

ANNA UNIVERSITY, CHENNAI
NON- AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM
M.E. EMBEDDED SYSTEM TECHNOLOGIES
I TO IV SEMESTERS CURRICULA AND I SEMESTER SYLLABUS

SEMESTER I

SEMESTER V								
S. NO.	COURSE CODE	COURSE TITLE	CATE- GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4103	Applied Mathematics for Embedded Systems Technologists	FC	3	1	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	ET4101	Design of Embedded Systems	PCC	3	0	0	3	3
4.	ET4102	Software for Embedded Systems	PCC	3	0	0	3	3
5.	ET4103	Microcontroller Based System Design	PCC	3	0	0	3	3
6.	ET4104	VLSI Design and Reconfigurable Architecture	PCC	3	0	0	3	3
7.		Audit Course I*	AC	2	0	0	2	0
PRACTICALS								
8.	ET4111	Embedded System Laboratory - I	PCC	0	0	4	4	2
9.	ET4112	Embedded Programming Laboratory - I	PCC	0	0	4	4	2
TOTAL				19	1	8	28	22

* Audit Course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE- GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	ET4201	Real Time Operating System	PCC	3	0	0	3	3
2.	ET4202	Embedded System Networking	PCC	3	0	0	3	3
3.	ET4203	Embedded Control for Electric Drives	PCC	3	0	0	3	3
4.	ET4251	IoT for Smart Systems	PCC	3	0	0	3	3
5.		Professional Elective I	PEC	3	0	0	3	3
6.		Professional Elective II	PEC	3	0	0	3	3
7.		Audit Course II*	AC	2	0	0	2	0
PRACTICALS								
8.	ET4211	Embedded System Laboratory - II	PCC	0	0	4	4	2
9.	ET4212	Embedded Programming Laboratory - II	PCC	0	0	4	4	2
TOTAL				20	0	8	28	22

* Audit Course is optional

SEMESTER III

S. NO.	COURS ECODE	COURSE TITLE	CATE- GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Professional Elective III	PEC	3	0	0	3	3
2.		Professional Elective IV	PEC	3	0	0	3	3
3.		Professional Elective V	PEC	3	0	0	3	3
4.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
5.	ET4311	Project Work I	EEC	0	0	12	12	6
TOTAL				12	0	12	24	18

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE- GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	ET4411	Project Work II	EEC	0	0	24	24	12
TOTAL				0	0	24	24	12

TOTAL NO. OF CREDITS: 74

FOUNDATION COURSES (FC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			LECTURE	TUTORIAL	PRACTICAL		
1.	MA4103	Applied Mathematics for Embedded Systems Technologists	3	1	0	4	I

PROFESSIONAL CORE COURSES (PCC)

S. NO.	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			LECTURE	TUTORIAL	PRACTICAL		
1.	ET4101	Design of Embedded Systems	3	0	0	3	I
2.	ET4102	Software for Embedded Systems	3	0	0	3	I
3.	ET4103	Microcontroller Based System Design	3	0	0	3	I
4.	ET4104	VLSI Design and Reconfigurable Architecture	3	0	0	3	I
5.	ET4111	Embedded System Laboratory - I	0	0	4	2	I
6.	ET4112	Embedded Programming Laboratory -I	0	0	4	2	I
7.	ET4201	Real Time Operating System	3	0	0	3	II
8.	ET4202	Embedded System Networking	3	3	0	3	II
9.	ET4203	Embedded Control for Electric Drives	3	0	0	3	II
10.	ET4251	IoT for Smart Systems	3	0	0	3	II
11.	ET4211	Embedded System Laboratory - II	0	0	4	2	II
12.	ET4212	Embedded Programming Laboratory -II	0	0	4	2	II
TOTAL CREDITS						32	

RESEARCH METHODOLOGY AND IPR COURSES (RMC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			LECTURE	TUTORIAL	PRACTICAL		
1.	RM4151	Research Methodology and IPR	2	0	0	2	I
TOTAL CREDITS						2	

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS	SEMESTER
			LECTURE	TUTORIAL	PRACTICAL		
1.	ET4311	Project Work I	0	0	12	6	III
2.	ET4411	Project Work II	0	0	24	12	IV
TOTAL CREDITS						18	

PROFESSIONAL ELECTIVES

SEMESTER II

ELECTIVE I & II

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	ET4001	Wireless And Mobile Communication	PEC	3	0	0	3	3
2.	ET4002	Virtual Instrumentation	PEC	3	0	0	3	3
3.	ET4003	Embedded Processor Development	PEC	3	0	0	3	3
4.	ET4004	Automotive Embedded System	PEC	3	0	0	3	3
5.	ET4005	Intelligent Control and Automation	PEC	3	0	0	3	3
6.	ET4006	Unmanned Aerial Vehicle	PEC	3	0	0	3	3
7.	ET4071	DSP Based System Design	PEC	3	0	0	3	3
8.	ET4072	Machine Learning and Deep Learning	PEC	3	0	0	3	3

SEMESTER III

ELECTIVE III, IV & V

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	ET4007	Computer Vision	PEC	3	0	0	3	3
2.	ET4008	Multimedia Communication	PEC	3	0	0	3	3
3.	ET4009	Embedded Networking and Automation of Electrical System	PEC	3	0	0	3	3
4.	ET4010	Smart System Design	PEC	3	0	0	3	3
5.	ET4011	Embedded Computing	PEC	3	0	0	3	3
6.	ET4012	Embedded Systems Security	PEC	3	0	0	3	3

7.	ET4013	Robotics and Automation	PEC	3	0	0	3	3
8.	ET4014	Reconfigurable Processor and SoC Design	PEC	3	0	0	3	3
9.	ET4015	MEMS and NEMS Technology	PEC	3	0	0	3	3
10.	ET4016	Entrepreneurship and Embedded Product Development	PEC	3	0	0	3	3
11.	ET4017	Embedded System for Biomedical Applications	PEC	3	0	0	3	3
12.	PS4074	Renewable Energy and Grid Integration	PEC	3	0	0	3	3
13.	PX4251	Electric Vehicles and Power Management	PEC	3	1	0	4	4
14.	ET4073	Python Programming for Machine Learning	PEC	3	0	0	3	3
15.	PS4075	Smart Grid	PEC	3	0	0	3	3

AUDIT COURSES - I

REGISTRATION FOR ANY OF THESE COURSES IS OPTIONAL TO STUDENTS

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

SUMMARY

	Name of the Programme: M.E.EMBEDDED SYSTEMS TECHNOLOGIES					
	SUBJECT AREA	CREDITS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1.	FC	4				4
2.	PCC	16	16			32
3.	PEC		6	9		15
4.	RMC	2				2
5.	OEC			3		3
6.	EEC			6	12	18
7.	Non Credit/Audit Course	0	0			0
8.	TOTAL CREDIT	22	22	18	12	74

OBJECTIVES :

- To understand the techniques of Fourier transform to solve partial differential equations.
- To become familiar with graph theory for modelling the embedded system.
- To understand various optimization techniques for utilizing system and network resources.
- To understand the basic concepts of probability to apply in embedded technology.
- To understand the basic concept of random variables and queuing theories to address stochastic and dynamic environment in embedded technology.

UNIT I FOURIER TRANSFORM TECHNIQUES FOR PARTIAL DIFFERENTIAL EQUATIONS**12**

Fourier transform : Definitions - Properties – Transform of elementary functions - Dirac delta function – Convolution theorem – Parseval's identity – Solutions to partial differential equations : Heat equation - Wave equation - Laplace and Poisson's equations.

UNIT II GRAPH THEORY**12**

Introduction to paths, trees, vector spaces - Matrix coloring and directed graphs - Some basic algorithms – Shortest path algorithms – Depth - First search on a graph – Isomorphism – Other Graph - Theoretic algorithms – Performance of graph theoretic algorithms – Graph theoretic computer languages.

UNIT III OPTIMIZATION TECHNIQUES**12**

Linear programming - Basic concepts – Graphical and simplex methods – Big M method - Two phase simplex method - Revised simplex method - Transportation problems – Assignment problems .

UNIT IV PROBABILITY AND RANDOM VARIABLES**12**

Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Exponential, Normal distributions – Two dimensional random variables - Poisson process.

UNIT V QUEUEING THEORY**12**

Single and multiple servers - Markovian queuing models - Finite and infinite capacity queues – Finite source model – Queuing applications.

TOTAL : 60 PERIODS**OUTCOMES :**

Upon Completion of the course, the students will be able to

- Apply Fourier transform techniques to solve PDE technology.
- Model the networks in embedded systems using graph theory.
- Utilize the system and network resources using various optimization techniques.
- Address stochastic and dynamic behavior of data transfer using probability and queuing theories in embedded systems technologies.

REFERENCES :

1. Taha H .A., " Operations Research: An Introduction " , 9th Edition, Pearson Education Asia, New Delhi, 2016.
2. Walpole R.E., Myer R.H., Myer S.L., and Ye, K., " Probability and Statistics for Engineers and Scientists ", 7th Edition, Pearson Education, Delhi, 2002.
3. Sankara Rao, K., " Introduction to Partial Differential Equations ", Prentice Hall of India Pvt. Ltd., New Delhi, 1997.
4. Narasingh Deo, " Graph Theory with Applications to Engineering and Computer Science ", Prentice Hall India, 1997.
5. S. S. Rao, " Engineering Optimization, Theory and Practice ", 4th Edition, John Wiley and Sons, 2009.

RM4151

RESEARCH METHODOLOGY AND IPR

L T P C
2 0 0 2

UNIT I RESEARCH DESIGN

6

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES

6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING

6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS

6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS

6

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCES

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

OBJECTIVES:

- To provide knowledge on the basics, building blocks of Embedded System.
- To discuss Input/output Interfacing & Bus Communication with processors.
- To teach automation using scheduling algorithms and Real time operating system.
- To discuss on different Phases & Modeling of a new embedded product.
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS**9**

Introduction to Embedded Systems –built in features for embedded Target Architecture - selection of Embedded processor – DMA- memory devices – Memory management methods-memory mapping, cache replacement policies- Timer and Counting devices, Watchdog Timer, Real Time Clock- Software Development tools-IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging- Overview of functional safety standards for embedded systems.

UNIT II EMBEDDED NETWORKING BY PROCESSORS**9**

Embedded Networking: Introduction, I/O Device Ports & Buses- multiple interrupts and interrupt service mechanism – Serial Bus communication protocols -RS232 standard–RS485–USB–Inter Integrated Circuits (I²C)- CAN Bus –Wireless protocol based on Wifi , Bluetooth, Zigbee – Introduction to Device Drivers.

UNIT III RTOS BASED EMBEDDED SYSTEM DESIGN**9**

Introduction to basic concepts of RTOS- Need, Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-context switching, interrupt latency and deadline shared memory, message passing-, Interprocess Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: VxWorks, uC/OS-II, RT Linux.

UNIT IV MODELLING WITH HARDWARE/SOFTWARE DESIGN APPROACHES**9**

Modelling embedded systems- embedded software development approach --Overview of UML modeling with UML, UML Diagrams-- Hardware/Software Partitioning , Co-Design Approaches for System Specification and modeling- CoSynthesis- features comparing Single-processor Architectures & Multi-Processor Architectures--design approach on parallelism in uniprocessors & Multiprocessors.

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT**9**

Objective, Need, different Phases & Modelling of the EDLC.choice of Target Architectures for Embedded Application Development-for Control Dominated-Data Dominated Systems-Case studies on Digital Camera, Adaptive Cruise control in a Car, Mobile Phone software for key inputs.

TOTAL: 45 PERIODS**OUTCOMES:**

At the end of this course, the students will demonstrate the ability

CO1: To understand the functionalities of processor internal blocks, with their requirement.

CO2: Observe that Bus standards are chosen based on interface overheads without sacrificing processor performance

CO3: Understand the role and features of RT operating system, that makes multitask execution possible by processors.

CO4: Understand that using multiple CPU based on either hardcore or softcore helps data overhead management with processing- speed reduction for uC execution.

CO5: Guidelines for Embedded consumer product design based on phases of product development.

REFERENCES:

1. Rajkamal, 'Embedded system-Architecture, Programming, Design', TMH,2011.
2. Peckol, "Embedded system Design",JohnWiley&Sons,2010
3. Lyla B Das," Embedded Systems-An Integrated Approach",Pearson2013
4. Elicia White,"Making Embedded Systems",O'Reilly Series,SPD,2011
5. Bruce Powel Douglass,"Real-Time UML Workshop for Embedded Systems,Elsevier,2011
6. Advanced Computer architecture , By Rajiv Chopra, S Chand , 2010
7. Jorgen Staunstrup, Wayne Wolf , Hardware / Software Co- Design Principles and Practice, Springer, 2009.
8. Shibu.K.V, "Introduction to Embedded Systems", TataMcgraw Hill,2009
9. Tammy Noergaard, "Embedded System Architecture, A comprehensive Guide for Engineers and Programmers", Elsevier, 2006
10. Giovanni De Micheli, Mariagiovanna Sami , Hardware / Software Co- Design, Kluwer Academic Publishers , 2002

ET4102

SOFTWARE FOR EMBEDDED SYSTEMS

**LT P C
3 0 0 3**

OBJECTIVES:

- To expose the students to the fundamentals of embedded Programming
- To Introduce the GNU C Programming Tool Chain in Linux.
- To study the basic concepts of embedded C.
- To teach the basics of Python Programming
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills.

UNIT I BASIC C PROGRAMMING

9

Typical C Program Development Environment - Introduction to C Programming - Structured Program Development in C - Data Types and Operators - C Program Control - C Functions - Introduction to Arrays.

UNIT II EMBEDDED C

9

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts.

UNIT III C PROGRAMMING TOOL-CHAIN IN LINUX

9

C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using gprof - Introduction to GNU C Library.

UNIT IV PYTHON PROGRAMMING

9

Introduction - Parts of Python Programming Language - Control Flow Statements - Functions - Strings - Lists - Dictionaries - Tuples and Sets.

UNIT V MODULES, PACKAGES AND LIBRARIES IN PYTHON

9

Python Modules and Packages - Creating Modules and Packages - Practical Example - Libraries for Python - Library for Mathematical functionalities and Tools - Numerical Plotting Library - GUI Libraries for Python - Imaging Libraries for Python - Networking Libraries.

TOTAL: 45 PERIODS

OUTCOMES:

- CO1: Understanding of C programming and its salient features for embedded systems
- CO2: The learning process delivers insight into various programming languages/software compatible to embedded process development with improved design & programming skills.
- CO3: Developing knowledge on C programming in Linux environment.
- CO4: Able to write python programming for Embedded applications.
- CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded programming skills.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "C How to Program", 8th Edition, Pearson Education Limited, 2016.
2. Michael J Pont, "Embedded C", Addison-Wesley, An imprint of Pearson Education, 2002.
3. William von Hagen, "The Definitive Guide to GCC", 2nd Edition, Apress Inc., 2006.
4. Gowrishankar S and Veena A, "Introduction to Python Programming", CRC Press, Taylor & Francis Group, 2019.
5. Noel Kalicharan, "Learn to Program with C", Apress Inc., 2015.
6. Steve Oualline, "Practical C programming", O'Reilly Media, 1997.
7. Fabrizio Romano, "Learn Python Programming", Second Edition, Packt Publishing, 2018.
8. John Paul Mueller, "Beginning Programming with Python for Dummies", 2nd Edition, John Wiley & Sons Inc., 2018.
9. Mark Lutz, "Programming Python", 4th Edition, O'Reilly Media Inc., 2010.

ET4103

MICROCONTROLLER BASED SYSTEM DESIGN

**LT P C
3 0 0 3**

OBJECTIVES:

- To teach the architecture of PIC Microcontroller and RISC processor.
- To compare the architecture and programming of 8,16,32 bit RISC processor.
- To teach the implementation of DSP in ARM processor.
- To discuss on memory management, application development in RISC processor.
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills.

UNIT I PIC MICROCONTROLLER

9

Architecture – memory organization – addressing modes – instruction set – PIC programming in Assembly & C –I/O port, Data Conversion, RAM & ROM Allocation, Timer programming, practice in MP-LAB.

UNIT II	ARM ARCHITECTURE	9
Architecture – memory organization – addressing modes – The ARM Programmer's model -Registers – Pipeline - Interrupts – Coprocessors – Interrupt Structure		
UNIT III	PERIPHERALS OF PIC AND ARM MICROCONTROLLER	9
PIC: ADC, DAC and Sensor Interfacing –Flash and EEPROM memories. ARM: I/O Memory – EEPROM – I/O Ports – SRAM –Timer –UART - Serial Communication with PC – ADC/DAC Interfacing.		
UNIT IV	ARM MICROCONTROLLER PROGRAMMING	9
ARM general Instruction set – Thumb instruction set –Introduction to DSP on ARM – Implementation example of Filters		
UNIT V	DESIGN WITH PIC AND ARM MICROCONTROLLERS	9
PIC implementation - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Stand alone Data Acquisition System –ARM Implementation- Simple ASM/C programs- Loops –Look up table-Block copy- subroutines- Hamming Code.		

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course, the students will demonstrate the ability

- CO1: To understand the basics and requirement of processor functional blocks.
- CO2: Observe the specialty of RISC processor Architecture.
- CO3: Incorporate I/O hardware interface of a processor based automation for consumer application with peripherals.
- CO4: Incorporate I/O software interface of a processor with peripherals.
- CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in commercial embedded processors

REFERENCES:

1. Steve Furber, 'ARM system on chip architecture', Addison Wesley, 2010.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield 'ARM System Developer's Guide Designing and Optimizing System Software', Elsevier 2007.
3. Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey ' PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008.
4. John Iovine, 'PIC Microcontroller Project Book ', McGraw Hill 2000
5. William Hohl, ' ARM Assembly Language' Fundamentals and Techniques, 2009.
6. Rajkamal, "Microcontrollers Architecture, Programming, Interfacing, & System Design, Pearson, 2012
7. ARM Architecture Reference Manual, LPC213x User Manual
8. www.Nuvoton .com/websites on Advanced ARM Cortex Processors

OBJECTIVES:

- To expose the students to the fundamentals of sequential system design, synchronous and Asynchronous circuits.
- To understand the basic concepts of CMOS and to introduce the IC fabrication methods
- To introduce the Reconfigurable Processor technologies, To provide an insight and architecture significance of SOC.
- To introduce the basics of analog VLSI design and its importance.
- To learn about the programming of Programmable device using Hardware description Language.

UNIT I INTRODUCTION TO ADVANCED DIGITAL SYSTEM DESIGN 9
Modeling of Clocked Synchronous Sequential Network(CSSN), Design of CSSN, Design of Asynchronous Sequential Circuits (ASC), Designing Vending Machine Controller, Races in ASC, Static and Dynamic Hazards, Essential Hazards, Designing Hazard free circuits.

UNIT II CMOS BASICS & IC FABRICATION 9
Moore's Law-MOSFET Scaling - MOS Transistor Model-Determination of pull up / pull down ratios-CMOS based combinational logic & sequential design- Dynamic CMOS –Transmission Gates-BiCMOS- Low power VLSI – CMOS IC Fabrications - Stick Diagrams, Design Rules and Layout.

UNIT III ASIC AND RECONFIGURABLE PROCESSOR AND SoC DESIGN 9
Introduction to ASIC, ASIC design flow- programmable ASICs- Introduction to reconfigurable processor- Architecture -Reconfigurable Computing, SoC Overview, recent trends in Reconfigurable Processor & SoC, Reconfigurable processor based DC motor control.

UNIT IV ANALOG VLSI DESIGN 9
Introduction to analog VLSI- Design of CMOS 2stage-3 stage Op-Amp –High Speed and High frequency op-amps-Super MOS- Analog primitive cells- Introduction to FPAA.

UNIT V HDL PROGRAMMING 9
Overview of digital design with VHDL, structural, data flow and behavioural modeling concepts- logic synthesis-simulation-Design examples, Ripple carry Adders, Carry Look ahead adders, Multiplier, ALU, Shift Registers, Test Bench.

TOTAL: 45 PERIODS

OUTCOMES:

- CO1: incorporating synchronous and asynchronous switching logics, with clocked circuits design
- CO2: The learning process delivers insight into developing CMOS design techniques and IC fabrication methods.
- CO3: Understand the need of reconfigurable computing, hardware-software co design and operation of SoC processor.
- CO4: Design and development of reprogrammable analog devices and its usage for Embedded applications.
- CO5: Understanding and usage of HDL computational processes with improved design strategies.

REFERENCES:

1. Donald G. Givone, "Digital principles and Design", Tata McGraw Hill 2002.
2. Charles H. Roth Jr., "Fundamentals of Logic design", Thomson Learning, 2004.
3. Nurmi, Jari (Ed.) "Processor Design System-On-Chip Computing for ASICs and FPGAs" Springer, 2007.
4. Joao Cardoso, Michael Hübner, "Reconfigurable Computing: From FPGAs to Hardware/Software Codesign" Springer, 2011.
5. Pierre-Emmanuel Gaillardon, Reconfigurable Logic: Architecture, Tools, and Applications, 1st Edition, CRC Press , 2015
6. Mohamed Ismail ,Terri Fiez, "Analog VLSI Signal and information Processing", McGraw Hill International Editions,1994.
7. William J. Dally / Curtis Harting / Tor M. Aamodt," Digital Design Using VHDL:A Systems Approach, Cambridge Univerity Press,2015.
8. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2n Edition, Tata McGraw Hill, 1998.

ET4111**EMBEDDED SYSTEM LABORATORY – I****L T P C
0 0 4 2****OBJECTIVES:**

- To involve the students to Practice on Workbench /Software Tools/ Hardware Processor Boards with the supporting Peripherals.
- To teach the concepts of algorithm development & programming on software tools and Digital processors with peripheral interfaces.
- To encourage students to practice in open source software / packages /tools
- To train though hands-on practices in commercial and licensed Hardware-software suites
- Practicing through the subdivisions covered within experiments listed below to expose the students into the revising the concepts acquired from theory subjects.

DOMAIN	EXPERIMENT DETAILS	EQUIPMENT/ SUPPORTS REQUIRED
1.	Programming with 8 bit Microcontrollers # Assembly programming	8051/ other 8 bit Microcontrollers with peripherals; IDE, Board Support Software Tools /C Compiler/others
2.	Programming with 8 bit Microcontrollers # C programming	8051 Microcontrollers with peripherals; IDE, Board Support Software Tools /C Compiler/others
3.	I/O Programming with 8 bit Microcontrollers I/O Interfacing : Serial port programming/ LCD/Sensor Interfacing /PWM Generation/ Motor Control	8051 Microcontrollers with peripherals; Board Support Software Tools, peripherals with interface

4. .	Programming with PIC Microcontrollers : ✓ Assembly ✓ C programming	PIC Microcontrollers with peripherals; ;IDE, Board Support Software Tools /C Compiler/others
5. .	I/O Programming with PIC Microcontrollers I/O Interfacing : PWM Generation/ Motor Control/ADC/DAC/ LCD/Sensor Interfacing	PIC Microcontrollers with peripherals; Board Support Software Tools, peripherals with interface

TOTAL: 60 PERIODS

OUTCOMES:

At the end of this course, the students will demonstrate the ability in

CO1: The Laboratory experiments exposes insight into various embedded processors of CISC and RISC architecture / computational processors with peripheral interface.

CO2: Understanding the fundamental concepts of how process can be controlled with uC.

CO3: working on programming logic of Processor based on software suites(simulators, emulators)

CO4: Incorporate I/O software interface of a processor with peripherals.

CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in interfacing and use of commercial embedded processors

REFERENCES:

1. Mohamammad Ali Mazidi & Mazidi ' 8051 Microcontroller and Embedded Systems', Pearson Education
2. Mohammad Ali Mazidi, Rolind Mckinley and Danny Causey, 'PIC Microcontroller and Embedded Systems' Pearson Education
3. Simon Monk," Make Action-with Arduino and Raspberry Pi,SPD ,2016.
4. Wesley J.Chun,"Core Python Applications Programming,3rd ed,Pearson,2016
5. Kraig Mitzner, 'Complete PCB Design using ORCAD Capture and Layout', Elsevier
6. Vinay K.Ingle,John G.Proakis,"DSP-A Matlab Based Approach",Cengage Learning,2010.
7. Taan S.Elali,"Discrete Systems and Digital Signal Processing with Matlab",CRC Press2009.
8. Jovitha Jerome,"Virtual Instrumentation using Labview"PHI,2010.
9. Woon-Seng Gan, Sen M. Kuo, 'Embedded Signal Processing with the Micro Signal Architecture', John Wiley & Sons, Inc., Hoboken, New Jersey 2007
10. Dogan Ibrahim, 'Advanced PIC microcontroller projects in C', Elsevier 2008

OBJECTIVES:

- To involve the students to Practice on Workbench /Software Tools/ Hardware Processor Boards with the supporting Peripherals.
- To teach the concepts of algorithm development & programming on software tools and Digital processors with peripheral interfaces.
- To encourage students to practice in open source softwares / packages /tools
- To train through hands-on practices in commercial and licensed Hardware-software suites
- Practicing through the subdivisions covered within experiments listed below to expose the students into the revising the concepts acquired from theory subjects.

DOMAIN	EXPERIMENT DETAILS	EQUIPMENT/ SUPPORTS REQUIRED
1.	Programming in Higher Level Languages/Open Source Platforms	C/C++/Java/Embedded C/Embedded Java/ Compilers &Platforms/cloud
2.	Programming with Arduino Microcontroller Board	Arduino Boards with peripherals ;IDE, Board Support Software Tools /Compiler/others
3.	HDL Programming in FPGA processors	Processor Boards with Board Support Tools & Interfaces
4	Programming & Simulation in Simulators /Tools/others	Simulation Tools as Proteus/ ORCAD
5.	Programming & Simulation in Simulators /Tools/others	Simulation Tools as MATLAB /others

TOTAL: 60 PERIODS**OUTCOMES:**

At the end of this course, the students will demonstrate the ability in

CO1: Developing Optimized code for embedded processor

CO2: Understanding the fundamental concepts of how process can be realized using Software Modules

CO3: Circuit and System level simulators to develop solution for embedded based applications.

CO4: Incorporate I/O software interface of a processor with peripherals.

CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on Embedded computing and algorithm development with programming concepts.

OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING**6**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS**6**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS**6**

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS**6**

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS**6**

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS**OUTCOMES**

- CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

OBJECTIVES

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION**6**

Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS**6**

Economic Damage, Loss of Human and Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

UNIT III DISASTER PRONE AREAS IN INDIA**6**

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT**6**

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT**6**

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS**OUTCOMES**

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop the strengths and weaknesses of disaster management approaches

REFERENCES

1. Goel S. L., Disaster Administration And Management Text And Case Studies”, Deep & Deep Publication Pvt. Ltd., New Delhi, 2009.
2. Nishitha Rai, Singh AK, “Disaster Management in India: Perspectives, issues and strategies “New Royal book Company, 2007.
3. Sahni, Pardeep Et. Al. ,” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi, 2001.

AX4093

CONSTITUTION OF INDIA

L T P C
2 0 0 0

OBJECTIVES

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT IV ORGANS OF GOVERNANCE

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION

District’s Administration head: Role and Importance, □ Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT VI ELECTION COMMISSION

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING

1. The Constitution of India,1950(Bare Act),Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

www.binils.com

PROGRESS THROUGH KNOWLEDGE

UNIT I	சங்க இலக்கியம்	6
	1. தமிழின் துவக்க நூல் தொல்காப்பியம் - எழுத்து, சொல், பொருள் 2. அகநானூறு (82) - இயற்கை இன்னிசை அரங்கம் 3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி 4. புறநானூறு (95,195) - போரை நிறுத்திய ஔவையார்	
UNIT II	அறநெறித் தமிழ்	6
	1. அறநெறி வகுத்த திருவள்ளுவர் - அறம், வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ் 2. பிற அறநூல்கள் - இலக்கிய மருந்து - ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)	
UNIT III	இரட்டைக் காப்பியங்கள்	6
	1. கண்ணகியின் புரட்சி - சிலப்பதிகார வழக்குரை காதை 2. சமூகசேவை இலக்கியம் மணிமேகலை - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை	

1. சிறுபாணாற்றுப்படை

- பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஓளவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்

2. நற்றிணை

- அன்னைக்குரிய புன்னை சிறப்பு

3. திருமந்திரம் (617, 618)

- இயமம் நியமம் விதிகள்

4. தர்மச்சாலையை நிறுவிய வள்ளலார்

5. புறநானூறு

- சிறுவனே வள்ளலானான்

6. அகநானூறு (4) - வண்டு

நற்றிணை (11) - நண்டு

கலித்தொகை (11) - யானை, புறா

ஐந்திணை 50 (27) - மான்

ஆகியவை பற்றிய செய்திகள்

1. உரைநடைத் தமிழ்,

- தமிழின் முதல் புதினம்,
- தமிழின் முதல் சிறுகதை,
- கட்டுரை இலக்கியம்,
- பயண இலக்கியம்,
- நாடகம்,

2. நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,
3. சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,
4. பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,
5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
- www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
- <https://ta.wikipedia.org>
3. தர்மபுர ஆதின வெளியீடு
www.binils.com
4. வாழ்வியல் களஞ்சியம்
- தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
- தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
- தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்

TOTAL: 30 PERIODS