# Study Scheme 2018 for M.Tech Electronic Product Design & Technology

## Semester-1

<table>
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<th>Course Code</th>
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<th>P</th>
<th>Int</th>
<th>Ext</th>
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Total | 14 | 0 | 8 | 320 | 380 | 800 | 16  |

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Total | 12 | 0 | 12| 340 | 360 | 800 | 16  |

## Semester-3

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Total | 6 | 0 | 20| 140 | 160 | 300 | 16  |

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Total | 860 | 940 | 2000 | 68  |

* S/US - Satisfactory/Unsatisfactory
## Program Electives

### Program Elective I

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<td>MTEP-PE1A-18</td>
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<td>MTEP-PE1B-18</td>
<td>Microelectronic Technology</td>
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<td>MTEP-PE1C-18</td>
<td>Reliability of Electronics</td>
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### Program Elective II

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<td>MTEP-PE2A-18</td>
<td>Soft Computing Techniques</td>
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<tr>
<td>MTEP-PE2B-18</td>
<td>Advanced Digital Signal Processing</td>
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<tr>
<td>MTEP-PE2C-18</td>
<td>Sensor Data Fusion</td>
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### Program Elective III

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<td>MTEP-PE3A-18</td>
<td>Electronics System Design</td>
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<tr>
<td>MTEP-PE3B-18</td>
<td>Machine Vision Systems</td>
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<tr>
<td>MTEP-PE3C-18</td>
<td>Embedded System for Wireless &amp; Mobile Communication</td>
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### Program Elective IV

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<td>MTEP-PE4A-18</td>
<td>Agri electronic and instrumentation</td>
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<tr>
<td>MTEP-PE4B-18</td>
<td>Sensor Technology and MEMS</td>
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<tr>
<td>MTEP-PE4C-18</td>
<td>Advanced Sensors and Actuator</td>
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### Program Elective V

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<td>MTEP-PE5A-18</td>
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<td>MTEP-PE5B-18</td>
<td>Internet of Things &amp; Information Technology Applications</td>
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<tr>
<td>MTEP-PE5C-18</td>
<td>Mechatronic Systems</td>
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### List of Audit courses I & II

- MTA101-18 English for Research Paper Writing
- MTA102-18 Disaster Management
- MTA103-18 Sanskrit for Technical Knowledge
- MTA104-18 Value Education
- MTA105-18 Constitution of India
- MTA106-18 Pedagogy Studies
- MTA107-18 Stress Management by Yoga
- MTA108-18 Personality Development through Life Enlightenment Skills
Course Objective
To introduce ARM processor which is widely used in embedded system and Digital signal processing has become a part of many embedded systems. This subject provides basic knowledge of ARM microcontrollers and DSP.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications.
2. Identify and characterize architecture of Programmable DSP Processors
3. Develop small applications by utilizing the ARM processor core and DSP processor-based platform.

Unit 1: ARM Cortex-M3 Processor
Processor Applications, Programming model – Registers, Operation modes, Exceptions and Interrupts, Reset Sequence Instruction Set, Unified Assembler Language, Memory Maps, Memory Access Attributes, Permissions, Bit-Band Operations, Unaligned and Exclusive Transfers. Pipeline, Bus Interfaces

Unit 2: Exceptions
Exceptions Types, Priority, Vector Tables, Interrupt Inputs and Pending behavior, Fault Exceptions, Supervisor and Pend able Service Call, Nested Vectored Interrupt Controller, Basic Configuration, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency.

Unit 3: LPC 17xx Microcontroller
Internal memory, GPIOs, Timers, ADC, UART and other serial interfaces, PWM, RTC, WDT

Unit 4: Programmable DSP (P-DSP) Processors: Harvard architecture, Multi port memory, architectural structure of P-DSP- MAC unit, Barrel shifters, Introduction to TI DSP processor family

Unit 5: VLIW architecture and TMS320C6000 series
architecture study, data paths, cross paths, Introduction to Instruction level architecture of C6000 family, Assembly Instructions memory addressing, for arithmetic, logical operations

Unit 6: Code Composer
Studio for application development for digital signal processing, On chip peripherals, Processor benchmarking
IK Gujral Punjab Technical University, Kapurthala

References:

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Course Objective
acquire an understanding of the nature of power semiconductor devices and their control and use in switch-mode; understand the arrangement and topology of the circuits in which switch-mode devices.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand basic operation of various power semiconductor devices and switching circuits.
2. Analysis and design Transformers for PWM converters
3. Study principle and operation switch mode power supplies.
4. Study and analyze ups and other power supplies

Unit 1: Power Semiconductor Devices
General characteristics of Power devices such as GTOs, Power BJT, Power MOSFET, IGBT, MCT.

Unit 2: Transformer Design
Fundamentals, Selection of core material, Insulating material and wires, Design Methodology of pulse transformers, High Frequency transformers, Design of Transformers for PWM converter.

Unit 3: Coils
Fundamentals, Selection of core material, Insulating materials and wires, Design of inductors for power frequency, Radio frequency & High frequency.

Unit 4: Switch Mode Power Supplies
Basic regulators, Buck, Boost, Buck Boost, Derived topologies, flyback, forward, Push-pull, half & full bridge converter, Special converters like Cuk™ converter, PWM control techniques, Study of PWM control
ICs Design of base derive circuits, Design of input section, output section & control section, Thermal design concepts, EMI/EMC considerations, Protection circuit design for power supplies.

Unit 5: UPS and Other Power Supplies
Concept of Uninterrupted power supplies, Inverter preferred (online UPS), Line preferred UPS system (offline UPS system), Line interactive UPS system, Reliability of UPS system, Solar cells as power source devices & their characteristics.

BOOKS RECOMMENDED:

MTEP-PE1-18 Program Elective-I

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<th>MTEP-PE1A-18</th>
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Course Objective: To provide knowledge levels needed for PLC programming and operating, to make the students understand various types of PLC registers and apply PLC Timers and Counters for the control of industrial processes.

Course Outcomes: At the end of this course student will demonstrate the ability to:
1. Ability to gain knowledge on Programmable Logic Controllers
2. Will understand different types of Devices to which PLC input and output modules are connected
3. To provide the knowledge about understand various types of PLC registers
4. Able to create ladder diagrams from process control descriptions.
5. Ability to apply PLC timers and counters for the control of industrial processes
6. Able to use different types PLC functions, Data Handling Function.

Unit 1: Introduction
Introduction to Programmable Logic Controllers (PLCs), history of PLCs, Characteristics, Operation, function, Types of PLC Advantages of PLCs and Comparison of PLC based control systems with computers.

Unit 2: PLC Hardware
Block diagram of PLC, Internal architecture of PLC, The I/O section, Digital and Analog Input output modules of PLCs, special I/O Modules, I/O specifications, CPU, Memory design and human machine interfaces.

**Unit 3: PLC Instructions**
Number system and codes, fundamental of logic, Bit Logic Instructions, Instruction set: Bit level instructions, Compare, Move/Logical, Math, Program Control Instructions etc

**Unit 4: Basics of PLC programming-Ladder**
Diagram of logic gates, program files, program scan, PLC programming languages, branch instructions.

**Unit 5: PLC Timers and Counter Instruction**
Various types of PLC timers with detailed timing diagrams: On delay timer, Off delay timer, Retentive on delay timer, Pulse timer. Various types of PLC counters: Up counter, Down counter, Up-Down counter, Programming of various applications using timers and counters using Ladder diagram only.

**Unit 6: PLC communications**

**Unit 7: Industrial Automation**

**Books Recommended:**
- Programmable Logic Controllers by Frank D. Petruzella, McGraw-Hill Education; 4 edition (1 October 2010)
- Programmable Logic Controllers by john W. Webb: Principles and Applications (Fifth Edition
IK Gujral Punjab Technical University, Kapurthala

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Course Objective: To familiarize students with the fabrication and the physical concepts behind the operation of microelectronic devices.

Course Outcomes: At the end of this course student will demonstrate the ability to:
1. Outline the progress made in the history of microelectronics.
2. Describe the evolution of microelectronics from point-to-point wiring through high element density state-of-the-art microelectronics.
3. List the advantages and disadvantages of point-to-point wiring and high element density state-of-the-art microelectronics.
4. Identify printed circuit boards, diodes, transistors, and the various types of integrated circuits. Describe the fabrication techniques of these components.

Unit 1: Environment for VLSI Technology: Clean room and safety requirements. Wafer cleaning processes and wet chemical etching techniques.

Unit 2: Impurity incorporation: Solid State diffusion modeling and technology; Ion Implantation modeling, technology and damage annealing; characterization of Impurity profiles.

Unit 3: Oxidation: Kinetics of Silicon dioxide growth both for thick, thin and ultrathin films. Oxidation Technologies in VLSI and ULSI; Characterization of oxide films; High k and low k dielectrics for ULSI.

Unit 4: Lithography: Photolithography, E-beam lithography and newer lithography techniques for VLSI/ULSI; Mask generation. Chemical Vapor

Unit 5: Deposition techniques: CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal films; Epitaxial growth of silicon; modeling and technology.

Unit 6: Metal film deposition: Evaporation and sputtering techniques. Failure mechanisms in metal Interconnects; Multi-level metallization schemes.

Unit 7: Plasma and Rapid Thermal Processing: PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI. Process integration for NMOS, CMOS and Bipolar circuits; Advanced MOS technology.

Text/References
IC Gujral Punjab Technical University, Kapurthala

4. VLSI Fabrication Technology, B.Raj & Singh, Laxmi Publications
7. A.S Grove, "Physics and Technology of semiconductor devices", John Wiley & Sons

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Course Objective

Course Outcomes: At the end of this course student will demonstrate the ability to:

1. Demonstrate understanding of basic reliability measures such as failure rate, availability, MTTR, etc.
2. Compute and evaluate reliability for redundant, series, and parallel systems
3. Develop fault trees and apply various reliability models to identify and analysis possible faults in machine systems and assess their impact on overall system reliability & maintainability.
4. Use reliability improvement techniques and undertake product testing.

Unit 1: Concept of reliability

Failures of systems and its modes. Measure of Reliability, Reliability function, Hazard rate MTBF and their interrelations.

Unit 2: Reliability Data and Analysis

Data sources, Data collection, use of Reliability Data, Reliability Analysis, Performance Parameters, calculation of failure rate, Application of Weibull distribution.

Unit 3: System Reliability and Modeling

Series systems, Parallel system, series parallel systems. Time dependence, Reliability Determination, stand by systems, r out of n, Configurations, Methods of tie set and cut sets of or reliability evaluation, simulation and Reliability prediction. Monte Carlo method, concepts of network topology. Overall reliability evolution.
IK Gujral Punjab Technical University, Kapurthala

Unit 4: Maintainability and Availability

Unit 5: Life

Unit 6: Value Engineering
Techniques in value Engg; Structure of value Engg. Reliability Management.

Books Recommended:
- Related IEEE/IEE publications

MTEP-PE2-18 Program Elective-II

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Course Objective
1. Artificial Intelligence, Various types of production systems, characteristics of production systems. 2. Neural Networks, architecture, functions and various algorithms involved. 3. Fuzzy Logic, Various fuzzy systems and their functions. 4. Genetic algorithms, its applications and advances.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand importance of soft computing.
2. Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
3. Implement algorithms based on soft computing.
4. Apply soft computing techniques to solve engineering or real life problems.
Unit 1: Introduction
History of development in neural networks, neural network characteristics, Artificial neural network technology, Model of a neuron, topology, learning, types of learning, supervised, unsupervised and reinforcement learning.

Unit 2: Supervised Learning
Basic hop field model, the perceptron, linear reparability, Basic learning laws, Hebb’s rule, Delta rule, Widroff and Huff LMS learning rule, correlation learning rule, In star and out star learning rules. Unsupervised learning, competitive learning, K mean clustering algorithm, Kolwner’s feature maps.

Unit 3: Radial Basis Function
Basic learning laws in RBF network, recurrent networks, recurrent back propagation, Real time recurrent learning algorithm.

Unit 4: Counter Propagation Networks

Unit 5: Fuzzy Logic
Basic concepts of fuzzy logic, Fuzzy logic crisp set, Linguistic variable, Membership functions, Operation of fuzzy set, Fuzzy IF-THEN rules, Variable inference techniques, Defuzzification techniques, Basic fuzzy inference algorithm, Application of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

Unit 6: Support Vector Machines
Introduction, Support Vector classification, Support Vector regression, applications.

Unit 7: Basics of Genetic Algorithms
Evolution of Genetic and Evolutionary Algorithms, Applications.

BOOKS RECOMMENDED:
- Kosko B, *Neural Networks and Fuzzy Logic*, Prentice Hall
- Haykin S, *Neural Networks*, Pearson Education
- Anderson JA, *An Introduction to Neural Networks*, Prentice Hall
- Sivanandam S and Deepa SN, *Principles of Soft Computing*, Wiley India
Course Objective: To provide an understanding of the principles and concepts digital signal processing, to introduce compressive sensing and its application to automatic target recognition, to provide an understanding of current research in advanced digital signal processing.

Course Outcomes: At the end of this course student will demonstrate the ability to:
1. To understand theory of different filters and algorithms
2. To understand theory of multirate DSP, solve numerical problems and write algorithms
3. To understand theory of prediction and solution of normal equations
4. To know applications of DSP at block level.

Unit 1 Overview of DSP
Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

Unit 2 Multi rate DSP
Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in sub band coding. Unit 3 Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

Unit 4 Adaptive Filters
Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm

Unit 5 Estimation of Spectra from Finite-Duration Observations of Signals.

Unit 6 Application of DSP & Multi rate DSP, Application to Radar, introduction to wavelets, application to image processing, design of phase shifters, DSP in speech processing & other applications

References:
Course Objective
Understand the importance of using data fusion in multi-sensor systems, understand different sensor characteristics and data representations and their importance in data fusion, describe and appreciate different architectures for data fusion, understand simple approaches to data fusion for enhancing sensor reliability.

Course Outcomes
At the end of this course student will demonstrate the ability to:

1. Have an in-depth knowledge and understanding of mathematical concepts for representing uncertainty
2. And combining data, including deriving algorithms from first principles.
3. Have a detailed understanding of data fusion process models and architectures within a system engineering context and be able to critically appraise their applicability to different applications.

Unit 1: Introduction
Sensors and sensor data, Limitations of single sensor, Advantages of multisensory data fusion, Multi sensor data fusion applications, Data fusion models, Generic fusion architectures.

Unit 2: Algorithms for Data Fusion
Taxonomy of algorithms for multi-sensor data fusion. Learning of fusion models: Learning Bayesian classifier, Rule learning from decision three algorithms.

Unit 3: Estimation
Kalman filtering, practical aspects of Kalman filtering, extended Kalman filters, partial filter, Decision level identify fusion. Knowledge based approaches.

Unit 4: Advanced Filtering

Unit 5: High Performance Data Structures
Tessellated, trees, graphs and function. Representing ranges and uncertainty in data structures. Designing optimal sensor systems within dependability bounds. Implementing data fusion system, Application of multisensor data fusion for mobile robot mapping and Navigation.
**Course Objective** To demonstrate programming proficiency using the various addressing modes and data transfer instructions of the ARM microcontroller and to interface the controller to external devices. Design and implement a DSP system using tools like MATLAB.

**Course Outcomes** At the end of this course student will demonstrate the ability to:

1. Install, configure and utilize tool sets for developing applications based on ARM processor core SoC and DSP processor.
2. Develop prototype codes using commonly available on and off chip peripherals on the Cortex M3 and DSP development boards.

**List of Assignments:**

**Part A) Experiments to be carried out on Cortex-M3 development boards and using GNU toolchain**

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.
5. UART Echo Test.
6. Take analog readings on rotation of rotary potentiometer connected to an ADC channel.
7. Temperature indication on an RGB LED.
8. Mimic light intensity sensed by the light sensor by varying the blinking rate of an LED.
9. Evaluate the various sleep modes by putting core in sleep and deep sleep modes.
10. System reset using watchdog timer in case something goes wrong.
11. Sample sound using a microphone and display sound levels on LEDs.

**Part B) Experiments to be carried out on DSP C6713 evaluation kits and using Code Composer Studio (CCS)**

1. To develop an assembly code and C code to compute Euclidian distance between any two points
2. To develop assembly code and study the impact of parallel, serial and mixed execution
3. To develop assembly and C code for implementation of convolution operation
4. To design and implement filters in C to enhance the features of given input sequence/signal

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<td>PLC &amp; Industrial Automation lab</td>
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**Course Objective**: Describe working of various blocks of basic industrial automation system

**Course Outcomes**: At the end of this course student will demonstrate the ability to:

1. Connect the peripherals with the PLC
2. Use various PLC functions and develop small PLC programs
3. Summarize Distributed control system and SCADA system
4. Use various industrial motor drives for the Industrial Automation

**List of Assignments**:

1. Assemble various modules and component of PLC to make a PLC system
2. Execute/Prepare INPUT-OUTPUT module chart
3. Execute/Prepare ladder diagram of AND, OR, NOT, NAND, NOR, X-OR, X-NOR gate.
4. Execute/Prepare ladder diagram of AND, OR, NOT, NAND, NOR, X-OR, X-NOR gate.
5. Execute/Prepare ladder diagram for logical operations along with truth table.
6. Execute/Prepare ladder diagram for different logical conditions- for Timer
7. Execute/Prepare ladder diagram for different logical conditions- for Counter
8. Execute/Prepare allover ladder diagram for industrial process and control.
9. Develop ladder diagram for a temperature, level, and flow control system.
10. Interface personal computers in network using different topology.
12. Use SCADA system.
13. Identify various levels of distributed control system.
Course Objective
To understand some basic concepts of research and its methodologies, identify appropriate research topics, select and define appropriate research problem and parameters. The IPR is to make the students aware of their rights for the protection of their invention done in their project work.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand research problem formulation.
2. Analyze research related information and follow research ethics.
3. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. 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.
5. 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.

Unit I
Overview of Research: Meaning of Research, Objectives of research, Types of research, Research approaches, Significance of research, Criteria of good research. Defining the research problem: research problem, Necessity of defining the problem, Technique involved in defining a problem.

Unit II
Research Design: Need for research design, Features of a good design, Basic principles of Experimental design Data Collection: Methods of Data Collection; Primary data and Secondary Data.

Unit III
Data preparation: Data preparation process, designing questionnaires and schedules. Descriptive statistics: Measures of central tendency, Mean, Median, Mode etc. Sampling and non-sampling errors, Testing of Hypotheses: Parametric (t, z and F) Chi Square, ANOVA, and non-parametric tests.

Unit IV

Suggested Readings/ Books:
- Asimov, Introduction to Design, Prentice Hall.
T. Ramappa, Intellectual Property Rights Under WT, S. Chand
Course Objective
This course is intended to prepare students to design products based on product design principles, guidelines and skills. Students will be given experience of designing products through case studies. At the end of the module students will communicate design concepts through sketches, virtual and physical appearance model.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Design electronic products using user centered design process.
2. Develop sketches, virtual and physical appearance models to communicate proposed designs.
3. Refine product design considering engineering design & manufacturing requirements and constraints.
4. Make mock-up model and working prototype along with design documentation.

Unit I : Introduction to Industrial Design:
General introduction, role of Industrial design in the domain of industry, product innovation, designer’s philosophy and role in product design. Product development tools and methods.

Unit 2 : Product Design Methodology:
Electronic product design and development, Methodology, creativity techniques, brain storming, documentation.

Unit 3 : System Reliability Concepts:
Introduction to concepts of reliability, nature of reliability problems in electronic equipment, series configuration, Parallel Configuration, Mixed Configuration, Methods of Solving Complex Systems, Mean Time to Failure (MTTF) and Mean Time between Failure (MTBF) of Systems. Maintainability, Availability Concepts, System Downtime, mean time to Repair (MTTR).

Unit 4: Ergonomics and Aesthetics in Electronic Product Design:
Overview of Electronic Product Design, Top-Down and Bottom-Up Approach, Ergonomic and Aesthetics definition with Example, issues in Designing Electronic Products, Design of Controls and Display w.r.t. Ergonomic and Aesthetics Consideration.

Unit 5 : Control Panel Design:
Types of Controls, Design and Organization of Control Panel, Engineering Considerations, Layout of Components, Selection of Materials, Sheet metals and plastic, Structural Design and Control Cabinets Fabrication.

Unit 6: Thermal Design:
Conduction, convection, thermal design of electronics equipment’s and case studies

Unit 7: PCB Design:
Design rules for analog circuits, digital circuits, power circuits with connectors, PCB design using CAD packages.

BOOKS:
- Ernest Paul DeGarmo, J. T. Black, Ronald A. Kohser “Materials and Processes in Manufacturing”,
- John Wiley & Sons.
- Military Handbook, Electronic

REFERENCES
- Ergonomics at work, David J. Oborne, Pub. Wiley (Text)
- SAMEER Notes on Product Design, Thermal Design
- Product Design of Electronic Equipment, SAMEER
- SAMEER Notes on Ergonomics and Human Interface

**Course Objective**
The student will achieve an understanding of the issues related to computer-integrated manufacturing and the integration of automated processes within a modern manufacturing environment. The focus will be on engineering design, modeling and applications in automation, flow lines, robotics, numerical control, and computer usage in manufacturing.
Course Outcomes: At the end of this course student will demonstrate the ability to:
1. A knowledge of automated processes in a modern manufacturing environment.
2. An understanding of using engineering design, and modeling techniques towards flow lines, robotics, numerical control and the integration of computer control/usage in manufacturing.
3. An understanding of contemporary manufacturing/production strategies such as agile manufacturing and group technology.

Unit 1: INTRODUCTION
CIM concepts, evolution of CIM, Objectives of a manufacturing system-classifications of manufacturing system, Basic Elements of an Automated system – Levels of Automation – Lean Production and Just-In-Time Production.

Unit 2: COMPUTER AIDED PLANNING AND CONTROL
Production planning and control-cost planning and control-inventory management-Material requirements planning - (ERP)-shop floor control-Factory data collection system-Automatic identification system-barcode technology automated data collection system.

Unit 3: COMPUTER MONITORING
Types of production monitoring systems-structure model of manufacturing process-process control & strategies direct digital control-supervisory computer control-computer in QC –contact inspection methods non-contact inspection method - computer-aided testing –integration of CAQC with CAD/CAM.

Unit 4: CELLULAR MANUFACTURING

Unit 5: INTEGRATED MANUFACTURING SYSTEM

BOOKS:

REFERENCES:
5. W.Bosshart, Design & Fabrication of PCB
Course Objective
To make the student understand and apply the theory behind wireless sensor networks.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Use suitable principles and standards in design and evaluation of sensor networks and wireless communication protocols for small digital transmitters.
2. Demonstrate an ability to read, critically evaluate, analyses and present (verbally or in written form) the content and implications of research articles in the area.
3. Drawing on relevant results from research literature design and implement software and system solutions for wireless embedded systems.

Unit 1: Introduction to wireless technologies
WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread spectrum technology.

Unit 2: Introduction to Bluetooth
Specification, Core protocols, Cable replacement protocol Bluetooth Radio: Type of Antenna, Antenna Parameters, Frequency hopping.

Unit 3: Bluetooth Networking
Wireless networking, wireless network types, devices roles and states, adhoc network, scatter net Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary bluetooth profile.

Unit 4: Hardware

Unit 5: Programming with Java

Unit 6: Obex Package
Interfaces, classes bluetooth services registration and search application, bluetooth client and server application.Overview of IrDA, HomeRF, Wireless LANs, JINI
IK Gujral Punjab Technical University, Kapurthala

BOOKS:
- Bluetooth Technology by C.S.R. Prabhu and A.P. Reddi; PHI

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**Course Objective**
The objective is to provide the students with an overview of machine vision systems, their applications, algorithms and modeling

**Course Outcomes**
At the end of this course student will demonstrate the ability to:
1. Understand machine vision principles.
2. Be able to acquire and process raw image data.
3. Be able to relate image data to 3D scene structures (assessed practical).
4. Know the concepts behind and how to use several model-based object representations, and to critically compare them.
5. Know many of the most popularly used current computer vision techniques.

**Unit 1: Introduction Machine Vision**

**Unit 2: Image Processing Techniques and Transformations**

**Unit 3: Edge Enhancement Techniques and Image Analysis**

**BOOKS:**
Course Objective
The objective of this course is to provide students with opportunities to learn different types of digital systems and to understand and deal with various practical issues related to their design.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. This is an advanced course on digital design techniques.
2. The objective of this course is to provide students with opportunities to learn different types of digital systems and to understand and deal with various practical issues related to their design. The students will be able to appreciate the advantages/disadvantages between the implementations using standard logic (SSI, MSI) and programmable logic (PLDs, PGAs).
3. A great deal of emphasis will be given to Hardware Description language- VHDL and its design styles so that students can describe digital systems using HDL.

Unit 1: Introduction to Digital Design Concepts
Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals

Unit 2: VHDL
Why VHDL? Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioural, dataflow and structural models

Unit 3: Clocked Sequential Finite State Machines
State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers

Unit 4: Multi-input System Controllers Design
System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling, state assignment concepts, flip-flop level implementation using VEM’s
Unit 5: Sequential Design using LSI & MSI circuits  Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs)

Unit 6: Asynchronous Sequential Finite State Machines  Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design

Recommended Books

Programme Elective-IV

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Course Objective  The objective of this course is to make students to gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques. This enables them to design, analysis, fabrication and testing the MEMS based components. And to introduce the student’s various opportunities in the emerging field of MEMS

Course Outcomes  At the end of this course student will demonstrate the ability to:
1. Design fabrication process plan for development of MEMS
2. Identify characterization and assembly techniques for developed MEMS.
3. Develop physics-based model of MEMS

Unit 1: Introduction

Unit 2: Micromachining techniques
Introduction to Bulk Micromachining, Isotropic and Orientation-Dependent Wet Etching, Dry Etching, Buried Oxide Process, Silicon Fusion Bonding, Sacrificial Layer Technology, Surface Micromachining using Plasma Etching, Combined 1C Technology and Anisotropic Wet Etching, Processes Using Both Bulk and Surface Micromachining, Adhesion Problems in Surface Micromachining, Surface Versus Bulk Micromachining

Unit 4: Smart Sensors and Modeling
Introduction to Smart Sensors, Integrated Smart sensors and smart systems, MEMS and NEMS devices, Elastic structures in MEMS and NEMS, Modeling of Thermal Elastic systems, Electrostatic- elastic systems, magnetically actuated systems, Microfluidics (Membrane Pumps, Nanolithography, Nano jets)

BOOKS:
1. Modeling MEMS and NEMS John A. Pelesko and David H. Bernstein Chapman & Hall/CRC
2. MEMS Fundamental Technology and Applications vikas Choudhary and Krzysztof Iniewski CRC press
7. K.D. (Guest Editor) “Integrated Sensors, Microp-actuators and micro-systems

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Course Objective To provide an understanding of the principles and concepts Electronics and Instrumentation from the Agriculture prospective, to introduce compressive Agri Instrumentation and its application to automatic target recognition, to provide an understanding of current research in Precision Farming and its applications

Course Outcomes At the end of this course student will demonstrate the ability to:
1. To understand theory of different transducers used in agriculture
2. To enable the student to gain experience in data acquisition and instrument control
3. To understand the Precision Farming and its applications
4. To know applications of DSP at block level.
Unit 1: Introduction to Agri Instrumentation:


Unit 2: Instrument technology for agriculture:


Unit 3: Precision Farming:


Unit 4: Applications in Agriculture Electronics:


Text Books

2. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication Reference Books
IK Gujral Punjab Technical University, Kapurthala

4. K. Krishna Swamy, “Microprocessor based Agri instrumentation”; PHI publisher
5. Subhas Chandra Mukhopadhyay Smart Sensing Technology for Agriculture and Environmental Monitoring springer 2012

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<th>MTEP-PE4C-18</th>
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Course Objective

Students are introduced to advanced concepts in sensing and actuation for mechatronic systems, including both traditional sensors and actuators, an introduction to advanced topics in microelectromechanical system (MEMS) sensing, and smart material

Course Outcomes

At the end of this course student will demonstrate the ability to

1. Understand the underlying physical principles of the basic transduction mechanisms of different sensors and actuators.
2. Understand the evolution of emerging sensor and actuator technologies such as microelectromechanical systems (MEMS).
3. Understand the fundamental principles of data acquisition.
4. Demonstrate the ability to apply self-directed learning skills by researching a sensor or actuator not discussed in class.

Unit 1: Measurement Terminology

Input and output, range, accuracy, precision, resolution, sensitivity, linearity, repeatability, reproducibility, calibration and traceability, Testing, quality assurance and safety.

Unit 2: Transducers and sensors

Sensors and transducers: Temperature sensors, resistive sensors, capacitive sensors, electrostatic sensors, piezoelectric sensors, ultrasonic sensors, radiological sensors and MEMS. Optical sensing techniques: Common electromagnetic sensors, IR sensors, passive IR sensors, photo-resistive sensors, photovoltaic sensors, photodiodes, photoelectric detectors, solid state lasers, CCD and CMOS sensors.

Unit 3: Smart Sensors

Unit 4: ACTUATORS

Unit 5: EMERGING TOPICS
Introduction to sensor networks, sensor fusion, soft and intelligent sensors. System on module, Virtual instrumentation, Intelligent instrumentation, Fault tolerance, Real time systems introduction, reference model, scheduling approaches.

BOOKS:
- Smart Sensor Systems Edited by Gerard C.M. Meijer © 2008 John Wiley & Sons, Ltd.
- K.D. (Guest Editor) “Integrated Sensors, Microp-actuators and micro-systems
- MEMS, Special Issue of proceedings of IEEE, Vol. 86, No.8, August 1998

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<th>MTEP-113-18</th>
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Course Objective: This is laboratory course meant to realize various sensors like Ph, temperature, humidity and gas sensors and their interfacing with advanced microcontroller for measurement of real time data in agriculture for innovation in farming.

Course Outcomes: At the end of this course student will demonstrate the ability to:
- To understand theory of different transducers used in agriculture
- To enable the student to gain experience in data acquisition and instrument control
- To understand the Precision Farming and its applications
Experiments

1. Program and Interfacing of pH sensor for the measurement of Ph level
2. Program and Interfacing of Electrical conductivity sensor for the measurement of EC level
3. Program and Interfacing of humidity sensor for the measurement of humidity in soil.
4. Program and Interfacing of temperature sensor for the measurement of environment temp.
5. Study of Wireless Sensor Network for agricultural needs
6. Program and Interfacing of GIS/GPS positioning system for precision farming for Yield monitoring and mapping, soil sampling and analysis.
7. Design, modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse,
9. Study of the Microprocessor based Soil Nutrition Estimation System,
10. Design and study of Drip Irrigation system

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Course Objective

Course Outcomes At the end of this course student will demonstrate the ability to:

- 3D modeling and drafting using 3D features – 20 models
- Assembling and drafting of 2 assemblies
- Surface modeling – 4 exercises
- Types of PCBs & Overview
- PCB Technologies
- About the Base Material
- Component Identification
- Introduction to OrCAD Capture, Entry of Schematic Diagram
IK Gujral Punjab Technical University, Kapurthala

- Netlist File Creation, Introduction to OrCAD Layout Plus
- Placement of Components, Manual Routing, Post Processing
- Excursion to an Industry

Note-
1. The term- work will be accessed on the basis of completion of above assignments and submission of report
2. Practical examination: Duration 3 hours, Candidate will carry out one exercise in 2D modeling and one exercise in 3D Modeling, followed by oral examination

Programme Elective-V

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Course Objective Knowledge of Automobile engineering is essential for Mechatronic students and the course aims at training students in Mechatronic systems in Automotive Industry.

Course Outcomes At the end of this course student will demonstrate the ability to:
1. Demonstrate technical competence in the field of mechatronics engineering including problem identification and formulation, as well as dynamic and control analysis of mechatronic systems.
2. Demonstrate the practical skills associated with the use of modern modelling and simulation tools.
3. Design electronic and embedded systems for mechatronic applications including robotic, computer vision and control systems.

Unit 1: Introduction
Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach.
Unit 2: Review of fundamentals of electronic
Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs.

Unit 3: Drives
Stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, transfer systems.

Unit 4: Hydraulic systems
Flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits. Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. Description.

Unit 5: Controllers
Description of PID controllers, CNC machines and part programming. Industrial Robotics

BOOKS:

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Course Objective Students will understand the concepts of Internet of Things and can able to build IoT applications.

Course Outcomes At the end of this course student will demonstrate the ability to:

1. Understand the concept of IOT and M2M
2. Study IOT architecture and applications in various fields
3. Study the security and privacy issues in IOT.

Unit 1: - IoT & Web Technology
The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies,
Unit 2: - M2M to IoT

Unit 3: IoT Architecture

Unit 4: IoT Applications

Unit 5: Internet of Things Privacy, Security and Governance
Introduction, Overview of Governance, Privacy and Security Issues,

Unit 6: Contribution from FP7 Projects, Security, Privacy and Trust in IoT

References:
- Cuno Pfister, “Getting Started with the Internet of Things”, OReilly Media, 2011.

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<th>MTEP-PE5C-18</th>
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Course Objective
An overview of computer architecture, which stresses the underlying design principles and the impact of these principles on computer performance. General topics include design methodology, processor design, control design, memory organization, system organization, and parallel processing.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand parallelism and pipelining concepts, the design aspects and challenges.
2. Evaluate the issues in vector and array processors.
3. Study and analyze the high performance scalable multithreaded and multiprocessor systems.

Unit 1: Parallel Processing and Pipelining Processing
Architectural Classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism, Explicitly Parallel Instruction Computing (EPIC) Architecture

Unit 2: Pipeline Architecture
Principles and implementation of Pipelining, Classification of pipelining processors, Design aspect of Arithmetic and Instruction pipelining, pipelining hazards and resolving techniques, Data buffering techniques, Advanced pipelining techniques, Software pipelining, VLIW (Very Long Instruction Word) processor.

Unit 3: Vector and Array Processor

Unit 4: Multiprocessor Architecture
Loosely and Tightly coupled multiprocessors, Inter Processor communication network, Time shared bus, Multiport Memory Model, Memory contention and arbitration techniques, Cache coherency and bus snooping, Massively Parallel Processors (MPP).

Unit 5: Multithreaded Architecture
Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions, Parallel Programming Techniques: Message passing program development.

Unit 6: Parallel algorithms for multiprocessors
Classification and performance of parallel algorithms, operating systems for multiprocessors systems, Message passing libraries for parallel programming interface, PVM (in distributed memory system), Message Passing Interfaces (MPI).

References:
Course Objective
This course deals with strategic cost management for engineering projects and useful quantitative techniques to implement.

Course Outcomes
At the end of this course, students will demonstrate the ability to:
1. Understand the cost calculation for decision-making about an engineering research project.
2. Able to define the role of each member in the project team.
3. Manage the project by applying quantitative techniques for cost management.

Unit 1
Introduction and Overview of the Strategic Cost Management Process

Unit 2:
Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

Unit 3:

Unit 4:
IK Gujral Punjab Technical University, Kapurthala

Recommended Books:
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
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

Course Objective
This course deals with Composite Materials and preparation/manufacturing of Metal Matrix Composites.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand the characteristics of Composite materials and their advantages and applications
2. Get exposure to Manufacturing of Metal Matrix Composites: Knitting, Braiding, Weaving and estimate Strength

Unit 1

Unit 2:

Unit 3:

Unit 4:

Unit 5:

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

Recommended Books:

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Course Name

Course Objective
This is course deals with effective and cheap methods to convert waste into useful energy.

Course Outcomes
At the end of this course student will demonstrate the ability to:
1. Understand various methods to convert agro, forest and industrial residue to useful energy
2. Get exposure Biomass Combustion, Biomass Gasification etc.

Unit 1
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit 2:

Unit 3:
Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit 4:
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.

Unit 5:
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.

Recommended Books:

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<tr>
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Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section
3. Understand the skills needed when writing a Title
Ensure the good quality of paper at very first-time submission

Syllabus
Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: 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,

Unit 5: skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

Unit 6: useful phrases, how to ensure paper is as good as it could possibly be the first-time submission

Suggested Studies:
Course Objectives: -Students will be able to:
1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Syllabus

Unit 1: Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Unit 2: 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.

Unit 3: 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.

Unit 4: 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.


Unit 6: 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.

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

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**Course Objectives**
1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

**Syllabus**

**Unit 1**
- Alphabets in Sanskrit,
- Past/Present/Future Tense,
- Simple Sentences

**Unit 2**
- Order
- Introduction of roots
- Technical information about Sanskrit Literature

**Unit 3**
- Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**Suggested reading**
1. “Abhyaspustakam” – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

**Course Output**
Students will be able to
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students
Course Objectives
Students will be able to
1. Understand value of education and self-development
2. Imbibe good values in students
3. Let the should know about the importance of character

Syllabus
Unit 1
- Values and self-development – Social values and individual attitudes. Work ethics, Indian vision of humanism.
- Value judgements

Unit 2
- Importance of cultivation of values.
- Patriotism. Love for nature, Discipline

Unit 3
- 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

Unit 4
- 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

Suggested reading
Course outcomes
Students will be able to
1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality
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.

Syllabus
Unit 1
- History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)

Unit 2
- Philosophy of the Indian Constitution: Preamble, Salient Features

Unit 3
- Contours of Constitutional Rights & Duties:
  - Fundamental Rights
  - Right to Equality
  - Right to Freedom
  - Right against Exploitation
  - Right to Freedom of Religion
  - Cultural and Educational Rights
  - Right to Constitutional Remedies
  - Directive Principles of State Policy
  - Fundamental Duties.

Unit 4
- Organs of Governance:
  - Parliament
  - Composition
  - Qualifications and Disqualifications
  - Powers and Functions
  - Executive
  - President
  - Governor
  - Council of Ministers
  - Judiciary, Appointment and Transfer of Judges, Qualifications
  - Powers and Functions

Unit 5
- Local Administration:
  - District’s Administration head: Role and Importance,
Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.
Elected officials and their roles, CEO Zila Pachayat: Position and role.
Block level: Organizational Hierarchy (Different departments),
Village level: Role of Elected and Appointed officials,
Importance of grass root democracy

Unit 6
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.

Suggested reading
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 elections through adult suffrage in the Indian Constitution.
Course Objectives:
Students will be able to:
1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Syllabus
Unit 1
- Introduction and Methodology:
  - Aims and rationale, Policy background, Conceptual framework and terminology
  - Theories of learning, Curriculum, Teacher education.
  - Conceptual framework, Research questions.
  - Overview of methodology and Searching.

Unit 2
- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.

Unit 3
- 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.

Unit 4
- 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

Unit 5
- Research gaps and future directions
- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

Suggested reading

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?
Course Objectives
1. To achieve overall health of body and mind
2. To overcome stress

Syllabus

Unit 1
- Definitions of Eight parts of yog. (Ashtanga) 8

Unit 2
- Yam and Niyam.
  Do’s and Don’t’s in life.
  i) Ahinsa, satya, astheya, bramhacharya and aparigraha
  ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3
- Asan and Pranayam
  i) Various yog poses and their benefits for mind & body
  ii) Regularization of breathing techniques and its effects-Types of pranayam

Suggested reading
1. ‘Yogic Asanas for Group Tarining-Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (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
Course Objectives
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

Syllabus

Unit 1: 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 (dont’s)
- Verses- 71,73,75,78 (do’s)

Unit 2
- 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.

Unit 3
- 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

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

Course Outcomes
Students will be able to
1. Study of Shrimad-Bhagwad-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.