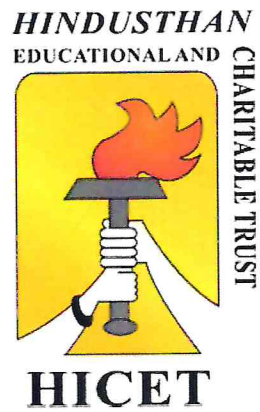


***HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY***  
**(An Autonomous Institution Affiliated to Anna University, Chennai)**  
**(Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade),**  
**COIMBATORE 641 032.**

**M.E EMBEDDED SYSTEMS –R2020**



**Curriculum & Syllabus**

**2020-2021**

## VISION AND MISSION OF THE INSTITUTION

### VISION

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

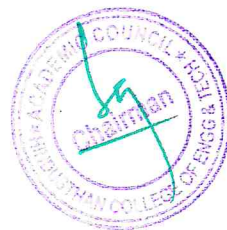
### MISSION

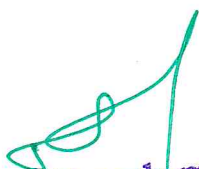
IM1: To provide academic excellence in technical education through novel teaching methods.

IM2: To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.

  
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## VISION AND MISSION OF THE DEPARTMENT

### VISION


To become a Centre of Excellence in Electrical and Electronics Engineering, in every facet of Engineering Education.

### MISSION

- M1. Provide a solid foundation in basic science, mathematics and engineering fundamentals enhancing the student's capability to identify, formulate, analyze and develop solutions for Engineering problems.
- M2. Create an ambiance for the students to develop and flourish their technical skills, design knowledge and innovative ideas to address the environmental issues and sustainable development of the society.
- M3. Inculcate moral values and leadership qualities to meet the challenges of life with courage and confidence.

  
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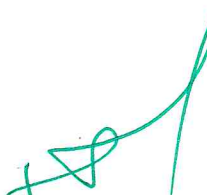
## PROGRAM OUTCOMES (POs)

**Engineering Graduates will be able to:**

- PO 1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- PO 2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- PO 4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- PO 5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

  
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- PO 6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- PO 7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- PO 8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- PO 9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- PO10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- PO11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

  
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## PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1. To analyze and ability to choose appropriate techniques to modernize existing infrastructure in accordance with industry standards

PSO 2. To develop effective communication skills and leadership qualities and ethical responsibilities to meet society's and the electrical industry's global technological challenges.

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)


PEO 1. Post Graduates shall have a good understanding in analyzing and designing embedded systems, as well as technical and professional experience.

PEO 2. Post Graduates shall work in industry as engineers, innovators, or entrepreneurs on technology development, deployment, or engineering system implementation.

PEO 3. Post Graduates adhere to high ethical and technical standards and contribute to society's advancement through scientific research.



  
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# **CURRICULUM**

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS  
CBCS PATTERN  
POSTGRADUATE PROGRAMMES  
M.E EMBEDDED SYSTEMS –R2020

REGULATION-2020

For the students admitted during the academic year 2021-2022 and onwards  
SEMESTER I

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
<b>THEORY</b>										
1	20MA1105	Advanced Mathematics for Electrical Engineering	BS	3	1	0	4	40	60	100
2	20ES1201	Advanced Digital system Design	PC	3	0	0	3	40	60	100
3	20ES1202	Embedded Systems Design	PC	3	0	0	3	40	60	100
4	20ES1203	Microcontroller Based System Design	PC	3	0	0	3	40	60	100
5	20ES1204	Software for Embedded Systems	PC	3	0	0	3	40	60	100
<b>PRACTICAL</b>										
6	20ES1001	Embedded Controllers Laboratory	PC	0	0	4	2	50	50	100
7	20ES1701	Technical Seminar	ES	0	0	2	1	0	100	100
<b>MANDATORY COURSES</b>										
8	20AC10XX	AUDIT COURSE I	AC	2	0	0	0	100	0	100
<b>Total Credits:</b>				<b>17</b>	<b>1</b>	<b>6</b>	<b>19</b>	<b>350</b>	<b>450</b>	<b>800</b>

SEMESTER II

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
<b>THEORY</b>										
1	20ES2201	Real Time Operating System	PC	3	0	0	3	40	60	100
2	20ES2202	Internet of Things	PC	3	0	0	3	40	60	100
3	20ES23XX	Professional Elective I	PE	3	0	0	3	40	60	100
4	20ES23XX	Professional Elective II	PE	3	0	0	3	40	60	100
5	20ES23XX	Professional Elective III	PE	3	0	0	3	40	60	100
<b>PRACTICAL</b>										
6	20ES2001	Real time and Embedded System Laboratory	PC	0	0	4	2	50	50	100
7	20ES2901	MINI PROJECT	PC	2	0	0	2	50	50	100
<b>MANDATORY COURSES</b>										
8	20AC20XX	AUDIT COURSE II	AC	2	0	0	0	100	0	100
<b>Total Credits:</b>				<b>19</b>	<b>0</b>	<b>4</b>	<b>19</b>	<b>400</b>	<b>400</b>	<b>800</b>



**LIST OF PROFESSIONAL ELECTIVES**

**PROFESSIONAL ELECTIVE I, II & III**

S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
<b>THEORY</b>										
1	20ES2301	Advanced Digital Signal Processing	PE	3	0	0	3	40	60	100
2	20ES2302	Research Methodology	PE	3	0	0	3	40	60	100
3	20ES2303	Digital Image Processing	PE	3	0	0	3	40	60	100
4	20ES2304	Computer Architecture and Parallel Processing	PE	3	0	0	3	40	60	100
5	20ES2305	Embedded Linux	PE	3	0	0	3	40	60	100
6	20ES2306	Robotics and Control	PE	3	0	0	3	40	60	100
7	20ES2307	Electromagnetic Interference and Compatibility	PE	3	0	0	3	40	60	100
8	20ES2308	Python Programming	PE	3	0	0	3	40	60	100
9	20ES2309	Automotive Embedded System	PE	3	0	0	3	40	60	100
10	20ES2310	ASIC and FPGA Design	PE	3	0	0	3	40	60	100

**AUDIT COURSES – I**

S.No.	Course Code	Course Title	L	T	P	C
<b>THEORY</b>						
1	20AC1091	English for Research Paper writing	2	0	0	0
2	20AC1092	Disaster Management	2	0	0	0
3	20AC1093	Sanskrit for Technical knowledge	2	0	0	0
4	20AC1094	Value Education	2	0	0	0
5	20AC1095	Constitution of India	2	0	0	0

**AUDIT COURSES - II**

S.No.	Course Code	Course Title	L	T	P	C
<b>THEORY</b>						
1	20AC2091	Pedagogy Studies	2	0	0	0
2	20AC2092	Stress Management by Yoga	2	0	0	0
3	20AC2093	Personality Development Through Life Enlightenment Skills	2	0	0	0
4	20AC2094	Unnat Bharat Abhiyan	2	0	0	0

**CREDIT DISTRIBUTION**

Semester	I	II	III	IV	TOTAL
Credits	19	19	19	15	72

  
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# **SYLLABUS**

**SEMESTER-I**

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20MA1105	ADVANCED MATHEMATICS FOR ELECTRICAL ENGINEERING	3	1	0	4

- Course Objective
1. Apply various analytical skills in applied mathematics with the tactics of problem solving and logical thinking of electrical engineering.
  2. Analyze problems in electrical engineering using matrix theory.
  3. To understand the knowledge of the linear programming problems.
  4. To cultivate a mathematical attitude and nurture the interests in Stochastic and Special Random Processes.

Unit	Description	Instructional Hours
	<b>LINEAR ALGEBRA</b>	
I	Linear equations and matrix Algebra: System of linear equations and its solutions sets, elementary row operations and echelon form, matrix operations, invertible matrices	12
	<b>MATRIX THEORY</b>	
II	Cholesky decomposition - Generalized Eigenvectors - Canonical basis - QR Factorization – Least squares method – Singular value decomposition.	12
	<b>LINEAR PROGRAMMING PROBLEMS</b>	
III	Linear Programming problems - Simplex method - Big M technique - Duality - Simple problems in Game Theory.	12
	<b>STOCHASTIC PROCESSES</b>	
IV	Classification of random processes - Strictly and wide sense stationary processes - Ergodic process -Auto correlation - Cross correlation - Properties and problems - Power spectral density functions	12
	<b>SPECIAL RANDOM PROCESSES</b>	
V	Markov process - Poisson process - Gaussian process - Linear time invariant systems - Linear System with random inputs - Autocorrelation and cross correlation functions of input and output.	12
	<b>Total Instructional Hours</b>	<b>60</b>


- Course Outcome
- CO1: Apply various methods to solve system of linear equations.  
 CO2: Apply matrix theory in Electrical Engineering problems.  
 CO3: Apply the knowledge of linear programming problem.  
 CO4: Apply the concept of power spectral density functions.  
 CO5: Apply the fundamental knowledge of the Markov and Poisson processes.

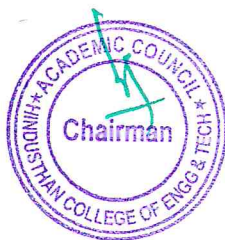
**TEXT BOOK**

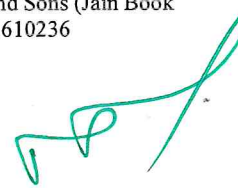
- T1 - O'Neil, P.V., "Advanced Engineering Mathematics", Thomson Asia Pvt. Ltd., Singapore, 2010.  
 T2 - Bronson, R. "Matrix Operation", Schaum's outline series, 2nd Edition, McGraw Hill, 2011.  
 T3 - Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2010.

**REFERENCE BOOKS**

- R1 - Kreyszig.E."Advanced Engineering Mathematics", Tenth Edition, John Wiley and sons (Asia) limited, 2017  
 R2 - Taha, H.A., "Operations Research, An Introduction", 9th Edition, Pearson education, New Delhi, 2016.  
 R3 - David C Lay, Linear Algebra and its applications, Pearson Education Publishers 3rd Edition 2004.  
 R4 - KantiSwarup, P.K. Gupta and Man Mohan, Operations Research Sultan Chand and Sons (Jain Book Agency Publishers Paper Back) 17th Edition 2014 Reprint New Delhi ISBN: 9789351610236

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1201	ADVANCED DIGITAL SYSTEM DESIGN	3	0	0	3

- Course Objective
1. Basic concepts of Sequential Circuit Design.
  2. Basic concepts of Asynchronous Sequential Circuit Design.
  3. Learn the concepts of fault modeling and fault - tolerant systems
  4. Study the concepts of programmable logic devices.
  5. Apply the concepts of System Design Using Verilog and Programmable Devices

Unit	Description	Instructional Hours
	<b>SEQUENTIAL CIRCUIT DESIGN</b>	
I	Analysis of clocked synchronous sequential circuits and modeling- State diagram, state table, state table assignment and reduction-Design of synchronous sequential circuits - ASM chart and realization using ASM.	9
	<b>ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN</b>	
II	Analysis of asynchronous sequential circuit – flow table reduction-races-state assignment-transition table and problems in transition table- design of asynchronous sequential circuit-Static, dynamic and essential hazards – data synchronizers – mixed operating mode asynchronous circuits – designing vending machine controller	9
	<b>FAULT DIAGNOSIS AND TESTABILITY ALGORITHMS</b>	
III	Fault table method-path sensitization method – Boolean difference method-D algorithm - Tolerance techniques – The compact algorithm – Fault in PLA – Test generation-DFT schemes – Built in self test.	9
	<b>SYNCHRONOUS DESIGN USING PROGRAMMABLE DEVICES</b>	
IV	Programming logic device families – Designing a synchronous sequential circuit using PLA/PAL – Realization of finite state machine using PLD – FPGA – Xilinx FPGA-Xilinx 4000	9
	<b>SYSTEM DESIGN USING VERILOG</b>	
V	Hardware Modelling with Verilog HDL – Logic System, Data Types and Operators For Modelling in Verilog HDL - Behavioral Descriptions in Verilog HDL – HDL Based Synthesis – Synthesis of Finite State Machines– structural modeling – compilation and simulation of Verilog code –Test bench - Realization of combinational and sequential circuits using Verilog – Registers – counters – sequential machine – serial adder – Multiplier- Divider – Design of simple microprocessor.	9
<b>Total Instructional Hours</b>		<b>45</b>

- Course Outcome
- CO1: Design and analysis of sequential circuit.  
CO2: Design and analysis of asynchronous sequential circuit.  
CO3: Explore fault diagnosis and testability algorithm  
CO4: Learn of programmable logic devices.  
CO5: Design and analysis of hardware description languages.

**TEXT BOOKS:**

- T1 Charles H.Roth Jr “Fundamentals of Logic Design” Thomson Learning 2004  
T2 M.D.Ciletti , Modeling, Synthesis and Rapid Prototyping with the Verilog HDL, Prentice Hall, 1999.

**REFERENCE BOOKS:**

- R1 M.G.Arnold, Verilog Digital – Computer Design, Prentice Hall (PTR), 1999.  
R2 Parag K.Lala “Digital system Design using PLD” B S Publications,2003  
R3 Nripendra N Biswas “Logic Design Theory” Prentice Hall of India,2001  
R4 Parag K.Lala “Fault Tolerant and Fault Testable Hardware Design” B S Publications,2002

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1202	EMBEDDED SYSTEMS DESIGN	3	0	0	3

- Course Objective
1. Understand the design challenges and methodologies of embedded system
  2. Study general and single purpose processor and its development
  3. Understand bus structures
  4. Learn the embedded system design procedurs for various processes
  5. Study the embedded software tools for RTOS

Unit	Description	Instructional Hours
I	<b>EMBEDDED SYSTEM OVERVIEW</b> Embedded System Overview, Design Challenges – Optimizing Design Metrics, Design Methodology, RT-Level Combinational and Sequential Components, Optimizing Custom Single-Purpose Processors.	9
II	<b>GENERAL AND SINGLE PURPOSE PROCESSOR</b> Basic Architecture, Pipelining, Superscalar and VLIW architectures, Development Environment: Application-Specific Instruction-Set Processors (ASIPs) Microcontrollers, Timers, Counters and watchdog Timer, UART and Analog-to-Digital Converters, Memory Concepts.	9
III	<b>BUS STRUCTURES</b> Basic Protocol Concepts, Microprocessor Interfacing – I/O Addressing, Port and Bus-Based I/O, Arbitration, Serial Protocols, I <sup>2</sup> C, CAN and USB, Parallel Protocols – PCI and ARM Bus, Wireless Protocols – IRDA, Bluetooth, IEEE 802.11.	9
IV	<b>STATE MACHINE AND CONCURRENT PROCESS MODELS</b> Basic State Machine Model, Finite-State Machine with Data path Model, Concurrent Process Model, Communication among Processes, Synchronization among processes, Dataflow Model, Real-time Systems, Automation: Synthesis, Intellectual Property Cores, Design Process Models.	9
V	<b>EMBEDDED SOFTWARE DEVELOPMENT TOOLS AND RTOS</b> Compilation Process – Libraries – Porting kernels – C extensions for embedded systems – Emulation and debugging techniques – RTOS – System design using RTOS.	9
<b>Total Instructional Hours</b>		<b>45</b>

- Course Outcome
- CO1: Identify the various embedded system design  
CO2: Evaluate the general and single purpose processors  
CO3: Compare various bus structures  
CO4: Recognize the process models  
CO5: Apply the embedded software development tools

**TEXT BOOKS:**

- T1 Bruce Powel Douglas, “Real time UML, second edition: Developing efficient objects for embedded systems”, 3rd Edition 1999, Pearson Education.  
T2 Frank Vahid and Tony Gwargie, “Embedded System Design”, John Wiley & sons, 2002.

**REFERENCE BOOKS:**

- R1 Daniel W. Lewis, “Fundamentals of embedded software where C and assembly meet”, Pearson Education, 2002.  
R2 Steve Heath, “Embedded System Design”, Elsevier, Second Edition, 2004.  
R3 Jonathan W. Valvano: “Embedded Microcomputer Systems – Real Time Interfacing”, Cengage Learning; Third of later edition  
R4 Osborn. G, “Embedded microcontroller and processor design”, Pearson

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1203	MICROCONTROLLER BASED SYSTEM DESIGN	3	0	0	3

- Course Objective
- To introduce the fundamentals of microcontroller based system design.
  - To teach I/O and RTOS role on microcontroller.
  - To know Microcontroller based system design, applications.
  - To teach I/O interface in system Design
  - To involve Discussions/Practice/Exercise on revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills.

Unit	Description	Instructional Hours
I	<b>8051 ARCHITECTURE</b> Architecture – memory organization – addressing modes – instruction set – Timers - Interrupts - I/O ports, Interfacing I/O Devices–Serial Communication	9
II	<b>8051 PROGRAMMING</b> Assembly language programming – Arithmetic Instructions – Logical Instructions –Single bit Instructions – Timer Counter Programming – Serial Communication Programming, Interrupt Programming, LCD digital clock, thermometer – Significance of RTOS for 8051	9
III	<b>PIC MICROCONTROLLER</b> 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	9
IV	<b>PERIPHERAL OF PIC MICROCONTROLLER</b> Timers – Interrupts, I/O ports- I2C bus-A/D converter-UART- CCP modules -ADC, DAC and Sensor Interfacing –Flash and EEPROM memories.	9
V	<b>SYSTEM DESIGN – CASE STUDY</b> Interfacing LCD Display – Keypad Interfacing - Generation of Gate signals for converters and Inverters - Motor Control – Controlling DC/ AC appliances – Measurement of frequency - Standalone Data Acquisition System	9
<b>Total Instructional Hours</b>		<b>45</b>

- Course Outcome
- CO1: 8-bit microcontrollers, learn assembly and C-programming of PIC.  
CO2: Learn Interfacing of Microcontroller.  
CO3: Learners will study about PIC microcontroller and system design.  
CO4: The course would enable students to enrich their knowledge with hands on experiments and project based learning  
CO5: Effectively utilize microcontroller software development tools such as a compiler, make files, or compile scripts

**TEXT BOOKS:**

- T1 Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey 'PIC Microcontroller and Embedded Systems using Assembly and C for PIC18', Pearson Education 2008  
T2 Rajkamal, "Microcontrollers Architecture, Programming Interfacing, & System Design, Pearson, 2012

**REFERENCE BOOKS:**

- R1 Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi 'AVR Micro controller and Embedded Systems using Assembly and C', Pearson Education 2014.  
R2 Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, 'The 8051 Microcontroller and Embedded Systems' Prentice Hall, 2005.  
R3 John Iovine, 'Pic Microcontroller Project Book', McGraw Hill 2000  
R4 Senthil Kumar, Saravanan, Jeevanathan, "microprocessor & microcontrollers, Oxford, 2013.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1204	SOFTWARE FOR EMBEDDED SYSTEMS	3	0	0	3

- To impart knowledge on
- COURSE OBJECTIVE**
- To expose the students to the fundamentals of embedded Programming.
  - To Introduce the GNU C Programming Tool Chain in Linux.
  - To study basic concepts of embedded C Embedded OS & Python Programming
  - To introduce time driven architecture, Serial Interface with a case study.
  - To involve Discussions/Practice/Exercise on revising & familiarizing the concepts acquire over the 5 Units of the subject for improved employability skills.

Unit	Description	Instructional Hours
	<b>EMBEDDED PROGRAMMING</b>	
I	C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - C Preprocessor - Advanced Types - Simple Pointers - Debugging and Optimization - In-line Assembly.	9
	<b>C PROGRAMMING TOOL CHAIN IN LINUX</b>	
II	C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using <i>gprof</i> - Memory Leak Detection with <i>valgrind</i> - Introduction to GNU C Library	9
	<b>EMBEDDED C</b>	
III	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.	9
	<b>EMBEDDED OS</b>	
IV	Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer0 and Timer1, Portability issue, Alternative system architecture, Important design considerations when using sEOS - Memory requirements - embedding serial communication & scheduling data transmission - Case study: Intruder alarm system	9
	<b>PYTHON PROGRAMMING</b>	
V	Basics of PYTHON Programming Syntax and Style - Python Objects - Dictionaries - comparison with C programming on Conditionals and Loops - Files - Input and Output - Errors and Exceptions - Functions - Modules - Classes and OOP - Execution Environment.	9
	<b>TOTAL INSTRUCTIONAL HOURS</b>	<b>45</b>

- COURSE OUTCOME**
- CO1: Ability to use GNU C to develop embedded software.  
 CO2: Knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware  
 CO3: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design

**TEXT BOOKS:**

- T1 Steve Oualline, 'Practical C Programming 3<sup>rd</sup> Edition', O'Reilly Media, Inc, 2006.  
 T2 Michael J Pont, "Embedded C", Pearson Education, 2007

**REFERENCES:**

- R1 Christian Hill, Learning Scientific Programming with Python, CAMBRIDGE UNIVERSITY PRESS, 2016.  
 R2 Wesley J. Chun, "Core python application Programming 3<sup>rd</sup> Edition", Pearson Educat, 2016.  
 R3 Mark J. Guzdial, "Introduction to computing and programming in python - a Multimedia approach, 4<sup>th</sup> edition, Pearson Education, 2015.  
 R4 Stephen Kochan, "Programming in C", 3<sup>rd</sup> Edition, Sams Publishing, 2009.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1001	EMBEDDED CONTROLLERS LABORATORY	0	0	4	2

- Course Objective
1. Impart the knowledge on Interfacing of different Processor.
  2. Testing of flash controller programming.
  3. Analyze of process control and PCB designing.
  4. Intend and analysis of modulator and demodulator.
  5. Design system using instrumentation amplifier.

Expt. No.	Description of the experiments
1	Interface matrix keyboard with microcontroller and display the key pressed on seven segment display
2	Program to read analog voltage applied at the input and display
3	Program to generate a PWM waveform
4	Interfacing LCD
5	Analog sensor interfacing
6	Serial communication
7	Motor control applications
8	Traffic control system
9	Wireless networking using ZigBee
10	PWM based motor Control

**Total Practical Hours 45**

Course Outcome

- CO1: Able to interface peripheral devices with embedded processors.
- CO2: Can choose appropriate microcontroller for the design specification with reference to a real time problem.
- CO3: Ability to troubleshoot embedded based hardware devices.
- CO4: Propose interfaces using embedded processors.
- CO5: Design and Analysis of real time operating systems.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES1701	TECHNICAL SEMINAR	0	0	2	1

Course Objective	<ol style="list-style-type: none"> <li>1. Prepare Engineering developments, prepare, and present on technical topics.</li> <li>2. Usage of various teaching aids such as overhead projectors, power point presentation and demonstrative models.</li> </ol>
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### Description

During the seminar session, each student is expected to prepare and present a topic on engineering/technology, for duration of about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar.

Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.

Three member departmental committee headed by Head of the Department will evaluate the student attendance, presentation, report and conduct viva-voce examination to award marks appropriately. Evaluation is 100% internal mode.

**Total Instructional Hours 30**

Course Outcome

- CO1: Prepare and present a topic on engineering subjects
- CO2: Prepare and present general topics effectively with good communication skills
- CO3: Categorize the available teaching aids and use them in their presentations.
- CO4: Discuss their ideas with confidence.
- CO5: Transfer their technical or general knowledge to others with confidence.

  
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**SEMESTER-II**

PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2201	REAL TIME OPERATING SYSTEM	3	0	0	3

- Course Objectives
1. Expose the students to the fundamentals of interaction of OS with a computer and User computation.
  2. Teach the fundamental concepts of how process are created and controlled with OS.
  3. Study on programming logic of modeling Process based on range of OS features
  4. Compare types and Functionalities in commercial OS, application development using RTOS
  5. Involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills

Unit	Description	Instructional hours
<b>I</b>	<b>REVIEW OF OPERATING SYSTEMS</b> Basic Principles - Operating System structures – System Calls – Files – Processes – Design and Implementation of processes – Communication between processes – Introduction to Distributed operating system – Embedded operating systems	9
<b>II</b>	<b>OVERVIEW OF RTOS</b> RTOS Task and Task state –Multithreaded Preemptive scheduler- Process Synchronization- Message queues– Mail boxes -pipes – Critical section – Semaphores – Classical synchronization problem – Deadlocks	9
<b>III</b>	<b>REAL TIME MODELS AND LANGUAGES</b> Event Based – Process Based and Graph based Models – Real Time Languages – RTOS Tasks – RT scheduling - Interrupt processing – Synchronization – Control Blocks – Memory Requirements.	9
<b>IV</b>	<b>REAL-TIME KERNEL</b> Principles – Design issues – Polled Loop Systems – RTOS Porting to a Target – Comparison and Basic study of various RTOS like – VX works – Linux supportive RTOS – C Executive.	9
<b>V</b>	<b>APPLICATION DEVELOPMENT</b> Discussions on Basics of Linux supportive RTOS – uCOS-C Executive for development of RTOS Application – Case study	9
<b>Total instructional hours</b>		<b>45</b>

- Course Outcomes
- CO1: Explain the operating system structures and types.  
 CO2: Insight into scheduling, disciplining of various processes execution.  
 CO3: Describe the various RTOS support modelling  
 CO4: Explain the commercial RTOS Suite features to work on real time Processes design.  
 CO5: Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in RTOS and embedded automation design.

**TEXT BOOKS:**

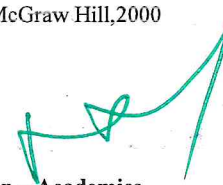
- T1. Silberschatz, Galvin, Gagne” Operating System Concepts, 6th ed, John Wiley, 2003  
 T2. Charles Crowley, “Operating Systems-A Design Oriented approach” McGraw Hill, 1997

**REFERENCE BOOKS:**

- R1. Raj Kamal, “Embedded Systems- Architecture, Programming and Design” Tata McGraw Hill, 2006.  
 R2. Karim Yaghmour, Building Embedded Linux System”, O’reilly Pub, 2003  
 R3. Mukesh Sigal and N G Shi “Advanced Concepts in Operating System”, McGraw Hill, 2000

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2202	INTERNET OF THINGS	3	0	0	3

- To impart knowledge on
- COURSE OBJECTIVE
1. Impart the outline knowledge on fundamentals of IoT
  2. Study the Internal structures and layers of IoT
  3. Identification of IoT protocols and wireless technology
  4. Gain the different platforms of IoT attributes and Data analytics
  5. Familiarize the different applications of IoT as a case study.

Unit	Description	Instructional Hours
	<b>INTRODUCTION TO INTERNET OF THINGS</b>	
I	Overview, Technology drivers, Business drivers, Typical IoT applications, Trends and implications	6
	<b>IOT ARCHITECTURE</b>	
II	Node Structure-Sensing, Processing, Communication, Powering, Networking- Topologies Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy, beacons.	12
	<b>PROTOCOLS AND WIRELESS TECHNOLOGY FOR IOT</b>	
	<b>Protocols:</b>	
III	NFC, RFID, Zigbee MIPI, M-PHY, UniPro, SPMI, SPI, M-PCIe Wired vs. Wireless communication, GSM, CDMA, LTE, GPRS, small cell.	9
	<b>Wireless technologies for IoT:</b> WiFi (IEEE802.11), Bluetooth / Bluetooth Smart, ZigBee / Zig Bee Smart, UWB (IEEE 802.15.4), 6LoWPAN, Proprietary systems	
	<b>DATA ANALYTICS FOR IOT</b>	
	<b>Services/Attributes:</b>	
IV	Big-Data Analytics and Visualization, Dependability, Security, Maintainability.	9
	<b>Data analytics for IoT:</b> A framework for data-driven decision making, Descriptive, Predictive and Prescriptive Analytics, Business Intelligence and Artificial Intelligence	
	Importance of impact and open innovation in data-driven decision making	
	<b>CASE STUDIES</b>	
V	Home Automation, smart cities, Smart Grid, Electric vehicle charging, Environment, Agriculture, Productivity Applications	9
<b>TOTAL INSTRUCTIONAL HOURS</b>		<b>45</b>

- COURSE OUTCOME
- CO1: Understand and Develop on the basic's concepts of IoT and its present developments.  
CO2: Identify the IoT structures and components related to IoT.  
CO3: Infer the protocols that associated with IoT.  
CO4: Develop and apply the platform for IoT in data analytics and its services or attributes.  
CO5: Discover the smart applications and control used by IoT

**TEXT BOOKS:**

- T1 Arshdeep Bahga and Vijai Madisetti: A Hands-on Approach "Internet of Things", Universities Press 2015.  
T2 Oliver Hersent, David Boswarthick and Omar Elloumi "The Internet of Things", Wiley, 2016

**REFERENCES:**

- R1 Samuel Greengard, "The Internet of Things", The MIT Press, 2015  
R2 Adrian McEwen and Hakim Cassimally "Designing the Internet of Things", Wiley, 2014.  
R3 Jean-Philippe Vasseur, Adam Dunkels, "Interconnecting Smart Objects with IP: The Next Internet", Morgan Kaufmann Publishers, 2010.  
R4 Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons, 2014

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2001	REAL TIME AND EMBEDDED SYSTEM LABORATORY	0	0	4	2

- Course Objective
1. Understand the design challenges of ARM processor in embedded system
  2. Study general of I/O Interfacing
  3. Understand and study of different types of microcontrollers.
  4. Learn the embedded system design real time system
  5. Study the embedded software tools for RTOS

**EXPT. No Description of the Experiments**

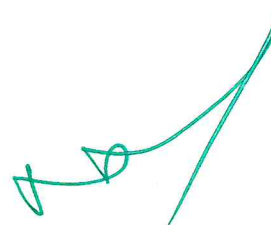
1. Programming ARM processor: ARM7 /ARM9/ARM Cortex
2. Study on in circuit Emulators, cross compilers, debuggers
3. I/O Programming with ARM processor: ARM7 /ARM9/ARM Cortex Microcontrollers I/O Interfacing: Timers/Interrupts/Serial port programming/PWM Generation/Motor Control/ADC/DAC/ LCD/RTC Interfacing/ Sensor Interfacing
4. Programming with Rasberry Pi Microcontroller Board: Study on in circuit Emulators, cross compilers, debuggers
5. Creating a Make file for an Embedded Application
6. Task Management and Resource Management using Open Source Real-Time Kernel
7. Inter-task Communication in Open Source Real-Time Kernel
8. Interrupt Management and Memory Management using Open Source Real-Time Kernel
9. Performance Evaluation of Single-core and Multi-core Scheduling Algorithms
10. Programming & Simulation in Python Simulators/Tools/others

**Total Practical Hours 45**

- Course Outcome
- CO1: Identify the various embedded system design
  - CO2: Evaluate the general and input and output interfacing
  - CO3: Compare various microcontrollers
  - CO4: Recognize the real time application
  - CO5: Apply the real time software development tools.

  
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PROGRAMME	COURSE CODE	PROFESSIONAL ELECTIVE-I, II & III NAME OF THE COURSE	L	T	P	C
M.E.	20ES2301	ADVANCED DIGITAL SIGNAL PROCESSING	3	0	0	3

- Course Objective
- 1.To understand Discrete-time signal transforms, digital filter design, optimal filtering
  2. To analyze and design Power spectrum estimation.
  - 3.To study and analyze the multi-rate digital signal processing
  4. To study and Design adaptive Filters.
  5. To understand and design multi-rate digital signal processing.

Unit	Description	Instructional Hours
	<b>DISCRETE RANDOM SIGNAL PROCESSING</b>	
I	Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem, special types of random process – Signal modeling-Least Squares method, Pade approximation, Prony’s method, iterative Prefiltering, Finite Data records, Stochastic Models	9
	<b>SPECTRUM ESTIMATION</b>	
II	Non-Parametric methods - Correlation method - Co-variance estimator - Performance analysis of estimators – Unbiased consistent estimators - Periodogram estimator - Barlett spectrum estimation - Welch estimation - Model based approach - AR, MA, ARMA Signal modeling -Parameter estimation using Yule-Walker method.	9
	<b>LINEAR ESTIMATION AND PREDICTION</b>	
III	Maximum likelihood criterion - Efficiency of estimator - Least mean squared error criterion - Wiener filter - Discrete Wiener Hoff equations - Recursive estimators - Kalman filter – Linear prediction, Prediction error - Whitening filter, Inverse filter - Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.	9
	<b>ADAPTIVE FILTERS</b>	
IV	FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Widrow Hoff LMS Adaptive algorithm - Adaptive channel equalization - Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters – Exponentially weighted RLS - Sliding window RLS - Simplified IIR LMS Adaptive filter	9
	<b>MULTIRATE DIGITAL SIGNAL PROCESSING</b>	
V	Mathematical description of change of sampling rate - Interpolation and Decimation - Continuous time model - Direct digital domain approach - Decimation by integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Applications to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.	9
<b>Total Instructional Hours</b>		<b>45</b>

- Course Outcome
- CO1: Identify various arithmetic and geometrical operations for random signals.  
CO2: Analyze the spectrum estimation.  
CO3: Analyze linear estimation and Prediction.  
CO4: Design the adaptive Filters.  
CO5: Analyze the multirate digital signal processing

**TEXT BOOKS:**

- T1-Monson H. Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons Inc., New York, 2006  
T2- Sophoncles J. Orfanidis, “Optimum Signal Processing“, McGraw-Hill, 2000

**REFERENCE BOOKS:**

- R1 John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing”, Prentice Hall of India, New Delhi, 2005.  
R2 Simon Haykin, “Adaptive Filter Theory”, Prentice Hall, Englehood Cliffs, NJ1986.  
R3 P. P. Vaidyanathan, “Multirate Systems and Filter Banks”, Prentice Hall, 1992  
R4 N. J. Fliege, ”Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets”, Wiely, 1999

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2302	RESEARCH METHODOLOGY	3	0	0	3

- Course Objectives
1. Impart scientific knowledge for carrying out research work effectively.
  2. Understand the concepts in various research designs.
  3. Acquire knowledge about Experimental design and Data collection
  4. Confer about the multivariate analysis techniques
  5. Disseminate knowledge on Research Practices and Report writing.

Unit	Description	Instructional hours
I	<b>INTRODUCTION TO RESEARCH</b> Research-Definition-Objectives of research, Meaning of research- Characteristics of research -Importance of research activities- Types of research-Research approaches- Significance-Problems in research- Qualities of good researcher- Research process.	9
II	<b>RESEARCH DESIGN</b> Formulation of the research design: Process-classification of research designs- Exploratory-Secondary resource analysis-Two-tired research design- -Validity in experimentation-factors affecting external validity-classification of experimental design - Pre-experimental- Quasi-experimental designs.	9
III	<b>DATA COLLECTION METHODS</b> Classification of Data-Collection of primary data-Observation-Interview method- Collection of data through Questionnaires-schedules-collection of secondary data- Research applications of secondary data-Benefits and drawbacks-classification of secondary data-Internal –External data sources.	9
IV	<b>MULTIVARIATE ANALYSIS TECHNIQUES</b> Growth of Multivariate techniques-Characteristics and applications-Classification- Variables in multivariate analysis-Important multivariate techniques-Factor analysis- Rotation in factor analysis-R-type and Q type factor analysis-Path analysis.	9
V	<b>RESEARCH PRACTICE AND REPORT WRITING.</b> Literature review-Conference proceedings-Journals-Journal Impact Factor (JFI)- Citation index-h-index-Significance of report writing-Different steps in writing report-Layout of report writing-Types of reports-Mechanics of writing a research report-precautions for writing research reports-Conclusion and Scope for future work-Oral presentation.	9
<b>Total instructional hours</b>		<b>45</b>

- Course Outcomes
- CO1: Observe the various approaches to do research.  
CO2: Carryout the research design.  
CO3: Evaluate the data collection for research activities.  
CO4: Acknowledge the function of Multivariate Analysis Techniques  
CO5: Organize the research activity systematically and prepare research report effectively.

**TEXT BOOKS:**

- T1. C.R. Kothari, Research Methodology Methods & Techniques, NEW Age International (P) Limited, New Delhi, 2007.  
T2. Dr. Deepak Chawla, Dr. Neena Sondhi, Research Methodology concepts and cases, Vikas Publishing House Pvt. Ltd., New Delhi, 2011

**REFERENCE BOOKS:**

- R1. K. Prathapan, Research Methodology for Scientific Research, I.K. International Publishing House Pvt. Ltd. New Delhi, 2014L.  
R2. R. Panneerselvam, Research Methodology, PHI Learning Private Limited, New Delhi, 2011.  
R3. Donald H. McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002.



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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20ES2303	DIGITAL IMAGE PROCESSING	3	0	0	3

- Course Objective
1. The fundamentals of image processing
  2. The techniques involved in image enhancement
  3. The low and high-level features for image analysis
  4. The fundamentals and significance of image compression
  5. The hardware for image processing applications.

Unit	Description	Instructional Hours
I	<b>FUNDAMENTALS OF IMAGE PROCESSING</b> Introduction to image processing systems, sampling and quantization, color fundamentals and models, image operations arithmetic, geometric and morphological. Multi-resolution analysis–image pyramids.	9
II	<b>IMAGE ENHANCEMENT</b> Spatial domain; Gray-level transformations – histogram processing – spatial filtering, smoothing and sharpening. Frequency domain: filtering in frequency domain – DFT, FFT, DCT – smoothing and sharpening filters–Homomorphic filtering. Image enhancement for remote sensing images and medical images.	9
III	<b>IMAGE SEGMENTATION AND FEATURE ANALYSIS</b> Detection of discontinuities – edge operators – edge linking and boundary detection, thresholding –feature analysis and extraction – region based segmentation – morphological watersheds – shape skeletonization, phase congruency. Number plate detection using segmentation algorithm	9
IV	<b>IMAGE COMPRESSION</b> Image compression: fundamentals–models–elements of information theory–error free compression–lossy compression–compression standards. Applications of image compression techniques in video and image transmission	9
V	<b>EMBEDDED IMAGE PROCESSING</b> Introduction to embedded image processing. ASIC vs FPGA - memory requirement, power consumption, parallelism. Design issues in VLSI implementation of Image processing algorithms - interfacing. Hardware implementation of image processing algorithms: Segmentation and compression	9
<b>Total Instructional Hours</b>		<b>45</b>

- Course Outcome
- CO1: Ability to understand the fundamentals of image processing.
  - CO2: Able to understand the techniques involved in image enhancement.
  - CO3: Ability to gain the knowledge about image compression.
  - CO4: Ability to learn the fundamentals of image compression.
  - CO5: Ability to Formulate hardware for image processing applications

**TEXT BOOKS:**

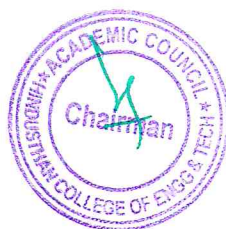
- T1 Rafael C. Gonzalez and Richard E.Woods, “Digital Image processing”, 2<sup>nd</sup> edition, Pearson education, 2003
- T2. Anil K. Jain, “Fundamentals of digital image processing”, Pearson education, 2003

**REFERENCE BOOKS:**

- R1 Milan Sonka, Valclav Halavac and Roger Boyle, “Image processing, analysis and machine vision”, 2<sup>nd</sup> Edition, Thomson learning, 2001
- R2 Mark Nixon and Alberto Aguado, “Feature extraction & Image processing for computer vision”, 3<sup>rd</sup> Edition, Academic press, 2012
- R3 Donald G. Bailey, “Design for Embedded Image processing on FPGAs” John Wiley and Sons, 2011.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2304	COMPUTER ARCHITECTURE AND PARALLEL PROCESSING	3	0	0	3

- Course Objective
1. Basic concepts of computer architecture Design and performance.
  2. Learn the difference between pipeline and parallel processing concepts.
  3. Study Memory Architectures, Memory Technology and Optimization
  4. Basic concepts of multiprocessors.
  5. Study various types of processor architectures and the importance of scalable architectures

Unit	Description	Instructional Hours
I	<b>COMPUTER DESIGN AND PERFORMANCE MEASURES</b> Fundamentals of Computer Design – Parallel and Scalable Architectures – Multiprocessors – Multi-vector and SIMD architectures – Multithreaded architectures – Stanford Dash multiprocessor – KSR1 - Data-flow architectures - Performance Measures.	9
II	<b>PARALLEL PROCESSING, PIPELINING AND ILP</b> Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Pipelining processors -Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors - Performance and Efficiency in Advanced Multiple Issue Processors.	9
III	<b>MEMORY HIERARCHY DESIGN</b> Memory Hierarchy - Memory Technology and Optimizations – Cache memory – Optimizations of Cache Performance – Memory Protection and Virtual Memory - Design of Memory Hierarchies.	9
IV	<b>MULTIPROCESSORS</b> Symmetric and distributed shared memory architectures – Cache coherence issues – Performance Issues – Synchronization issues – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.	9
V	<b>MULTI-CORE ARCHITECTURES</b> Software and hardware multithreading – SMT and CMP architectures – Design issues – Case-studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture – hp architecture.	9
<b>Total Instructional Hours</b>		<b>45</b>

- COURSE OUTCOME**
- CO1: Design and analysis of computer architecture and performance.  
CO2: Learn the difference between pipeline and parallel processing concepts.  
CO3: Analysis of Memory Technology and Optimization  
CO4: Learn the distribution of shared memory architectures.  
CO5: Design and analysis of multi core architecture.

**TEXT BOOKS:**

- T1 David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture: A hardware/ software approach”, Morgan Kaufmann / Elsevier, 1997  
T2 Hwang Briggs, “Computer Architecture and parallel processing”, McGraw Hill, 1984.

**REFERENCE BOOKS:**

- R1 John P. Hayes, “Computer Architecture and Organization”, McGraw Hill  
R2 John P. Shen, “Modern processor design. Fundamentals of super scalar processors”, Tata McGraw Hill 2003  
R3 Kai Hwang, "Advanced Computer Architecture", McGraw Hill International, 2001  
R4 William Stallings, “Computer Organization and Architecture – Designing for Performance”, Pearson Education, Seventh Edition, 2006

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2305	EMBEDDED LINUX	3	0	0	3

- COURSE OBJECTIVE**
1. To expose the students to the fundamentals of linux operating system, its basic commands and shell Programming
  2. To teach the history of embedded linux, various distributions and basics of gnuccross platform tool chain.
  3. To study on different host- target setup, debug and various memory device, file systems and performance tuning.
  4. To introduce the concept of configuring kernel using the cross-platform tool chain.
  5. To involve discussions/practice/exercise onto revising & familiarizing the concepts acquired over the 5 units of the subject for improved employability skills

Unit	Description	Instructional Hours
<b>FUNDAMENTALS OF LINUX</b>		
I	Basic Linux System Concepts: Working with Files and Directories - Introduction to Linux File system -Working with Partitions and File systems - Understanding Linux Permissions; Using Command Line Tools: Executing Commands from the Command Line - Getting to a Shell - Popular Command-Line Commands-Working with the BashShell.	9
<b>VARIOUS DISTRIBUTIONS AND CROSS PLATFORM TOOLCHAIN</b>		
II	Introduction - History of Embedded Linux - Embedded Linux versus Desktop Linux – Commercial Embedded Linux Distribution- Choosing a distribution –Embedded Linux Distributions-Architecture of Embedded Linux – Linux Kernel Architecture – Porting Roadmap – GNU Cross Platform Tool chain.	9
<b>HOST-TARGET SETUP AND OVERALL ARCHITECTURE</b>		
III	Real Life Embedded Linux Systems - Design and Implementation Methodology - Types of Host/Target Development Setups - Types of Host/Target Debug Setups - Generic Architecture of an Embedded Linux System - System Startup - Types of Boot Configurations - System Memory Layout – Processor Architectures-Buses and Interfaces-I/O – Storage.	9
<b>KERNEL CONFIGURATION</b>		
IV	A Practical Project Workspace-GNU Cross-Platform Development Tool chain-C Library Alternatives-Other Programming Languages-Eclipse: An Integrated Development Environment-Terminal Emulators - Selecting a Kernel - Configuring the Kernel - Compiling the Kernel - Installing the Kernel –Basic Root File System Structure-Libraries.	9
<b>LINUX DRIVERS</b>		
V	Introduction in to basics on Linux drivers, Introduction to GNU cross platform Toolchain-Case study on programming one serial driver for developing application using Linux Driver.	9
<b>Total Instructional Hours:</b>		<b>45 Hours</b>

**Course Outcome**

CO1: To use Linux desktop and GNU tool chain with Eclipse IDE  
CO2: Cross compile Linux kernel and port it to target board.  
CO3: Add applications and write customized application for the Linux kernel in the target board.  
CO4: Students will study about distributions and cross platform tool chain.  
CO5: Improved Employability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded systems design.

**TEXT BOOKS:**

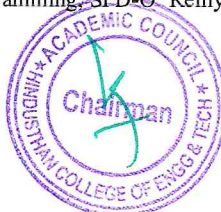
- T1. Karim Yaghmour, Jon Masters, Gilad Ben-Yossef, and Philippe Gerum, 'Building Embedded Linux Systems 2<sup>nd</sup> Edition', SPD -O'Reilly Publications, 2008  
T2. P. Raghavan, Amol Lad, Sriram Neelakandan, "Embedded Linux System Design & Development, Auerbach Publications, 2012

**REFERENCE BOOKS:**

- R1. William von Hagen, 'Ubuntu Linux Bible 3rd Edition', Wiley Publishing Inc., 2010  
R2 Jonathan Corbet, Alessandro Rubini & Greg Kroah-Hartman, 'Linux Device Drivers 3<sup>rd</sup> Edition', SPD-O'Reilly Publications, 2011  
R3 Robert Love, "Linux System Programming, SPD-O'Reilly Publications, 2010.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2306	ROBOTICS AND CONTROL	3	0	0	3

Course Objective		
1.	To introduce robot terminologies and robotic sensors	
2.	To educate forward and inverse kinematic relations	
3.	To educate on formulation of manipulator Jacobians and introduce path planning techniques	
4.	To educate on dynamic modelling	
5.	To introduce robot control techniques	

Unit	Description	Instructional hours
<b>I</b>	<b>INTRODUCTION AND TERMINOLOGIES</b> Definition-Classification-History- Robots components-Degrees of freedom-Robot joints-coordinates-Reference frames-workspace-Robot languages-actuators-sensors-Position, velocity and accelerationsensors-Torque sensors-tactile and touch sensors-proximity and range sensors- vision system-social issues.	9
<b>II</b>	<b>KINEMATICS</b> Mechanism-matrix representation-homogenous transformation-DH representation-Inverse kinematics solution and programming-degeneracy and dexterity	9
<b>III</b>	<b>DIFFERENTIAL MOTION AND PATH PLANNING</b> Jacobian-differential motion of frames-Interpretation-calculation of Jacobian-Inverse Jacobian- Robot Path planning	9
<b>IV</b>	<b>DYNAMIC MODELLING</b> Lagrangian mechanics-Two-DOF manipulator-Lagrange-Euler formulation-Newton-Euler formulation-Inverse dynamics	9
<b>V</b>	<b>ROBOT CONTROL SYSTEM</b> - Linear control schemes- joint actuators- decentralized PID control- computed torque control – force control-hybrid position force control-Impedance/Torque control	9
<b>Total instructional hours</b>		<b>45</b>

Course Outcome	
CO1:	Ability to understand the components and basic terminology of Robotics
CO2:	Able to calculate the forward kinematics and inverse kinematics of serial and parallel robots.
CO3:	Able to calculate the Jacobian for robot and to do the path planning for a robotic system.
CO4:	Able to develop dynamic modelling.
CO5:	Able to perform robot control system.

**TEXT BOOKS:**

- T1. R.K. Mittal and I J Nagrath, "Robotics and Control", Tata Mac Graw Hill, Fourth edition.  
T2. Saeed B.Niku, "Introduction to Robotics", Pearson Education, 2002.

**REFERENCE BOOKS:**

- R1. Fu, Gonzalez and Lee McGrawhill, "Robotics", international edition.  
R2. R.D. Klafter, T A Chmielewski and Michael Negin, "Robotic Engineering, An Integrated approach", Prentice Hall of India, 2003

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2307	ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY	3	0	0	3

- Course Objective
1. Familiarize with the fundamentals that are essential for electronics industry in the field of EMI/EMC
  2. Provide knowledge on various EMI sources and victims.
  3. Identify the various techniques used in EMC (Electromagnetic compatibility)
  4. Design PCB resistant to EMI
  5. Provide the various international standards in EMI Measurements

Unit	Description	Instructional hours
I	<b>EMI/EMC CONCEPTS</b> EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.	9
II	<b>EMI COUPLING PRINCIPLES</b> Sources of Conducted, and radiated interference; Interference coupling by Conduction and Radiation. Common ground impedance coupling; Common mode and ground loop coupling ; Differential mode coupling ; Power mains and Power supply coupling	9
III	<b>EMI CONTROL TECHNIQUES</b> Shielding, Filtering, Grounding, Bonding, Isolation transformer, Transient suppressors, opto isolators, Cable routing, Signal control	9
IV	<b>PCB DESIGN</b> Transmitter, Receiver, Antenna, Power Supply, Motors, Control devices, Digital Circuits, Digital computer Integrated circuit success ability	9
V	<b>EMI MEASUREMENTS AND STANDARDS</b> Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Tx /Rx Antennas, Working Principles of EMI sensing Device; EMI Rx and spectrum analyzer; Civilian standards-CISPR, FCC, IEC, EN; Military standards-MIL461E/462.	9
<b>Total instructional hours</b>		<b>45</b>

- Course Outcome
- CO1: Real world EMC designs constraints and to achieve the most cost effective design that meets all requirements.
- CO2: Diagnose and solve the basic electromagnetic compatibility problems.
- CO3: Designing the electronic system that function without errors or problems that are related to electromagnetic compatibility.
- CO4: Measuring the EMI with various methods and comparing it with standards.
- CO5: Controlling techniques for EMI and EMC.

#### TEXT BOOKS:

- T1. V.P.Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, Newyork, 1996.
- T2. S.Sathyamurthy "Basics of Electromagnetic Compatibility "sams publishers ,2008.

#### REFERENCE BOOKS:

- R1. Henry W.Ott., "Noise Reduction Techniques in Electronic Systems", A Wiley Inter Science, 1992.
- R2. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3<sup>rd</sup> Ed, Artech house, 2008.
- R3. C.R.Paul, "Introduction to Electromagnetic Compatibility", John Wiley and Sons, Inc, 1992.
- R4. Don R.J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V, 1988

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2308	PYTHON PROGRAMMING	3	0	0	3
Course Objectives	1	Students will learn the grammar of Python programming language.				
	2	Students will understand and be able to use the basic programming principles such as datatypes, variable, conditionals, loops, recursion, and function calls.				
	3	Students will learn how to use basic data structures such as List, Dictionary and be able to manipulate text files and images.				
	4	Students will understand the process and will acquire skills necessary to effectively attempt a programming problem and implement it with a specific programming language-Python.				
	5	To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills				

Unit	Description	Instructional Hours
	<b>INTRODUCTION TOPYTHON</b>	
I	Introduction to Python language – Using the interpreter – Python data types and functions – Working with Data – List, Dictionary and Set – Processing Primitives – List comprehensions – File Handling –Object model including Variables, Reference counting, Copying, and Type checking– Error handling.	9
	<b>PROGRAM ORGANIZATION AND FUNCTIONS</b>	
II	Organize Large programs into functions–Python functions including scoping rules and documentation strings–Modules and Libraries–Organize programs into modules–System administration, Text processing, Sub processes, Binary data handling, XML parsing and Database Access–Installing third-party libraries.	9
	<b>CLASSES AND OBJECTS</b>	
III	Introduction to Object-oriented programming – Basic principles of Object-oriented programming in Python – Class definition, Inheritance, Composition, Operator overloading and Object creation – Python special modules – Python Object System – Object representation, Attribute binding, Memory management, and Special properties of classes including properties, slots and private attributes.	9
	<b>TESTING, DEBUGGING AND SOFTWARE DEVELOPMENT PRACTICE</b>	
IV	Python Software development – Use of documentation string – Program testing using doc test and unit test modules – Effective use of assertions–Python debugger and profiler–Iterators and Generators to set up data processing pipelines – An effective technique for addressing common system programming problems (e.g. processing large data files, handling infinite data streams, etc.)	9
	<b>TEXT/OHANDLING</b>	
V	Text generation, Template strings and Unicode-packages – Python Integration Primer – Network programming–Accessing code– Survey on how Python interacts with other language programs.	9
	<b>Total Instructional Hours</b>	<b>45</b>
Course Outcomes	CO1	Students will be able to develop skill in system administration and network programming by learning Python.
	CO2	Students will also learn how to effectively use Python’s very powerful processing primitives, modelling etc
	CO3	etc
	CO4	Students will be able to design object-oriented programs with Python classes Able to Implement database and GUI applications.
	CO5	Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in embedded systems design

**TEXT BOOKS:**

- T1 MarkLutz, " Learning Python, Powerful OOPs,O'reilly,2011  
T2 Robert Sedgewick, Kevin Wayne, Robert Dondero, Intr Programming in Python, Pearson, 2016.

**REFERENCE BOOKS:**

- R1 Mark J. Guzdial, Barbara Ericson, " Introduction to Computing & Programming in Python, 4<sup>th</sup> Edition Pearson, 2015.  
R2 Budd, Timothy. Exploring Python. McGraw-Hillscience,2009.  
R3 Guttag, John. Introduction to Computation and Programming Using Python. MITPress,2013.  
R4 Zelle, John M. Python Programming: An Introduction to Computer Science. 1sted.FranklinBeedle&Associates,2003.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2309	AUTOMOTIVE EMBEDDED SYSTEM	3	0	0	3
Course Objectives	1	To expose the students to the fundamentals and building of Electronic Engine Control systems.				
	2	To teach on functional components and circuits for vehicles				
	3	To discuss on programmable controllers for vehicles				
	4	To teach logics of automation & commercial techniques for vehicle communication				
	5	To involve Discussions/Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills				

Unit	Description	Instructional Hours
	<b>BASICSOE ELECTRONIC ENGINECONTROLSYSTEMS</b>	
I	Motivation, concept for electronic engine controls and management- Standards; introduction to fuel economy- automobile sensors-volumetric, thermal, air-fuel ratio, solenoid, hall effect- exhaust gas oxygen sensors, Oxidizing catalytic efficiency, emission limits and vehicle performance; advantages of using Electronic engine controls–open and closed loop fuel control.	9
	<b>FUELCELLFORAUTOMOTIVE POWER</b>	
II	Fuel cell-Introduction-Proton exchange membrane FC (PEM), Solid oxide fuel cell (SOFC)-properties of fuel cells for vehicles-power system of an automobile with fuel cell based drive, and their characteristics	9
	<b>VEHICLE MANAGEMENT SYSTEMS</b>	
III	Electronic Engine Control-engine mapping, air/fuel ratio spark timing control strategy, fuel control, electronic ignition – Vehicle cruise control – speed control – anti – locking braking system-electronic suspension - electronic steering , wiper control ; Vehicle system schematic for interfacing with EMS,ECU.	9
	<b>AUTOMOTIVE TELEMATICS</b>	
IV	Role of Bluetooth, CAN, LIN and flex ray communication protocols in automotive applications; Multiplexed vehicle system architecture for signal and data / parameter exchange between EMS, ECUs with other vehicle system components and other control systems; Realizing bus interfaces for diagnostics, dashboard display, multimedia electronics.	9
	<b>ELECTRONIC DIAGNOSTICS FOR VEHICLES</b>	
V	System diagnostic standards and regulation requirements –On board diagnosis of vehicles electronic units & electric units- Speedometer, oil and temperature gauges and audio system.	9
	<b>Total Instructional Hours</b>	<b>45</b>
Course Outcomes	CO1 Design and develop automotive embedded systems.	
	CO2 Analyze various embedded products used in automotive industry.	
	CO3 Evaluate the opportunities involving technology, a product or a service required for developing a start up idea used for automotive applications	
	CO4 Improved Employability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded systems design	

**TEXT BOOKS:**

- T1 William B.Ribbens,"Understanding Automotive Electronics", Elseiver,2012  
T2 AliEmedi, Mehrdedehsani, John M Miller, "Vehicular Electric power system - land, Sea, Air and Space Vehicles" Marcel Decker, 2004.

**REFERENCE BOOKS:**

- R1 L.Vlacic, M.Parent, F.Harahima,"Intelligent Vehicle Technologies", SAE International,2001.  
R2 Jack Erjavec, Jeff Arias," Alternate Fuel Technology-Electric, Hybrid & Fuel Cell Vehicles", Cengage ,2012  
R3 Electronic Engine Control technology – Ronald K Jurgen Chilton's guide to Fuel Injection – Ford  
R4 Automotive Electricals/Electronics System and Components, Tom Denton, 3<sup>rd</sup> Edition, 2004.

  
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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
M.E.	20ES2310	ASIC AND FPGA DESIGN	3	0	0	3

Course Objectives	1	2	3	4	5
	To gain knowledge about Design, partitioning, floor planning, placement and routing in ASIC	To study the design flow of different types of ASIC with high performance algorithms	To familiarize the different types of programming technologies and logic devices.	To learn the architecture of different types of FPGA.	To understand the design issues of SOC and to analyse, synthesis, simulate and test systems

Unit	Description	Instructional Hours
	<b>OVERVIEW OF ASIC AND PLD</b>	
I	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.	9
	<b>ASIC PHYSICAL DESIGN</b>	
II	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.	9
	<b>LOGIC SYNTHESIS, SIMULATION AND TESTING</b>	
III	Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low-level design language – 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.	9
	<b>FPGA</b>	
IV	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	9
	<b>SOC DESIGN</b>	
V	System diagnostic standards and regulation requirements –On board diagnosis of vehicles electronic units & electric units-Speedometer, oil and temperature gauges and audio system.	9
	<b>Total Instructional Hours</b>	<b>45</b>

Course Outcomes	CO1	CO2	CO3	CO4	CO5
	Students will develop more understanding on the concepts of ASIC	Students will understand the Design, partitioning, floor planning, placement and routing in ASIC	Students will study about different logic synthesis, simulation and testing technologies in ASIC	Students will acquire knowledge about different types of FPGA	Students will learn System diagnostic standards and regulation requirements

**TEXT BOOKS:**

- T1 Richard Munden, "ASIC and FPGA Verification: A Guide to Component Modeling (Systems on Silicon)", Morgan Kaufman Publishers, 2004  
T2 M.J.S .Smith, "Application Specific Integrated Circuits", Addison -Wesley Longman Inc., 1997

**REFERENCE BOOKS:**

- R1 S. Trimberger, "Field Programmable Gate Array Technology", Kluwer Academic Publications, 1994  
R2 John V.Oldfield, Richard C Dore, "Field Programmable Gate Arrays", Wiley Publications 1995  
R3 P.K.Chan & S. Mourad, "Digital Design Using Field Programmable Gate Array", Prentice Hall, 1994  
R4 Parag.K.Lala, "Digital System Design using Programmable Logic Devices", BSP, 2003.

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC1091	ENGLISH FOR RESEARCH PAPER WRITING	2	0	0	0

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

Unit	Description	Instructional Hours
	<b>INTRODUCTION TO RESEARCH PAPER WRITING</b>	
I	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	06
	<b>PRESENTATION SKILLS</b>	
II	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction	06
	<b>TITLE WRITING SKILLS</b>	
III	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	06
	<b>RESULT WRITING SKILLS</b>	
IV	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	06
	<b>VERIFICATION SKILLS</b>	
V	Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission	06
<b>Total Instructional Hours</b>		<b>30</b>

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

**REFERENCE BOOKS:**

- R1: Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
- R2: Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
- R3: Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
- R4: Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

  
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<b>Programme</b> M.E.	<b>Course Code</b> 20AC1092	<b>Name of the Course</b> DISASTER MANAGEMENT	<b>L</b> 2	<b>T</b> 0	<b>P</b> 0	<b>C</b> 0
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- Course Objective**
1. Summarize basics of disaster
  2. Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
  3. Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
  4. Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
  5. Develop the strengths and weaknesses of disaster management approaches

<b>Unit</b>	<b>Description</b>	<b>Instructional Hours</b>
	<b>INTRODUCTION</b>	
I	Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.	06
	<b>REPERCUSSIONS OF DISASTERS AND HAZARDS</b>	
II	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.	06
	<b>DISASTER PRONE AREAS IN INDIA</b>	
III	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.	06
	<b>DISASTER PREPAREDNESS AND MANAGEMENT</b>	
IV	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.	06
	<b>RISK ASSESSMENT</b>	
V	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	06
	<b>Total Instructional Hours</b>	<b>30</b>

<b>Course Outcome</b>	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

**REFERENCE BOOKS:**

- R1: Goel S. L., "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi, 2009.
- R2: Nishitha Rai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company, 2007.
- R3: Sahni, Pardeep Et. Al. , "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi, 2001.

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC1093	SANSKRIT FOR TECHNICAL KNOWLEDGE	2	0	0	0

**Course Objective**

1. Illustrate the basic sanskrit language.
2. Recognize sanskrit, the scientific language in the world.
3. Appraise learning of sanskrit to improve brainfunctioning.
4. Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
5. Extract huge knowledge from ancient literature.

Unit	Description	Instructional Hours
I	<b>ALPHABETS</b> Alphabets in Sanskrit	06
II	<b>TENSES AND SENTENCES</b> Past/Present/Future Tense - Simple Sentences	06
III	<b>ORDER AND ROOTS</b> Order - Introduction of roots	06
IV	<b>SANSKRIT LITERATURE</b> Technical information about Sanskrit Literature	06
V	<b>TECHNICAL CONCEPTS OF ENGINEERING</b> Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	06
<b>Total Instructional Hours</b>		<b>30</b>

Course Outcome	CO1:	CO2:	CO3:	CO4:	CO5:
	Understanding basic Sanskrit language	Write sentences.	Know the order and roots of Sanskrit.	Know about technical information about Sanskrit literature.	Understand the technical concepts of Engineering.

**REFERENCE BOOKS:**

- R1: "Abhyastakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
- R2: "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
- R3: "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi, 2017.

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC1094	VALUE EDUCATION	2	0	0	0

- Course Objective**
1. Understand value of education and self-development
  2. Imbibe good values in students
  3. Let the should know about the importance of character
  4. To teach and inculcate the importance of value based living.
  5. To give students a deeper understanding about the purpose of life.

Unit	Description	Instructional Hours
	<b>VALUES AND SELF-DEVELOPMENT</b>	
I	Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgements	7
	<b>IMPORTANCE OF CULTIVATION OF VALUES</b>	
II	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline	7
	<b>PERSONALITY AND BEHAVIOR DEVELOPMENT</b>	
III	Personality and Behavior Development–Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	8
	<b>CHARACTER AND COMPETENCE</b>	
IV	Character and Competence–Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.	8
<b>Total Instructional Hours</b>		<b>30</b>

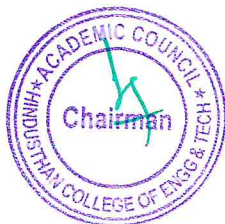
<b>Course Outcome</b>	CO1: Students will understand the importance of value based living.
	CO2: Students will gain deeper understanding about the purpose of their life.
	CO3: Students will understand and start applying the essential steps to become good leaders.
	CO4: Students will emerge as responsible citizens with clear conviction to practice values and ethics in life.
	CO5: Students will become value based professionals and building a healthy nation.

**REFERENCE BOOKS:**

- R1: Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC1095	CONSTITUTION OF INDIA	2	0	0	0

**Course Objective**

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional
3. Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
4. 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
5. To understand the central and state relation, financial and administrative.

Unit	Description	Instructional Hours
I	<b>HISTORY OF MAKING OF THE INDIAN CONSTITUTION &amp; PHILOSOPHY OF THE INDIAN CONSTITUTION</b> History, Drafting Committee, (Composition & Working), Preamble, Salient Features	06
II	<b>CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES</b> 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.	06
III	<b>ORGANS OF GOVERNANCE</b> Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions	06
IV	<b>LOCAL ADMINISTRATION</b> 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	06
V	<b>ELECTION COMMISSION</b> Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.	06
	<b>Total</b>	<b>30</b>
	<b>Instructional Hours</b>	

Course Outcome	CO1:	CO2:	CO3:	CO4:	CO5:
	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	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.

**REFERENCE BOOKS:**

- R1: The Constitution of India, 1950 (Bare Act), Government Publication.  
R2: Dr. S.N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1<sup>st</sup> Edition, 2015.  
R3: M.P. Jain, Indian Constitution Law, 7<sup>th</sup> Edn., Lexis Nexis, 2014.  
R4: D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC2091	PEDAGOGY STUDIES	2	0	0	0

- Course Objective**
1. Review existing evidence on there view topic to inform programme design and policy
  2. Making under taken by the Dfid, other agencies and researchers.
  3. . Identify critical evidence gaps to guide the development.
  4. Identify their Professional Development.
  5. Improve the Research and Future Direction.

Unit	Description	Instructional Hours
	<b>INTRODUCTION AND METHODOLOGY</b>	
I	Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and searching.	06
	<b>THEMATIC OVERVIEW</b>	
II	Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.	06
	<b>EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES</b>	
III	Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches -Teachers' attitudes and beliefs and Pedagogic strategies.	06
	<b>PROFESSIONAL DEVELOPMENT</b>	
IV	Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes	06
	<b>RESEARCH GAPS AND FUTURE DIRECTIONS</b>	
V	Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.	06
	<b>Total Instructional Hours</b>	<b>30</b>

Course Outcome	CO1:	CO2:	CO3:	CO4:	CO5:
	What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?	How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	How can teacher to develop their Professional development support effective pedagogy?	How can improve the Research and Future Direction using effective pedagogy.


#### REFERENCE BOOKS:

- R1: Ackers J, HardmanF (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2): 245- 261.
- R2: Agrawal M (2004)Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36(3):361-379.
- R3: Akyeamong K (2003) Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report 1.London:DFID
- R4: Akyeamong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33(3): 272–282.

- R5: Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education.  
Oxford and Boston: Blackwell.
- R6: Chavan M(2003) Read India: Amass scale, rapid, 'learning to read' campaign.



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<b>Programme</b>	<b>Course Code</b>	<b>Name of the Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
M.E.	20AC2092	<b>STRESS MANAGEMENT BY YOGA</b>	2	0	0	0

<b>Course Objective</b>	1. To achieve overall health of body and mind 2. To overcome stress 3. To possess emotional stability.
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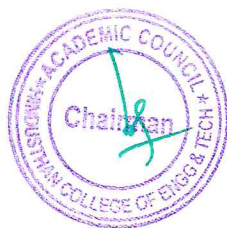
<b>Unit</b>	<b>Description</b>	<b>Instructional Hours</b>
I	<b>INTRODUCTION TO YOGA</b> Definitions of Eight parts of yoga. (Ashtanga) <b>DO'S AND DON'T'S IN LIFE</b>	10
II	Yam and Niyam - Do's and Don't's in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha. <b>ASAN AND PRANAYAM</b>	10
III	Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam	10
<b>Total Instructional Hours</b>		<b>30</b>

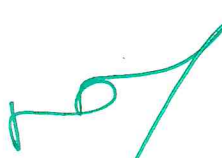
<b>Course Outcome</b>	CO1: Develop healthy mind in a healthy body thus improving social health also
	CO2: Improve efficiency
	CO3: The student will apply forces and exert themselves using rarely used muscle groups

**REFERENCE BOOKS:**

- R1: Yogic Asanas for Group Training-Part-I":Janardan Swami Yoga bhyasi Mandal  
R2: "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

  
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Programme	Course Code	Name of the Course	L	T	P	C
M.E.	20AC2093	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	2	0	0	0

Course Objective	Description
	1. To learn to achieve the highest goal happily 2. To become a person with stable mind, pleasing personality and determination 3. To awaken wisdom in students

Unit	Description	Instructional Hours
	<b>NEETISATAKAM-HOLISTIC DEVELOPMENT</b>	
I	Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (don't's) - Verses- 71,73,75,78 (do's)	10
	<b>DAY TO DAY WORK AND DUTIES</b>	
II	Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2- Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.	10
	<b>STATEMENTS OF BASIC KNOWLEDGE</b>	
III	Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 -Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63	10
<b>Total Instructional Hours</b>		<b>30</b>

Course Outcome	CO1:	CO2:	CO3:
	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life	The person who has studied Geeta will lead the nation and mankind to peace and prosperity	Study of Neet is hatakam will help in developing versatile personality of students.

**REFERENCE BOOKS:**

- R1: Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari's Three Satakam, Niti-sringar-vairagya, New Delhi,2010  
R2: Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016.

  
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