2	Charles E. Perkins, ―Ad Hoc Networking‖, Addison Wesley, 2000
3	Akyildiz,I.F., Su, W., Sankarasubramaniam&Cayirci, E.,"Wireless sensor networks: a survey, computer networks", Elsevier, 2002, 394 - 422

Head of the Department,
Electronics and Communication Engg
Mahendra Engineering College (Autonomous).
Mallasamudram, Namakkal Dt
Tamil Nadu 637 503