Vision
Empowering the community of students of Department of Electrical Engineering with very high morals, values, ethics, skills and technical knowledge through a rich curriculum blending the equal proportions of theoretical and hands-on experience by a process of transformation via hard-work and perseverance, with a view to serving the society in the role of socially responsible engineers so as to look after the needs of the nation and to elevate the standard of living of the people by incorporating innovation and sustained research.

Mission
- To attract the students to pursue not only the under graduation, but also up to the research level, with the exquisite infrastructure, learned faculties, state-of-the-art laboratories etc., from the Indian and International diasporas.
- To foster the global standards in learning, teaching and research that owes to an overall development of the department, faculties and students within the university and from across the globe as well.
- To enhance the calibre of students to be the most sought for, by the industrial and research entities.
- To enable for a diversified and challenging career that is ensued by the highest degree of professionalism, entrepreneurship, managerial and administrative expertise.

Programme Educational Objectives (PEO)
The core objectives of the M.E. programme in Embedded Systems are intended

PEO-1
To provide adequate opportunities for the students to gain knowledge in the area of embedded systems and the related disciplines and apply the same to do research to emulate new ideas.

PEO-2
To motivate the students to gain competency in the areas of modeling, design, programming and optimization to meet industrial challenges in the field of automotive electronics, robotics, communication, consumer electronics, and industrial process control.
PEO-3
To cultivate leadership qualities and communication skills in the students and make them competent to function effectively in multidisciplinary teams.

PEO-4
To inculcate in the minds of the students ethical responsibility towards serving the society and make them understand their role as engineers in improving the standard of life of the people

**PROGRAMME OUTCOMES (PO)**

**PO-1**
Ability to analyze the existing concepts and synthesize new concepts in the field of embedded systems and to integrate both for enrichment of knowledge.

**PO-2**
Ability to explore the area of embedded systems to arrive at critical decisions while carrying out research in appropriate domain.

**PO-3**
Ability to investigate complex embedded system application problems and arrive at feasible hardware and software models by applying the acquired knowledge

**PO-4**
Ability to employ state-of-the art techniques and research outcomes in the embedded systems learning process.

**PO-5**
Ability to integrate modern engineering tools for solution of embedded system problems with an understanding of the limitations.

**PO-6**
Ability to work as an effective team member in collaborative-multidisciplinary engineering tasks related to the field of embedded systems.

**PO-7**
Ability to efficiently manage embedded system applications after considering societal, environmental, economic and financial factors.

**PO-8**
Ability to inculcate lifelong learning and research with a high level of enthusiasm and commitment to facilitate global competence.

**PO-9**
Ability to develop effective presentation and communication skills during preparation of technical reports and design documentation.

**PO-10**
Ability to be a responsible professional with intellectual integrity, code of conduct and ethics of research and contribute towards the sustainable development of the society

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## M.E., EMBEDDED SYSTEMS

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Note: * - Four weeks during the summer vacation at the end of II Semester.

**M.E.(EMBEDDED SYSTEMS)- PART-TIME**

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**Total** | 115 | 285 | 400 | 10  |

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**Total** | 115 | 285 | 400 | 11 |

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**Total** | 90  | 210 | 300 | 8  |

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**PE – PROGRAM ELECTIVES**
1. Advanced Digital Signal Processing
2. Distributed Embedded Computing
3. Real Time Operating System
4. VLSI for Embedded Applications
5. SCADA for Embedded Applications
6. Embedded Product Development Technologies
7. Digital Instrumentation
8. Medical Instrumentation
9. Micro Electro Mechanical Systems
10. Digital Image Processing
11. Software Technology for Embedded Systems
12. Robotics and Automation
13. Wireless Sensor Networks
14. Wireless and Mobile Communication
15. FPGA Based Embedded System Design

**OE-OPEN ELECTIVES**
1. Business Analytics
2. Industrial Safety
3. Operations Research
5. Composite Materials
6. Waste to Energy

**AUDIT COURSES**
1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills.

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**COURSE OBJECTIVES:**
- To introduce the fundamentals of microcontroller based system design.
- To study the interfacing peripherals with microcontrollers.
- To learn the features, architecture and programming of PIC.
- To introduce PIC peripheral system design.
- To study on basic tool features for target configuration.
- To give case study experiences for microcontroller based applications.

**Introduction**

Need for Microcontroller based system design - Design cycle - Design problem - Hardware and software considerations - System
integration/Structure and characteristics-Interrupt structures-Programmable timers- Latency-Interrupt density-Interval considerations.

**89C51 Processor**

Review of architectures and instruction sets of 89C51 Processor - Coprocessor configuration - Closely coupled and loosely coupled configurations - Architecture and instruction set of I/O processor -I/O control -I/O timing - Data buffering with FIFO - Key boards and switches - Remote instrument control -Self test hardware - Key board parsing - Real time programming -Self test algorithm.

**PIC Microcontroller**


**Trouble Shooting and Development Systems**


**System Design Examples**


**REFERENCES:**


**COURSE OUTCOMES:**

1. Understand the fundamentals of microcontroller systems and interface, and have the ability to apply them.
2. Understand the architecture and capabilities of PIC microcontroller.
3. Learn importance of PIC in designing embedded application.
4. Learn use of hardware and software tools.
5. Develop interfacing to real world devices.
COURSE OBJECTIVES:

- Review the analysis and design of combinational logic circuits.
- Establish the methods for the analysis, modeling and design of synchronous sequential circuits.
- Incorporate the analysis and design of asynchronous circuit and obtain the hazard free circuits.
- Implement the digital systems on reconfigurable programmable logic devices.
- Study the different fault diagnosis and test methods.

Introduction

Review of Combinational circuit analysis – Minimization and design – Top-down modular design – Decoders, Encoders – Multiplexer and Demultiplexer – Incompletely specified functions – Circuit design.

Sequential Circuit Design


Asynchronous Sequential Circuit Design


Synchronous Design Using Programmable Devices

Fault Analysis


REFERENCES:

COURSE OUTCOMES:
1. Gather a review of combinational circuit and analysis.
2. Develop the ability to analyze and design synchronous sequential circuits.
3. Equip the capability to design Asynchronous sequential circuits and realize hazard free circuit.
4. Gain knowledge on implementation of sequential circuits using PLDs.
5. Understand the concepts fault diagnosis and testability.

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Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Effective literature studies approaches, analysis-Plagiarism, Research ethics
Effective technical writing, how to write report, Paper-Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee


REFERENCES:
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”

COURSE OUTCOMES:
Students will be able to:
1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
## Mapping with Programme Outcomes

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### COURSE OBJECTIVES:

- To learn the working principles of 89C51 microcontroller and PIC Microcontroller.
- To understand the characteristics of real time systems.
- To involve the students to Practice on Workbench /Software Tools/ Hardware Processor Boards with the supporting Peripherals.
- To instruct the concepts of algorithm development & programming on software tools and micro Controllers with peripheral interfaces.
- To practice through at least one of the subdivisions covered within experiments listed below to expose the students into the revising the concepts acquired from theory subjects.

### List of Experiments

1. Study of Microcontrollers
   (i) 89C51 Microcontroller
   (ii) PIC 16F877 Microcontroller
2. Applications of 89C51 Microcontroller
   (i) Frequency Measurement
   (ii) Checking of Boolean Functions
3. Seven Segment LED Display Using 89C51 Microcontroller
4. Stepper Motor Control Using 89C51 Microcontroller
5. Seven Segment LED Display, ADC and PWM Generation using PIC 16F877 Microcontroller
6. Application of I2C Logic for Character Display in PIC 16F877 Microcontroller
7. Realization of Real Time Clock using PIC16F877 Microcontroller
8. Serial Data Communication Using PIC16F877 Microcontroller
COURSE OUTCOMES:
Upon completion of the course the student will be able to
1. Explain the architecture and operation of 89C51 and PIC16F877 Microcontrollers
2. Identify and explain the operations of peripherals and memories typically interfaced with these controllers
3. Analyze instruction sets of 89C51 and PIC16F877 Microcontrollers.
4. Gain hands-on experience in doing experiments on 89C51 and PIC16F877 Microcontrollers, by using hardware kits in the laboratory and present the report.
5. Students should understand the hardware/software tradeoffs involved in the design of these Controllers.

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COURSE OBJECTIVES:
- To provide an introduction to DSP Processors.
- To explain Embedded C language programming techniques.
- To study the Hardware interfacing circuits and DSP Processor applications.

List of Experiments
1. Study of DSP Processors
   (i) TMS320F2812 Processor
   (ii) TMS320C5416 Processor
   (iii) TMS320C6713 Processor
2. Study of Code Composer Studio Software
3. Seven Segment LED Display Using DSP TMS320F2812 Processor
4. Linear and Circular Convolution using DSP TMS320C5416 Processor
5. Analog to Digital Conversion using DSP TMS320C5416 Processor
6. Digital to Analog Conversion using DSP TMS320C5416 Processor
7. Applications of DSP TMS320C6713 Processor
   (i) Low Pass Filter
   (ii) High Pass Filter
   (iii) Band Pass Filter
   (iv) Band Rejection Filter
9. ADC and DAC Using DSP TMS320C6713 Processor 
10. Computation of Power Density Spectrum of a sequence using DSP TMS320C6713 Processor

**COURSE OUTCOMES:**

Upon completion of the course the student will be able to
1. Explain the architecture and operation of various DSP Processors. 
2. Identify and explain the operations of peripherals and memories typically interfaced with DSP Processors. 
3. Analyze instruction sets of TMS320F2812, TMS320VC5416 and TMS320C6713 Processor. 
4. Gain hands-on experience in doing experiments on TMS320F2812, TMS320VC5416 and TMS320C6713 Processor by using hardware kit in the laboratory and present the report. 
5. Explain the hardware/software trade-offs involved in the design of DSP Processors. 

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**COURSE OBJECTIVES:**

- To acquire knowledge about the features of advanced processors. 
- To study the architectures of CISC processor. 
- To discuss on memory management, application development of CISC processors. 
- To discuss the architecture and instruction set of ARM processor. 
- To learn the programming concept in ARM processor 
- To study about ARM application. 

**Features of Advanced Processors**

Instruction set - Data formats - Instruction formats - Addressing modes - Memory Hierarchy - register file - Cache - Virtual memory and paging - Segmentation - Pipelining : The instruction pipeline - pipeline hazards - Instruction level parallelism - reduced instruction set - Computer principles - RISC versus
CISC - RISC properties - RISC evaluation - On-chip register files versus cache evaluation.

**Architecture of CISC Processors**


**ARM Architecture**


**ARM Programming**

Basic Assembly language program -The ARM Programmer’s model -Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors.— Instruction cycle timings

**ARM Application Development**


**REFERENCES:**


**COURSE OUTCOMES:**

1. Delivers insight into various embedded processors of RISC and CISC architecture with improved design strategies.
2. Introduces the recent advanced features in RISC and CISC processors.
3. Gives an idea about the instruction set in ARM processor
4. Explains the programming model in the processors.
5. Develops an overview about the application of the advanced processors.
Mapping with Programme Outcomes

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**COURSE OBJECTIVES:**

- To provide a clear understanding on the basic concept of embedded control system.
- To know the fundamentals of Real time operating system.
- To study the software and hardware design interface, SPI, RTC interfacing and programming.
- To teach the basic concepts of developing device driver-software –interfacing and porting using C & C++.
- To teach the application development on embedded controller.

**Embedded System Organization**

Embedded computing – characteristics of embedded computing applications – embedded system design challenges; Build process of Real-time Embedded system – Selection of processor; Memory; I/O devices-Rs-485, MODEM, Bus Communication system using I2C, CAN, USB buses, 8 bit –ISA, EISA bus;

**Real-Time Operating System**

Introduction to RTOS; RTOS- Inter Process communication, Interrupt driven Input and Output -Nonmaskable interrupt, Software interrupt; Thread – Single, Multithread concept; Multitasking Semaphores.

**Interface with Communication Protocol**

Design methodologies and tools – design flows – designing hardware and software Interface. –system integration; SPI, High speed data acquisition and interface-SPI read/write protocol, RTC interfacing and programming.

**Design of Software for Embedded Control**


**Case Studies with Embedded Controller**

Programmable interface with A/D & D/A interface; Digital voltmeter, control-Robot system; -PWM motor speed controller, serial communication interface.
REFERENCES:

COURSE OUTCOMES:
1. Understand the basic concept of embedded system such as memory, I/O devices, and bus communication system.
2. Design real time embedded systems using the concepts of RTOS.
3. Explain and design of software for embedded control.
4. Implement the real-time operating system principle.
5. Design simple A/D and D/A interface circuits.

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EEESCP26 ARM BASED SYSTEM DESIGN LAB

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COURSE OBJECTIVES:
- To provide an introduction to various ARM Processors.
- To explain Embedded C language programming techniques.
- To study the Hardware interfacing circuits and ARM Processor applications.

List of Experiments
1. Study of ARM Processors LPC 2148
2. ADC and DAC using ARM Processor LPC 2148
3. LCD and Seven Segment LED Display using ARM Processor LPC2148
4. Graphics LCD Display using ARM processor LPC2148
5. Interfacing Real Time Clock and Serial port with ARM processor LPC 2148
6. Stepper motor control using ARM processor LPC 2148
7. LCD Display Using Cortex M4 ARM processor
8. DAC using Cortex M4 ARM Processor
9. Study of SPARTAN 6 FPGA Processor
10. LCD and 7 segment LED Display using SPARTAN 6 Processor

**COURSE OUTCOMES:**

1. Upon completion of the course the student will be able to
2. Explain the architecture and operation of ARM Processors.
3. Identify and explain the operations of peripherals and memories typically interfaced with ARM Processors.
5. Design and do experiments on ARM LPC 2148 Processor by using hardware kit in the laboratory and present the report.

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**COURSE OBJECTIVES:**

- To train the students in the Embedded Systems related areas and enable them to have a practical knowledge in carrying out Embedded Systems related works.
- To train and develop skills in solving problems during execution of certain works related to Embedded Systems.
- To work on a technical topic related to Embedded Systems and acquire the ability to make written and oral presentations.
- To acquire the ability of writing technical papers for Conferences and Journals.

The students should individually undergo a training program in reputed concerns in the field of Embedded Systems during the summer vacation (at the end
of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the students have to submit a detailed report on the training they had, within ten days from the commencement of the third semester for Full-time / fifth semester for part-time. The students will be evaluated, by a team of staff members nominated by Head of the department, through a viva-voce examination.

The students will work for two periods per week guided by student counsellor. They will be asked to present a seminar of not less than fifteen minutes and not more than thirty minutes on any technical topic of student’s choice related to Embedded Systems and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counsellor based on the technical presentation and the report and also on the interaction shown during the seminar.

**COURSE OUTCOMES:**

1. The students can face the challenges in the field with confidence.
2. The students will be benefited by the training with managing the situation that arises during the execution of works related to Embedded Systems.
3. The students will be getting the training to face the audience and to interact with the audience with confidence.
4. To tackle any problem during group discussion in the corporate interviews.
5. To enable the students capable of preparing reports based on what they have learnt in the industry

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**COURSE OBJECTIVES:**

- To carry out thesis Project work Phase – I which is an integral part of the thesis consisting of problem statement, literature review, thesis overview and scheme of implementation.
• To attempt the solution to the problem by analytical/simulation/experimental methods and validate with proper justification.

METHOD OF EVALUATION:
The student carries out literature survey and identifies the topic of thesis and finalizes it in consultation with Guide/Supervisor and prepare a comprehensive thesis report after completing the work to the satisfaction of the supervisor.

The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

Thesis report has to be submitted at the end of the semester.

The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES:
1. Review quality of Literature survey and Novelty in the problem
2. Assess clarity of Problem definition and Feasibility of problem solution
3. Validate the relevance to the specialization
4. Acquire Knowledge on the clarity of objective and scope
5. Improve the quality of Written and Oral Presentation

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COURSE OBJECTIVES:
• To carry out Thesis work Phase – II which is the remaining part of the thesis.
• To attempt the solution to the problem by analytical/simulation/experimental methods and validate with proper justification.

METHOD OF EVALUATION:
The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

Thesis report has to be submitted at the end of the semester.
The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

**COURSE OUTCOMES:**
1. Identify the Embedded system problem
2. Analyze, design and implement solution methodologies
3. Apply modern engineering tools for solution
4. Write technical reports following professional ethics
5. Develop effective communication skills to present and defend their research work to a panel of experts.

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## PROGRAM ELECTIVES

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**COURSE OBJECTIVES:**
- To study the analysis of discrete random signals.
- To study the digital filter design.
- To study the applications of adaptive filtering.
- To study the analysis of speech signals.
- To study the multi-rate signal processing fundamentals
- To introduce the various types of transforms.

**Discrete Random Signal Processing**

**Adaptive Signal Processing**
Speech Signal Processing
Digital models for speech signal - Mechanism of speech production - time
domain processing of speech signal - Pitch period estimation - Linear predictive
Coding – autocorrelation method – Durbin recursive solution.

Multirate Signal Processing
Mathematical representation of change of the sampling rate - Interpolation and
Decimation - Decimation by integer factor – Interpolation by an integer factor –
Direct form FIR filter structures – Single and multistage realization - Poly-phase
realization – Application to sub band coding.

Types of Transform
Fourier Transform – Short Time Fourier Transform (STFT) - Discrete Time
Fourier Transform (DTFT) – Continuous Wavelet Transform (CWT) – Wavelet
Transform (WT) – Recursive multi-resolution decomposition – Hilbert transform -
applications and its limitations

REFERENCES:

COURSE OUTCOMES:
Students should be able to:
1. To understand advanced digital signal processing algorithms
2. To design adaptive filters for a given application
3. To design multi-rate DSP systems.
4. To understand decimation and interpolation of discrete-time signals.
5. To understand advanced digital signal transforms and their algorithms

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COURSE OBJECTIVES:

- To expose the students to the fundamentals of Network Management, Security and Communication Technologies.
- To understand the basics of internet with knowledge of internet server interfacing.
- To study Java based Networking.
- To get introduced to Embedded Network Routing Agents
- To study the Networking on-chip real time multiprocessor embedded systems.

Internet Hardware Infrastructure


Internet Concepts

- Capabilities and limitations of the internet – Interfacing Internet server applications to corporate databases HTML and XML Web page design and the use of active components.

Distributed Computing Using Embedded Java


Embedded Agent


Embedded Computing Architecture


REFERENCES:

COURSE OUTCOMES:
1. Explains various network (hardware and security).
2. Explains basic concepts of internet database and webpage design.
3. Explains the distributed database computing using embedded Java.
4. Describes the embedded agent design and operation mechanism.
5. Explains the real time multiprocessor distributed embedded systems

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- To impart students about the fundamentals of Real Time Systems and interaction with RTOS
- To teach the concepts of how process are created and controlled with RTOS.
- To study on programming logic of modeling and analyzing RTS
- To study about the services rendered by RTOS in an application.
- To acquire knowledge about the common problems in developing an RTOS.
- To discuss the application development using RTOS.

RTOS
Differences between General Purpose OS & RTOS, Real-time concepts, Hard Real time and Soft Real-time systems,Basic architecture of an RTOS, components in RTOS - kernel, objects, scheduler, Multitasking, context switch, Scheduling types - Preemptive priority based scheduling - Round-robin and preemptive scheduling - Task states - Task management.

Kernel Objects
Semaphores – Binary, counting, mutual exclusion (mutex) semaphores, Synchronization between two tasks and multiple tasks, Single shared-resource-access synchronization, Recursive shared- resource-access synchronization -message queue- Sending messages in FIFO or LIFO order- broadcasting messages. Common pipe- pipe operation- Select operation on multiple pipes-Pipes for inter-task- Synchronization - Event register - control block- Signals- Catch operation- Execution sequence of wait and signal operations.
**RTOS Services**

Overview- TCP/IP protocol- Stack- File system- Remote procedure calls- RTOS command shell- Exceptions and Interrupts- Programmable interrupt controller- Priority scheme- Task and stack- Interrupt nesting- Interrupt processing in two contexts. Timer and Timer Services - Real-time clock- Soft-timer- Servicing the timer interrupt in the task context- Timeout event handlers.

**I/O Subsystem and Memory Management**

Port-mapped I/O- Memory-mapped I/O- Write operation for a block-mode device- I/O function mapping- Associating devices with drivers- Memory allocation map, fragmentation, free operation, Management unit.

**Typical RTOS**

Introduction to RT Linux, Real-Time Linux Applications in Embedded system, Common Design Problems - Deadlock, priority inversion problem, Embedded RTOS for fault-Tolerant applications

**REFERENCES:**


**COURSE OUTCOMES:**

1. It acquires knowledge about Real Time Operating System.
2. It helps to understand the concept of real time programming.
3. It gives an idea about the services rented by an RTOS in a developed application.
4. It describes about I/O and memory management concepts
5. It provides a concept to design and develop application using RTOS.

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COURSE OBJECTIVES:

- To enlighten the student with the growth of integrated circuits and develop procedure for their design, simulation and implementation.
- The evolution and growth of integrated circuit, the methods of layout and the different approaches for their design are to be discussed.
- A detailed study of the fabrication techniques is to be made. Analysis of analog and digital VLSI circuits is to be carried out. The need for application of specific devices and their features along with examples are to be dealt.
- The course will refurbish the student to realign his ideas on a different plane. It will help the student to develop newer control strategies that can meet the desired performance more precisely.

VLSI Design Concepts

Evolution of VLSI - VLSI design process - Architectural design - Logical design - Physical design - Lay-out styles - Full custom - Semi custom approaches - Need for design rules - Types of design rules - Design for MOS & CMOS circuits - Simple layout examples - Sheet resistance, area capacitance, wiring capacitance - Dry capacitive loads.

VLSI Fabrication Techniques

Wafer fabrication - Wafer processing - Oxidation - Patterning - Silicon gate NMOS process - CMOS process - Nwell - Pwell - Twin tub - Silicon on insulator - CMOS Process enhancements - Analytical techniques - Ion beam techniques - Chemical methods - Package Fabrication technology - Reliability requirements - Field loss - Failure mechanism - Design automation.

Analog VLSI

Introduction to analog VLSI - Analog circuit building blocks - Switches, active resistors - Current sources and sinks - Current mirrors/amplifiers - MOS & BJT, inverting amplifiers - CMOS and BJT two stage op-amp - Analog signal processing circuits - Sensors - D/A and A/D converters.

Digital VLSI

Logic design - Switch logic - Gate logic - Dynamic CMOS logic - Structured design - Simple combinational logic design - Clocked sequential design - Sub-system design - Design of shifters - Arithmetic processors - ALU - Serial, Parallel and pipelined multiplier arrays.

FPGA Based Embedded Processor


REFERENCES:

COURSE OUTCOMES:
1. Obtain the knowledge of basic fundamentals of VLSI design concepts
2. Understand various fabrication process technologies used in VLSI devices.
3. Be able to analyze and design CMOS analog IC building blocks like MOS amplifiers,
4. Current mirrors and multistage differential amplifiers
5. Be able to analyze and design CMOS digital IC building blocks

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Mapping with Programme Outcomes
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**COURSE OBJECTIVES:**
- To understand basics of SCADA.
- To understand the concept of various components involved with SCADA.
- To acquire knowledge about SCADA communication protocols.
- To study about monitoring and control techniques related to SCADA.
- To obtain basic knowledge implementation of SCADA in embedded systems.
- To learn about the application of SCADA in Embedded system.

**Introduction to SCADA**

Introduction to SCADA, Data acquisition systems, Evolution of SCADA, SCADA definitions, Communication technologies, Elements of a SCADA system, SCADA Functional requirements, SCADA Hierarchical concept, SCADA architecture, General features of SCADA.

**SCADA System Components**

Remote Terminal Unit (RTU), Interface units, Human- Machine Interface Units (HMI), Display Monitors/Data Logger Systems, Intelligent Electronic Devices (IED), Communication Network, SCADA Server, SCADA Control systems and Control panels.

**SCADA Communication**

SCADA Communication requirements, Communication protocols: Past, Present and Future, Structure of a SCADA Communications Protocol, Comparison of various communication protocols, IEC 61850 based communication architecture, Communication media like Fiber optic, PLC, Interface provisions and communication extensions, synchronization with NCC, DCC.

**SCADA Monitoring and Control**

Online monitoring the event and alarm system, trends and reports, Blocking list, Event disturbance recording, Control function - Station control, bay control, breaker control and disconnector control.

**SCADA Applications**

Utility applications in Embedded systems, monitoring, analysis and improvement. SCADA applications in Utility Automation and Industries-Case studies, Implementation, Simulation Exercises

**REFERENCES:**

**COURSE OUTCOMES:**

1. Understanding the concept of SCADA.
2. Analyse various system components involved in SCADA system.
3. Acquires knowledge about monitoring and control methods in SCADA.
4. Helps to know about communication protocols in SCADA system.
5. Describes about application of SCADA in Embedded system.

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**COURSE OBJECTIVES:**

- To understand basics of product design and development.
- To acquire knowledge about testing methodologies.
- To understand the basic concepts of product development based on its reliability, cost, robustness.
- To discuss about the need for CAE, CAD, CAM, IDE tools in product design.
- To obtain basic knowledge on industrial design.
- To understand the concept of developing products in an embedded system.

**Concepts of Product Development**


**Product Design Phase**

System design – design phases – design styles – design of safety critical systems – design diversity – design for maintainability. System engineering –

**Approaches in Product Development**


**Industrial Design**

Integrate process design - Managing costs - Robust design – need for Involving CAE, CAD, CAM, IDE tools - Prototype basics - Principles of prototyping - Planning for prototypes- Economic & Cost Analysis - Understanding and representing tasks- baseline project planning - accelerating the project execution.

**Developing Embedded Product Design**


**REFERENCES:**


**COURSE OUTCOMES:**

1. Gives an idea about an approach to concept creativity, selection and testing.
2. Provides an idea for designing a consumer specific product.
3. Gives knowledge up gradation on recent trends in embedded systems design.
4. Describes the economic analysis and the consideration while designing a product.
5. Helps to improve the integration of customer requirements in product design.
### Mapping with Programme Outcomes

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### COURSE OBJECTIVES:

- To obtain the subject knowledge and ability to use basic Data acquisition system concepts.
- To familiarize the students the functioning of different types of instrument communication, interfacing and data transmission.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.
- To provide the P.G students with a sound foundation in the mathematical, scientific and engineering instruments to formulate, solve and analyze engineering problems and to prepare them for employability and higher studies.
- To promote student awareness of the lifelong learning and to introduce them to professional ethics and codes of professional practice.
- To prepare students for successful careers in industry that meets the needs of latest developments in industries as employable professionals.

### Introduction

Data acquisition systems – Overview of A/D converter, types and characteristics – Sampling, Errors - Objective – Data acquisition interface requirements – Counters – Modes of operation – Frequency, Period, Time interval measurements, Prescaler, Heterodyne converter for frequency measurement, Single and Multi channel Data Acquisition systems.

### Interfacing and Data Transmission

Instrument Communication


Visual Instrumentation


Case Studies

PC based DAS, Data loggers, PC based process measurements like flow, temperature, pressure and level development system, Programmable Logic Controllers, CRT interface and controller with monochrome and colour video display.

REFERENCES:


COURSE OUTCOMES:

1. To enhance teaching & research contributions in Embedded System Technology particularly for PC based Instrumentation concepts.
2. An ability to design and conduct experiments as well as to organize, analyze and interpret data on multidisciplinary domains.
3. Be able to identify problems in major issues of Instrument Communication Systems, analyze problems & solve them using the base of Embedded Technology.
4. To provide guidance and to develop inter-process communication techniques based on hardware– software approaches for real time process automations.
5. An ability to effectively communicate technical information in speech, presentation, and in writing.
COURSE OBJECTIVES:

- To understand basics of measurement system.
- To understand the concept of various biomedical instruments and technologies.
- To acquire knowledge about sensing devices used in biomedical instruments.
- To understand the biomedical instruments used in hospitals.
- To discuss about the reduction of noise in biomedical instruments.
- To obtain basic knowledge on medical imaging systems.

Medical Instrumentation Basics

Basic Medical Instrumentation system, General Constraints in design of medical instrumentation system, Classification of Biomedical Instruments, Biomedical Simulators, Sources of Bioelectric Potential and Electrodes- Resting and Action potential, Propagation of action potential, The bioelectric potentials: ECG, EEG, EMG, ERG, EOG, EGG; Digital Biosignals, Equipment standards and patient safety.

Sensing Devices for Biomedical Instruments


Measurement Systems

Artifacts and Noise In Medical Instrumentation

Examples of noise in medical instrumentation and biomedical signals – baseline wander, power line interference, electrode motion artifacts, Noise reduction with digital signal processing; QRS complex detection in ECG- Pan Tompkins Algorithm

Modern Medical Imaging Systems

Ultrasound and Ultrasonic imaging system – Ultrasound Doppler and flow detector, Echocardiogram; Physics of X-rays and X-ray machines, Information content of an Image, Radiography, Computed Radiography, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET).

REFERENCES:

COURSE OUTCOMES:
1. Helps to learn about Biomedical Instruments.
2. Acquires knowledge about Electrodes, Sensors and Transducers for biomedical signal acquisition
3. Gives an idea about ECG, EEG and EMG recording techniques and their instrumentation
4. Helps to know about signal processing and filtering techniques for noise and artifact removal.
5. Describes the modern medical imaging modalities and instruments

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COURSE OBJECTIVES:

- This course intends to provide a conceptual understanding of micro fabrication techniques and the issues surrounding them.
- To know the major classes, components and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.
- To learn Bulk micromachining process and to understand the concept of different etching process and etching materials in fabrication process.
- To impart knowledge about surface micromachining process and to understand the types and concept of bonding process.
- To study and design of different types of MEMS actuators, Micro grippers, MEMS resonators and their applications.

**Introduction To Micro Machined Devices**

Microsystems vs. MEMS - Markets for Microsystems and MEMS, Scaling Principles- Materials for micromachining, Micromachining terms- mechanical properties of silicon-native oxides of silicon and other semiconductors-typical silicon wafer types.

**Bulk Micro Machining**


**Surface Micromachining**


**Bonding Processes**

Mems Actuators And Their Applications


REFERENCES:
5. Tai-Ran-Hsu, MEMS & Microsystems Design and Manufacture, Tata McGraw Hill, New Delhi, 2002

COURSE OUTCOMES:
1. Understanding the concept of scaling laws that are used extensively in the design of micro devices and systems.
2. Analyze the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
3. Provide impart knowledge about thin film process and etchants used for isotropic and anisotropic etching.
5. Understanding the types of bonding process and the techniques used for sacrificial process.

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COURSE OBJECTIVES:

- To understand the image fundamentals and mathematical transforms necessary for image processing.
- To understand about Sampling Techniques.
- To know different transform and various algorithms to evaluate them
- To know the design of Digital filters
- To know different coding methods
- To understand the image segmentation techniques.

Digital Image Fundamentals and Image Transforms


Image Enhancement and Restoration


Image Compression


Image Segmentation

Detection of Discontinuities – Point detection, Line detection, - Edge detection – Edge linking and Boundary Detection –Thresholding – Basic global and adaptive thresholding - Image segmentation by region growing - region splitting and merging -Basic formulation of Region oriented segmentation – Morphological operations - Clustering methods

Application of Image Processing

Image classification – Image understanding- Image recognition – Patterns and pattern classes - Matching by minimum distance classifier - Neural Network applications in image processing –Image fusion – Steganography - Digital image watermarking
REFERENCES:

COURSE OUTCOMES:
1. Explain different transform and various algorithms to evaluate them
2. Implement the design of Digital filters
3. Implement the different coding methods
4. Apply the basic concepts of Image segmentation,
5. Explain image recognitions and the applications

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COURSE OBJECTIVES:
- To expose the students to the fundamentals of embedded Programming.
- It aims at familiarizing the students in embedded concepts and programming in ‘C’.
- This module covers the advanced topics in ‘C’
- To learn Memory management and Data structures which are of high relevance in embedded software is considered in depth.
- The syllabus also covers the topic ‘scripting languages for embedded systems’.
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills.
Programming Embedded Systems


Embedded C Programming


Embedded Applications Using Data Structures

Linear data structures – Stacks and Queues Implementation of stacks and Queues - Linked List - Implementation of linked list, Sorting, Searching, Insertion and Deletion, Nonlinear structures – Trees and Graphs Object Oriented programming basics using C++ and its relevance in Embedded systems.

Scripting Languages for Embedded Systems


Embedded Software Development Tools

Host and target machines – Linkers / Locators for Embedded Software – Debugging techniques – Instruction set simulators Laboratory tools – Practical example – Source code.

REFERENCES:

COURSE OUTCOMES:
1. The learning process delivers insight into various programming languages / softwares compatible to embedded process development with improved design & programming skills.
2. Develop advanced programs in Embedded C.
3. Get knowledge in data structure and OOP.
4. Develop programs using scripting languages.
5. Improved Employment ability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded systems design.
COURSE OBJECTIVES:

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot.
- To learn manipulators and their applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.
- To know about the electronic systems in automation of mechanical operations.
- To involve Discussions/ Practice/Exercise onto revising & familiarizing the concepts acquired over the 5 Units of the subject for improved employability skills.

Introduction


Robot Drives and Power Transmission Systems


Manipulators

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators.
Industrial Automation

Fundamental concepts in manufacturing and automation, definition of automation, reasons for automating. Types of production and types of automation, automation strategies, levels of automation.

Programmable Automation

Special design features of CNC systems and features for lathes and machining centers. Drive system for CNC machine tools. Introduction to CIM; condition monitoring of manufacturing systems.

REFERENCES:


COURSE OUTCOMES:

1. Explain the basic concepts of working of robot.
2. Analyze the function of manipulators in the robot.
3. Use robots in different applications.
4. Knowledge of industrial automation by transfer lines and automated assembly lines.
5. Ability to understand the electronic control systems in metal machining and other manufacturing processes.

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COURSE OBJECTIVES:

- To introduce the basic concepts in communication networks and the protocols used in the networks.
- To give an exposure to sensor networks and different architectures of Wireless Sensor Networks.
- To familiarise the students about the various multiple access techniques available in the communication systems and introduce the different clustering algorithms for WSNs.
- To acquire knowledge on security management systems and security protocols for WSN and distributed sensor systems.
- To give an idea about power and energy level management techniques available for WSNs.

Networks Fundamentals


Architecture


Protocols


Security System


Energy Management

REFERENCES:

COURSE OUTCOMES:
1. Describe and explain the working of communication protocols and the evolution of 2G/3G networks.
2. Understand the characteristics, architectures and modeling of WSNs.
3. Explain the concepts of multiple access techniques and the working of various clustering algorithms and their usefulness for routing in WSNs.
4. Describe the different security management techniques and security protocols defined for WSNs.
5. Elucidate the design issues related to the energy and power management techniques for WSNs.

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COURSE OBJECTIVES:
- Expose the students to the fundamentals of wireless communication technologies.
- Teach the fundamentals of cellular concepts.
- Study the concepts of mobile radio propagation.
- Explore various modulation techniques used.
- Introduce network routing protocols.
- Study the various multiple access techniques.
Introduction

Brief history of wireless communication - elements of wireless communication systems- radio frequency spectrum and bandwidth requirements - Universal Mobile Communication Systems- Personal Communication systems- emerging trends in wireless communications Wireless systems and standards: AMPS and ATACS systems- 2G, 2.5G, 3G and B3G systems and standards.

Cellular Concept


Mobile Radio Propagation


Modulation Technique for Mobile Radio


Multiple Access Techniques


REFERENCES:

**COURSE OUTCOMES:**

1. Fundamental concepts of wireless communication and its standards have been brought out.
2. Cellular concepts and various radio propagation models have been pointed out.
3. Architecture of various mobile radio models have been understood.
4. Various mobile radio modulation techniques have been described.
5. Different access techniques have been learnt.

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**COURSE OBJECTIVES:**

- Gain knowledge on various processors
- Acquire an exposure on system development.
- Understand the architecture of latest processors.
- Design different application circuits using a single FPGA chip.
- Program the FPGA to do specific work.
- Create embedded systems using FPGA.

**ASICS, CMOS Logic and ASIC Library Design**


**Programmable Logic Cells and I/O Cells**

- Digital clock Managers-Clock management- Regional clocks- Block RAM – Distributed RAM-Configurable Logic Blocks-LUT based structures – Phase locked loops- Select I/O resources –Anti fuse - static RAM - EPROM and EEPROM technology – PREP bench marks – Actel ACT – Xilinux LCA – Altera FLEX – Altera MAX DC & AC inputs and outputs – Clock and power inputs – Xilinux I/O blocks.

**Architectures**

- Architecture - FPGAs, Xilinx XC4000 - ALTERA's FLEX 8000/10000, ACTEL's ACT-1,2,3 and their speed performance - Apex, Cyclone FPGAs and Quartus
architectures - case studies: Altera MAX 5000 and 7000 - Altera MAX 9000 – Spartan II and Virtex II FPGAs.

**Design Entry and Testing**

**Partitioning and Routing**

**REFERENCES:**
6. Design manuals of Altera, Xilinx and Actel. (From the web).

**COURSE OUTCOMES:**
1. Underlying fundamental concepts of VLSI have been brought out.
2. Memory management and input/output technology of various processors have been pointed out.
3. Architecture of various processors have been understood.
4. Softwares for the processors have been learnt.
5. Some basic design examples using VLSI processors have been described.

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COURSE OBJECTIVES:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.
- Manage business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.


Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.

Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression.


REFERENCES:
2. Business Analytics by James Evans, Pearson’s Education.

COURSE OUTCOMES:
Students will
1. Demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

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Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication
methods, general sketch, working and applications, i. Screw down grease cup, ii.
Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed
lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and
factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree
concept, need and applications, sequence of fault finding activities, show as
decision tree, draw decision tree for problems in machine tools, hydraulic,
pneumatic, automotive, thermal and electrical equipment's like, I. Any one
machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,
Electrical motors, Types of faults in machine tools and their general causes.

Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and
need, degreasing, cleaning and repairing schemes, overhauling of mechanical
components, overhauling of electrical motor, common troubles and remedies of
electric motor, repair complexities and its use, definition, need, steps and
advantages of preventive maintenance. Steps/procedure for periodic and preventive
generating (DG) sets,

Program and schedule of preventive maintenance of mechanical and electrical
equipment, advantages of preventive maintenance. Repair cycle concept and
importance

REFERENCES:
1. Maintenance Engineering Handbook, Higgins & Morrow, Da
   InformationServices.
   &HallLondon.

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Optimization Techniques, Model Formulation, models, General L.R
Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

Formulation of a LPP - Graphical solution revised simplex method - duality
theory - dual simplex method - sensitivity analysis - parametric programming

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow
problem - max flow problem - CPM/PERT

Scheduling and sequencing - single server and multiple server models -
deterministic inventory models Probabilistic inventory control models - Geometric
Programming.

Competitive Models, Single and Multi-channel Problems, Sequencing Models,
Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory
Simulation

REFERENCES:
At the end of the course, the student should be able to

1. Students should be able to apply the dynamic programming to solve problems of discrete and continuous variables.
2. Students should be able to apply the concept of non-linear programming.
3. Students should be able to carry out sensitivity analysis.
4. Students should be able to model the real world problem and simulate it.

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Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and non-technical activities. Detailed Engineering activities. Pre project execution main clearances and documents. Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.


REFERENCES:
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting


Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

REFERENCES:
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digesters.


Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

REFERENCES:
COURSE OBJECTIVES:

Students will be able to:

- 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 Ensure the good quality of paper at very first-time submission syllabus

Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness


Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Key skills that are needed when writing a Title, key skills are needed when writing an Abstract, key skills that are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Skills that are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills that are needed when writing the conclusion.

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

REFERENCES


COURSE OBJECTIVES:

Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
• Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
• Critically understand the strengths and weaknesses of disaster management approaches, planning and programming.

Introduction Disaster
Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade

Repercussions Of Disasters And Hazards
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.

Disaster Prone Areas In India
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

Disaster Preparedness And Management
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.

Risk Assessment

Disaster Mitigation Meaning
Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

REFERENCES:
2. Sahni, Pardeep Et Al. (Eds.),” Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.
COURSE OBJECTIVES

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- Enhancing the memory power
- The engineering Scholars equipped with the Sanskrit will be able to explode the huge knowledge from ancient literature.

Alphabets in Sanskrit, past/ present/ future tense, simple sentences order, Introduction of roots technical information about Sanskrit literature.

Technical concepts of Engineering – electrical, mechanical, architecture, mathematics

REFERENCES
1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” PrathamaDeeksha-VempatiKutumbshastri, RashtriyaSanskritSansthanam, New Delhi Publication

COURSE OUTCOMES:
Students will be able to
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood.
3. Being a global language, will help to develop logic in students.
4.

COURSE OBJECTIVES
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character


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 brotherhood
and religious tolerance, True friendship, Happiness Vs suffering, love for truth. Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.

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

REFERENCES

COURSE OUTCOMES
Students will be able to
2. Learn the importance of Human values
3. Developing the overall personality

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COURSE OBJECTIVES:
Students will be able to:
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 role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. 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.

HISTORY OF MAKING OF THE INDIAN CONSTITUTION: HISTORY, DRAFTING COMMITTEE, (COMPOSITION&WORKING)

PHILOSOPHY OF THE INDIAN CONSTITUTION PREAMBLE, SALIENT FEATURES

Contours of Constitutional Rights & Duties

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.
Local Administration


Election Commission

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

REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.

COURSE OUTCOMES:
Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. 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.

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<td>Students will be able to:</td>
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<td>1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DFID, other agencies and researchers.</td>
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<td>2. Identify critical evidence gaps to guide the development.</td>
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Introduction and Methodology


Thematic overview

Pedagogical practices are being used by teachers, in formal and informal classrooms in developing countries. Curriculum, Teacher education.
Evidence on the effectiveness of pedagogical practices

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.

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.

Research gaps and future directions

Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

REFERENCES:


COURSE OUTCOMES:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners.
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
### STRESS MANAGEMENT BY YOGA

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**COURSE OBJECTIVES:**
- To achieve overall health of body and mind
- To overcome stress
  - Definitions of Eight parts of yoga (Ashtanga) Yam and Niyam
  - Do’s and Don’t’s in life.
    - i) Ahinsa, satya, astheya, bramhacharya and aparigraha
    - ii) Shaucha, santosh, tapa, swadhyay,ishwarpranidhan
- Asan and Pranayam
  - i) Various yoga poses and their benefits for mind & body
  - ii) Regularization of breathing techniques and its effects - Types of pranayam

**REFERENCES:**
1. ‘Yogic Asanas for Group Training Part-I” : Janardan Swami YogabhyasiMandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata.

**COURSE OUTCOMES:**
- Students will be able to:
  1. Develop healthy mind in a healthy body thus improving social health also
  2. Improve efficiency

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### PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

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**COURSE OBJECTIVES:**
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students
  - 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’ts)
- Verses - 71, 73, 75, 78 (do’s) Approach to day to day work and duties Shrimad BhagwadGeeta:
  - 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.
  Statements of basic knowledge. Shrimad Bhagwad Geeta:
- Chapter 2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16, 17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:
- Chapter 2-Verses 17, Chapter 3-Verses 36, 37, 42,
- Chapter 4-Verses 18, 38, 39
- Chapter 18 – Verses 37, 38, 63

REFERENCES:
1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P. Gopinath,
3. Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES:
  Students will be able to:
1. Study of Shrimad - Bhagvad- Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students