COURSE STRUCTURE AND SYLLABUS

For
B. Tech. Electronics Engineering Programme
with effect from the Academic Year

2017-2018 (First Year), 2018-2019 (Second Year),
2019-2020 (Third Year), 2019-2021 (Final Year).
## Curriculum for Semester III [Second Year]

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Total: 13 L 05 T 10 100 MSE 450 CA 550 ESE 1100 Credits 22
### B. Tech (Electronics & Telecommunication Engineering) / B. Tech (Electronics Engineering)

#### Curriculum for Semester IV [Second Year]

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### Dr. Babasaheb Ambedkar Technological University, Lonere.

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Bachelor of Technology Degree Course in Electronics Engineering
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**Program Elective 2**

(A) Digital Communication
(B) Computer Network and Cloud Computing
(C) Nano Electronics
(D) Web Development and Design

**Open Elective 1**

(A) Digital System Design
(B) Neural Networks and Fuzzy Systems
(C) NSQF (Level 7 Course)
(D) Analog Integrated Circuit Design

**Open Elective 2**

(A) Embedded System Design
(B) Electronics System Design
(C) Project Management and Operation Research
(D) Android Programming

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* To be evaluated in VIIth Semester
# Proposed Curriculum for Semester VII [Final Year]

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<td>(B) Data Compression and Encryption/Encryption</td>
<td>(B) Wireless Sensor Networks</td>
<td>(B) Satellite Communication</td>
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<td>(C) NSQF (Level 7 Course)</td>
<td>(C) CMOS Design</td>
<td>(C) Fiber Optic Communication</td>
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<td>(D) Parallel Processing</td>
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<td>(D) Wireless Communication</td>
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</table>

Dr. Babasaheb Ambedkar Technological University, Lonere.
## Proposed Curriculum for Semester VIII [Final Year]

(Students doing the Project at Institute Level)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course Code</th>
<th>Type of Course</th>
<th>Course Title</th>
<th>Hours Per Week</th>
<th>Evaluation Scheme</th>
<th>Total Marks</th>
<th>Credits</th>
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| Total   | 9   | 0  | 20  | 60  | 240 | 350 | 650 | 19  |        |          |

Bachelor of Technology Degree Course in Electronics Engineering
B. Tech (Electronics Engineering)
Proposed Curriculum for Semester VIII [Final Year]
(Students doing the Project at Industry)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course Code</th>
<th>Type of Course</th>
<th>Course Title</th>
<th>Hours Per Week</th>
<th>Evaluation Scheme</th>
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* Students should complete the certification credit course using SWAYAM, MOOC, NPTEL, Coursera platform and submit the certificate. University will transfer these credits accordingly.
### OR

**B. Tech (Electronics Engineering)**

Proposed Curriculum for Semester VIII [Final Year]

(Students doing the In-plant training and completing the Project sponsored / promoted by Industry)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course Code</th>
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<th>Hours Per Week</th>
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*Students should complete the certification course using SWAYAM, MOOC, NPTEL Platform or self-study mode.*

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**Program Elective 6 (Group A)**

- (A) Surface Mounting Technology
- (B) Mixed Signal Design
- (C) Bio-medical Signal Processing
- (D) Multirate Digital Signal Processing
- (E) Wavelet Theory

**Program Elective 7 (Group B)**

- (A) e-Yantra
- (B) Mobile Communication & Networks
- (C) Geo-informatics and Spatial Computing
- (D) Software Defined Radio
- (E) Entrepreneurship Development

**Open Elective 3 (Group C)**

- (A) Advanced Industrial Automation
- (B) Electronics in Smart City
- (C) Industrial Drives and Control
- (D) Robotics Design
- (E) Block Chain Technology
Second Year B. Tech Classes (Common to all Branches)  Semester: III

Prerequisites: Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and first degree, Fourier series, Vector algebra, Algebra of complex numbers.

Course Objectives:
After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
2. Transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Vector differentiation and integration required in Electromagnetics and Wave theory.
4. Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

Course Outcomes:
On completion of the course, students will be able to:

1. Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
2. Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
4. Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields.
5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.
UNIT - 1  
07 Hours

Laplace Transform
Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by \( t^n \), scale change property, transforms of functions divided by \( t \), transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT - 2  
07 Hours

Inverse Laplace Transform
Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT - 3  
07 Hours

Fourier Transform
Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval’s identity for Fourier Transforms.

UNIT - 4  
07 Hours

Partial Differential Equations and Their Applications
Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange’s linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation \( \left( \frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2} \right) \), and two dimensional heat flow equation (i.e. Laplace equation : \( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0 \)).
Functions of Complex Variables (Differential calculus)
Limit and continuity of f(z); Derivative of f(z); Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection, bilinear transformation; Conformal mapping.

Functions of Complex Variables (Integral calculus)
Cauchy’s integral theorem; Cauchy’s integral formula; Residues; Cauchy’s residue theorem (All theorems without proofs).

TEXT BOOKS
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.

REFERENCE BOOKS
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
Dr. Babasaheb Ambedkar Technological University, Lonere.


<table>
<thead>
<tr>
<th>GENERAL INSTRUCTIONS</th>
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</thead>
<tbody>
<tr>
<td>1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.</td>
</tr>
<tr>
<td>2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.</td>
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<tr>
<td>3. The minimum number of assignments should be eight covering all topics.</td>
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</table>

| BTEXC302 | Analog Circuits | 3 Credits |

Course Objectives:
1. To understand characteristics of IC and Op-Amp and identify the internal structure.
2. To introduce various manufacturing techniques.
3. To study various op-amp parameters and their significance for Op-Amp.
4. To learn frequency response, transient response and frequency compensation techniques for Op-Amp.
5. To analyze and identify linear and nonlinear applications of Op-Amp.
6. To understand functionalities of PLL.

Course Outcomes:
On completion of the course, students will be able to:
1. Understand the characteristics of IC and Op-Amp and identify the internal structure.
2. Understand and identify various manufacturing techniques.
3. Derive and determine various performances based parameters and their significance for Op-Amp.
4. Comply and verify parameters after exciting IC by any stated method.
5. Analyze and identify the closed loop stability considerations and I/O limitations.
6. Analyze and identify linear and nonlinear applications of Op-Amp.
7. Understand and verify results (levels of V & I) with hardware implementation.
8. Implement hardwired circuit to test performance and application for what it is being designed.
9. Understand and apply the functionalities of PLL.
Dr. Babasaheb Ambedkar Technological University, Lonere.

<table>
<thead>
<tr>
<th>UNIT - 1</th>
<th>06 Hours</th>
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<tbody>
<tr>
<td><strong>OP-AMP Basics</strong></td>
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<tr>
<td>Block diagram of OP-AMP, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations, Need and types of level shifter, current mirror circuits. Feedback topologies: Voltage series and voltage shunt feedback amplifier and its effect on $R_i$, $R_o$, bandwidth and voltage gain.</td>
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<tr>
<td><strong>Linear Applications of OP-AMP</strong></td>
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<tr>
<td>Inverting and non-inverting amplifier configurations, voltage follower, summing, averaging scaling amplifier, difference amplifier, integrator, differentiator, and instrumentation amplifiers.</td>
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<tr>
<th>UNIT - 3</th>
<th>06 Hours</th>
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<tr>
<td><strong>Non-linear Applications of OP-AMP</strong></td>
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<tr>
<td>Introduction to comparator, characteristics and applications of comparator, Schmitt trigger, clippers and clampers, voltage limiters, square wave generator, triangular wave generator, Need of precision rectifiers, Half wave and Full wave precision rectifiers.</td>
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<tr>
<th>UNIT - 4</th>
<th>06 Hours</th>
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<tbody>
<tr>
<td><strong>Converters using OP-AMP</strong></td>
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<tr>
<th>UNIT - 5</th>
<th>06 Hours</th>
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<tbody>
<tr>
<td><strong>Oscillators</strong></td>
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<tr>
<td>Principle of Oscillators, Barkhausen criterion, Oscillator types: RC oscillators (design of phase shift, Wien bridge etc.), LC oscillators (design of Hartley, Colpitts, Clapp etc.), non-sinusoidal oscillators, and voltage controlled oscillators.</td>
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<table>
<thead>
<tr>
<th>UNIT - 6</th>
<th>06 Hours</th>
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<tbody>
<tr>
<td><strong>Active filters and PLL</strong></td>
<td></td>
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<tr>
<td>Design guidelines of Active filters: Low pass, high pass, band pass and band stop filters, block diagram of PLL and its function.</td>
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</table>
TEXT/REFERENCE BOOKS


Prerequisites:
Basic knowledge of Semiconductor Physics.

Course Objectives:
1. To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications
2. To introduce concepts of both positive and negative feedback in electronic circuits
3. To analyze and interpret FET and MOSFET circuits for small signal at low and high frequencies
4. To simulate electronics circuits using computer simulation software and verify desired results
5. To study the different types of voltage regulators.

Course Outcomes:
On completion of the course, students will be able to:
1. Comply and verify parameters after exciting devices by any stated method.
2. Implement circuit and test the performance.
3. Analyze small signal model of FET and MOSFET.
4. Explain behavior of FET at low frequency.
5. Design an adjustable voltage regulator circuits.
JFET
Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self). FET as an amplifier and its analysis (CS) and its frequency response, Small signal model, FET as High Impedance circuits

MOSFET & its DC Analysis

Electronics Amplifiers

Oscillators

Multivibrators
IC555 Block diagram, Types of Multivibrators: Astable, Monostable and Bistable, Operation of Multivibrators using FETs and IC555. Applications of IC555 in Engineering.
Voltage Regulator

Block diagram of an adjustable three terminal positive and negative regulators (317,337) typical connection diagram, current boosting, Low drop out voltage regulators, Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.

TEXT/REFERENCE BOOKS


Course Objectives:

1. To learn about the basic laws of electric circuits as well as the key fundamentals of the communication channels, namely transmission lines.
2. To understand the need of simplification techniques of complicated circuits
3. To learn about the comprehensive insight into the principle techniques available for characterizing circuits, networks and their implementation in practice.
4. To learn about the use of mathematics, need of different transforms and usefulness of differential equations for analysis of networks.
5. To train the students for handling analog filter design through theory of NA along with practical, this is basic requirement of signal processing field.

Course Outcomes:

On completion of the course, students will be able to:
1. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
2. Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters.
3. Identify issues related to transmission of signals, analyze different RLC networks.
4. Find technology recognition for the benefit of the society.

**UNIT - 1**

**Basic Circuit Analysis and Simplification Techniques**


*Note: Above circuit analysis, mentioned in this Unit-1, is for AC network only.*

**UNIT - 2**

**Frequency Selective Networks**

Significance of Quality factor, Series Resonance: Resonating frequency, Reactance curves, Variation of circuit parameters such as impedance, phase angle, voltage and current with frequency; Bandwidth, Selectivity, Magnification factor, Parallel resonance: Resonant frequency, Variation circuit parameters such as admittance, phase angle, voltage and current with frequency; Bandwidth and selectivity. Analysis of parallel resonating circuit with resistance present in both branches (inductive and capacitive branches) and tank circuit, Effect of generator resistance on BW & Selectivity, Comparison and applications of series and parallel resonant circuits.

**UNIT - 3**

**Electrical Network Parameters and Passive Filters**

Classifications: Symmetrical and Asymmetrical networks. Properties of two port Network :(i) Symmetrical Networks (T and Γ only): Characteristics impedance and propagation constant in terms of circuit components, open and short circuit parameters (ii) Asymmetrical
Networks: Image Impedance and Iterative Impedance. Passive Filters: Filter fundamentals, Introduction to Neper and Decibel, Relation between Neper and Decibel, Constant K-LPF, HPF, BPF and BSF, m-derived LPF and HPF, Terminating half sections, Concept of composite filters. Attenuators: Symmetrical T and II type attenuators, Ladder attenuator.

**UNIT - 4**

<table>
<thead>
<tr>
<th>steady state and transient response</th>
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<tr>
<td>DC and AC response of R-L, R-C and RLC circuits, Analysis of electrical circuits using Laplace Transform.</td>
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</table>

**UNIT - 5**

<table>
<thead>
<tr>
<th>two port network parameters and functions</th>
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</thead>
<tbody>
<tr>
<td>Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.</td>
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</table>

**UNIT - 6**

<table>
<thead>
<tr>
<th>transmission line theory</th>
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</thead>
<tbody>
<tr>
<td>Types of Transmission lines, Transmission Line Equation, Equivalent circuits, Primary and Secondary line constants, Terminations of transmission lines, VSWR and Reflection Coefficient, Impedance matching, Transmission line measurements using Smith chart.</td>
</tr>
</tbody>
</table>

**TEXT/REFERENCE BOOKS**

Dr. Babasaheb Ambedkar Technological University, Lonere.

| BTEXC305 | Digital Logic Design | 3 Credits |

**Course Objectives:**
1. To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2. To lay the foundation for further studies in areas such as communication, VHDL, computer.

**Course Outcomes:**
On completion of the course, students will be able to:
1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design combinational and sequential circuits.
3. Design and implement hardware circuit to test performance and application.
4. Understand the architecture and use of VHDL for basic operations and Simulate using simulation software.

**UNIT - 1**  
**06 Hours**

**Combinational Logic Design**
Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don’t care conditions, Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Design of Multiplexers and De-multiplexers, Decoders.

**UNIT - 2**  
**06 Hours**

**Sequential Logic Design**
1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops. Application of Flip-flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, definitions of lock out, Clock Skew, and Clock jitter.
State Machines
Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

Digital Logic Families
Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL, Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I^2L and DCTL

Programmable Logic Devices and Semiconductor Memories
Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

Introduction to VHDL
Behavioral – data flow, and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples, combinational circuit design examples in VHDL and simulation.

TEXT/REFERENCE BOOKS

### BTHM3401 Basic Human Rights Audit

**Course Objectives:**

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency.
3. To recognize democratic institutions as a fundamental human right.
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur.
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights.
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture.
11. To study the effects of draconian laws and unlawful use of State's machinery and force by the enforcement agencies.
Course Outcomes:
On completion of the course, students will be able to:

1. Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.
2. Strengthen the respect for human rights and fundamental freedoms.
3. Enable all persons to participate effectively in a free society.
4. Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights.
5. Learn about regional, national, state, and local law that reinforces international human rights law.
6. Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights.

UNIT - 1    06 Hours

The Basic Concepts
Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

UNIT - 2    06 Hours

Human Rights and Human Duties

UNIT - 3    06 Hours

Society, Religion, Culture, and their Inter-Relationship
Impact of Social Structure on Human behavior, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

UNIT - 4    06 Hours

Social Structure and Social Problems
Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged
UNIT - 5
06 Hours

State, Individual Liberty, Freedom and Democracy
The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

UNIT - 6
06 Hours

Human Rights in Indian Constitution and Law
The constitution of India:
(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

TEXT/REFERENCE BOOKS

2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

BTEXC401 Electrical Machines and Instruments 3 Credits

Course Objectives:
1. Model and Analyze the performance of different types of DC machines
2. Learn the applications of DC generators
3. Analyze the performance of different types of DC motors
4. Analyze the performance of different types of Sensors and Transducers
5. Familiarize with the applications of DC machines
6. To prepare students to perform the analysis of any electromechanical system.
7. To empower students to understand the working of electrical equipment used in everyday life.

Course Outcomes:

On completion of the course, students will be able to:

1. The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
2. The skill to analyze the response of any electrical machine.
3. The ability to troubleshoot the operation of an electrical machine.
4. The ability to select a suitable measuring instrument for a given application.
5. The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument.

UNIT - 1 06 Hours

DC Machines

DC machines construction, working principle (motor & generator), EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), back emf, starters of dc machine, Speed control of DC motor Breaking of DC motor, applications of DC machines (motor and generator).

UNIT - 2 06 Hours

Induction Motor and Synchronous Motor

Induction Motor: Construction, working principle, types, torque equation, torque slip characteristics, power stages, losses and efficiency, starters speed control, breaking, applications. Synchronous motor: Construction, working principle, starting methods, effect of load, hunting, V-curve, synchronous condenser, applications.

UNIT - 3 06 Hours

Special Purpose Machines

Construction, working and application of steeper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM.
Sensors and Transducers
Classification selection of transducers strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types, interfacing techniques of transducers with microprocessor and controller.

Industrial Measurement and Industrial Applications
Measurement of vibration, electrical telemetry thickness, humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, object counter level measurement, on/off timers, RTC, sound level meter, tachometer, VAW meter.

I/O Devices
Recorder X-Y plotters and its applications, optical oscillograph.

TEXT/REFERENCE BOOKS
1. A course in Electrical and Electronic Measurement and Instrumentation” by A. K. Sawhney (Publisher name: Dhanpat Rai & Co.)
2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
11. B. L. Theraja, “Electrical technology” volume 2, S. Chand.

### Course Objectives:
1. To introduce the concepts of analog communication systems.
2. To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
3. To understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase)

### Course Outcomes:
On completion of the course, students will be able to:
1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Understand the concepts of modulation and demodulation techniques.
3. Design circuits to generate modulated and demodulated wave.
4. Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
5. Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase).
6. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
7. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

### Introduction to Communication System
Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation,
Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.

<table>
<thead>
<tr>
<th>UNIT - 2</th>
<th>06 Hours</th>
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</table>
**Amplitude Modulation**
Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator.
Types of AM: DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.

<table>
<thead>
<tr>
<th>UNIT - 3</th>
<th>06 Hours</th>
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</table>
**Angle Modulation**
Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM.

<table>
<thead>
<tr>
<th>UNIT - 4</th>
<th>06 Hours</th>
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</thead>
</table>
**Radio Receivers and Demodulators**
Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and IFRR, Tracking and Double spotting, TRF, Super heterodyne receivers, RF amplifier, Local oscillator and mixer, IF amplifier, AGC.

<table>
<thead>
<tr>
<th>UNIT - 5</th>
<th>06 Hours</th>
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</table>
**AM and FM Detectors**
AM Detectors: Envelop detector and practical diode detector.
FM Detectors: Slope detector, phase discriminator and ratio detector.

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<tr>
<th>UNIT - 6</th>
<th>06 Hours</th>
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</thead>
</table>
**Noise**
Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature.
Course Objectives:
1. Objective of this course is to introduce to the students the fundamentals of microprocessor.
2. After learning Microprocessor course, students will get advantage to pursue higher studies in Embedded Systems or employment in core industries.
3. The learner can design microprocessor based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.
4. The students can design and develop processor which can be used in Robotics, Automobiles, Space and many research areas.
5. The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.
6. The students will get acquainted with recent trends in microprocessor like pipelining, cache memory etc.
7. To understand the applications of Microprocessors.
8. To learn interfacing of real world input and output devices.
9. To study various hardware and software tools for developing applications.

Course Outcomes:
1. Learner gains ability to apply knowledge of engineering in designing different case studies.
2. Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.
3. Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.
4. Students can identify and formulate control and monitoring systems using microprocessors.
5. Students will design cost effective real time system to serve engineering solution for Global, social and economic context.
6. This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation.
7. Learn use of hardware and software tools.
8. Develop interfacing to real world devices.

<table>
<thead>
<tr>
<th>UNIT - 1</th>
<th>07 Hours</th>
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</thead>
<tbody>
<tr>
<td>Fundamentals of Microprocessor</td>
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</table>
Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals.

<table>
<thead>
<tr>
<th>UNIT - 2</th>
<th>07 Hours</th>
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</thead>
<tbody>
<tr>
<td>Programming with 8085</td>
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</tbody>
</table>
Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs.

<table>
<thead>
<tr>
<th>UNIT - 3</th>
<th>07 Hours</th>
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</thead>
<tbody>
<tr>
<td>Interrupts</td>
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</tbody>
</table>
Interrupt structure of 8085 microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts.

<table>
<thead>
<tr>
<th>UNIT - 4</th>
<th>07 Hours</th>
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<tbody>
<tr>
<td>Interfacing</td>
<td></td>
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</tbody>
</table>
Memory Interfacing, Interfacing with 8255 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8279 Display controller, Interrupt controller 8259.
UNIT - 5  07 Hours

Introduction of 8086 Microprocessor

Detail Architecture of 8086, Addressing Modes, Assembler directives, Co-Processor

TEXT/REFERENCE BOOKS

1. Microprocessor and interfacing 8085, Douglas V Hall, Tata Mc Gram Hill.
2. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
5. Rout 8085 microcontroller-architecture, programming and application, 2nd edi, penram international.

BTEXC404  Signals and Systems  3 Credits

Course Objectives:
1. To understand the mathematical description of continuous and discrete time signals and systems.
2. To classify signals into different categories.
3. To analyze Linear Time Invariant (LTI) systems in time and transform domains.
4. To build basics for understanding of courses such as signal processing, control system and communication.
5. To develop basis of probability and random variables.

Course Outcomes:
On completion of the course, students will be able to:
1. Understand mathematical description and representation of continuous and discrete time signals and systems.
2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.

4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s-domain.

5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

UNIT - 1  06 Hours

Introduction to Signals and Systems

Introduction and Classification of signals: Definition of signal and systems, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power, elementary signals used for testing: exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc

Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding, Sampling Theorem and reconstruction of sampled signal, Concept of aliasing, examples on under sampled and over sampled signals.

Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

UNIT - 2  06 Hours

Time domain representation of LTI System


UNIT - 3  06 Hours

Fourier Series

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, FS representation of CT signals using exponential Fourier series, Fourier spectrum representation, properties of Fourier series, Gibbs phenomenon, Discrete Time Fourier Series and its properties.
Fourier transform
Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, FT of standard periodic CT signals, Introduction to Fourier Transform of DT signals, Properties of CTFT and DTFT, Fourier Transform of periodic signals. Concept of sampling and reconstruction in frequency domain, sampling of bandpass signals.

Laplace and Z-transform
Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC and its properties, properties of Laplace transform, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, Application of Laplace transforms to the LTI system analysis.
Introduction to Z-transform, and its properties, Inverse Z-transform, different methods of inverse Z-transform, Z-transform for discrete time system LTI analysis.

Probability and Random Signals
Probability: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, Random variables: Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Definitions: Statistical averages, mean, moments and expectations, standard deviation and variance, Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

TEXT/REFERENCE BOOKS
8. NPTEL video lectures on Signals and Systems.

<table>
<thead>
<tr>
<th>BTID405</th>
<th>Product Design Engineering</th>
<th>2 Credits</th>
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</table>

**Teaching Scheme:**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture-cum-demonstration</td>
<td>1 hr/week</td>
</tr>
<tr>
<td>Design Studio</td>
<td>2 hr/week</td>
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</tbody>
</table>

**Examination Scheme:**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>Continuous Assessment 1</td>
<td>30</td>
</tr>
<tr>
<td>Continuous Assessment 2</td>
<td>30</td>
</tr>
<tr>
<td>Final Assessment</td>
<td>40</td>
</tr>
</tbody>
</table>

- Pre-requisites: Knowledge of Basic Sciences, Mathematics and Engineering Drawing
- Design Studio : 2 hr/week to develop design sketching and practical skills, learning digital tools
- Continuous Assessment: Progress through a product design and documentation of steps in the selected product design
- Final Assessment: Product Design in Studio with final product specifications

**Course Outcomes:** At the end of the course, students will be able to

1. Create simple mechanical or other designs
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively with colleagues.
Introduction to Engineering Product Design:
Trigger for Product/ Process/ System, Problem solving approach for Product Design, Disassembling existing Product(s) and understanding relationship of components with each other, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failed products, Public/Society’s perception of products, and its input into product design.

Ideation:
Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or group of individuals, Sketching of products, Market research for need, competitions, scale and cost, Initial specifications of products.

Conceptualisation:
Computer operation principles and image editing through a graphical Composition; Computer aided 2D drafting and 3D Modeling through simple exercises.

Designing of components, Drawings of parts and synthesis of a product from its component parts, Rendering the designs for 3-D visualization and to create a photo realistic image, Parametric modelling of product, 3-D Visualization of mechanical products, Detail Engineering drawings of components.

Detailing:
Managing assembling, Product specifications- data Sheet, Simple mechanical designs, Workshop safety and health issues, Create documents for knowledge sharing.
Hands-on Activity Charts for Use of Digital Tools

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Difficulty</th>
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<tbody>
<tr>
<td>Activity 1</td>
<td>Learn the basic vector sketching tools.</td>
<td>2</td>
</tr>
<tr>
<td>Activity 2</td>
<td>General understanding of shading for adding depth to objects. Understanding of editing vectors</td>
<td>2</td>
</tr>
<tr>
<td>Activity 3</td>
<td>Begin developing a thought process for using digital sketching.</td>
<td>3</td>
</tr>
<tr>
<td>Activity 4</td>
<td>Create a basic shape objects sphere, box cylinders</td>
<td>3</td>
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<tr>
<td>Activity 5</td>
<td>Create Automotive wheel concepts</td>
<td>3</td>
</tr>
<tr>
<td>Activity 6</td>
<td>Understanding Navigation and Data Panel Interface</td>
<td>2</td>
</tr>
<tr>
<td>Activity 7</td>
<td>Solid and Surface modelling, Rendering 3-D models</td>
<td>4</td>
</tr>
<tr>
<td>Activity 8</td>
<td>Product market and Product Specification Sheet</td>
<td>3</td>
</tr>
<tr>
<td>Activity 9</td>
<td>Documentation for the product</td>
<td>2</td>
</tr>
</tbody>
</table>

**TEXT/REFERENCE BOOKS**

1. Model Curriculum for “Product Design Engineer – Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programmes and to work in research institutes.
2. To understand different numerical techniques used for solving algebraic and transcendental equations.
3. To understand numerical methods to solve a system of linear equations.
4. To understand numerical integration and differentiation techniques.
5. To understand various difference operators and interpolation techniques.
6. To understand object-oriented programming fundamentals and features.
7. To mold students professionally by course contents and sufficient problem solving and programming exercises and to acquaint them with different types of numerical techniques and programming concepts.

Course Outcomes:
On completion of the course, students will be able to:

1. Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem.
2. Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques.
3. Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values.
4. Prepare them to write computer programs for the numerical computational techniques.
5. Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc.

6. Understand procedure-oriented and object oriented programming concepts.

7. Capable of writing C and C++ programs efficiently.

---

**UNIT - 1**

**06 Hours**

**Introduction to Computational Methods and Errors**

Computational Methods: General principles of computational techniques, Introduction, common ideas and concepts of computational methods, various computational techniques.

Errors: Types and sources of errors, Concept in error estimation, Error propagation, Error due to floating point, Representation of errors, Elementary uses of series in calculation of errors.

---

**UNIT - 2**

**06 Hours**

**Solution of Transcendental / Polynomial Equations and System of Linear Equation**

Solution of Transcendental / Polynomial Equations: Finding root of polynomial equations deploying computational methods such as Bisection, Regula-falsi, Newton-Raphson, Seccant, Successive approximation. System of linear equation: Solving linear equations deploying computational methods such as Gauss elimination, Gauss Jordan, Partial pivoting, Matrix triangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods.

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**UNIT - 3**

**06 Hours**

**Interpolation and Polynomial Approximation**

Least square approximation, Orthogonal polynomials Chebyshev polynomials, Finite difference operator and their relations, Forward, backward, central and divided difference, Newton's forward divided difference, Backward difference interpolation, Sterling interpolation, Lagrange’s interpolation polynomials, Spline interpolation, Least square approximation.

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**UNIT - 4**

**06 Hours**

**Numerical Integration and Differentiation**

UNIT - 5

Object Oriented Programming
Software Evaluation, Object oriented programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, Object oriented languages, Applications of OOP
Beginning with C++: Structure of C++ program, Creating the source file, Compiling & linking, Basic data types, User defined data types, Symbolic constants, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Type cast operator. Functions in C++: Function prototyping, Inline functions, Function overloading, Friend and virtual functions. Classes and Objects: Specifying a class, Defining member functions, C++ program with class, Arrays within a class, Memory allocation for objects, Constructors, Multiple constructor in class, Dynamic initialization of objects, Dynamic constructor, Destructors.

UNIT - 6

Operator Overloading and Type Conversions
Defining operator overloading, Overloading unary operators, Overloading binary operators, Manipulation of strings operators, Rules for overloading operators. Inheritance: Extending Classes: Defining derived classes, Single inheritance, multilevel inheritance, multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Member classes: Nesting of classes Pointers Virtual Functions and Polymorphism: Pointers to objects, Pointers to derived classes, Virtual functions, pure virtual functions Managing Console I/O Operations C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Managing output with manipulators.

TEXT/REFERENCE BOOKS

4. D. Ravichandran, "Programming with C++", TMH
Dr. Babasaheb Ambedkar Technological University, Lonere.


<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BTEXC501</td>
<td>Electromagnetic Field Theory</td>
<td>3</td>
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</tbody>
</table>

**Course Objectives:**

1. Learners can be able to explore their knowledge in the area of EM Waves and its analysis.
2. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
3. To understand the boundary conditions for different materials/surfaces.
5. To get the basics of microwave, transmission lines and antenna parameters.
6. Students get acquainted with different physical laws and theorems and provide basic platform for upcoming communication technologies.

**Course Outcomes:**

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

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form
7. Understand principle of radiation and radiation characteristics of an antenna.

**UNIT - 1**

**Maxwell’s Equations**

Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.
UNIT - 2

Uniform Plane Wave
Uniform plane wave, Propagation of wave, Wave polarization, Poincare’s Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor

UNIT - 3

Transmission Lines
Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

UNIT - 4

Plane Waves at a Media Interface
Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

UNIT - 5

Wave propagation
Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide

UNIT - 6

Radiation
Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

TEXT/REFERENCE BOOKS


### BTEXC502 Control Systems Engineering 3 Credits

**Course Objectives:**
- To introduce the elements of control system and their modeling using various Techniques.
- To introduce methods for analyzing the time response, the frequency response and the stability of systems.
- To introduce the concept of root locus, Bode plots, Nyquist plots.
- To introduce the state variable analysis method.
- To introduce concepts of PID controllers and digital and control systems.
- To introduce concepts programmable logic controller.

**Course Outcomes:**
At the end of this course, students will demonstrate the ability to
1. Understand the modeling of linear-time-invariant systems using transfer function and state-space representations.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Design simple feedback controllers.

### UNIT - 1

**Introduction to control problem**
Industrial Control examples, Mathematical models of physical systems, Control hardware and their models, Transfer function models of linear time-invariant systems.

UNIT - 2

Time Response Analysis
Standard test signals, Time response of first and second order systems for standard test inputs. Application of initial and final value theorem, Design specifications for second-order systems based on the time-response

UNIT - 3

Stability Analysis
Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique. Construction of Root-loci, Dominant Poles, Application of Root Locus Diagram,

UNIT - 4

Frequency-response analysis

UNIT - 5

Introduction to Controller Design
Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, Application of Proportional, Integral and Derivative Controllers, Designing of Lag and Lead Compensator using Root Locus and Bode Plot.

UNIT - 6

State variable Analysis
Dr. Babasaheb Ambedkar Technological University, Lonere.

**TEXT/REFERENCE BOOKS**


<table>
<thead>
<tr>
<th>BTEXC503</th>
<th>Microelectronics</th>
<th>3 Credits</th>
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</table>

**Course Objectives:** As part of this course, students:

- Will understand the physical, electrical, and optical properties of semiconductor materials and their use in microelectronic.
- Relate the atomic and physical properties of semiconductor materials to device and circuit performance issues.
- Develop an understanding of the connection between device-level and circuit-level performance of microelectronic systems.

**Course Outcomes:** After successfully completing the course students will be able to upon successful completion of this course, students should be able to:

1. Compute carrier concentrations for semiconductor materials under a variety of doping conditions.
2. Compute conductivity and resistivity of semiconductor materials under a variety of condition.
3. Silicon wafer processing and formation of P N junction using diffusion and Ion Implantation technique.
4. Wet and Dry oxidation process required for photolithography process.
5. Manufacturing process for P N junction, BJT, MOS, and IC fabrication.
UNIT - 1

MOSFETS:
Device Structure and Physical Operation, V-I Characteristics, MOSFET Circuits at DC, Biasing in MOS amplifier Circuits, Small Signal Operation and Models, MOSFET as an amplifier and as a switch, biasing in MOS amplifier circuits, small signal operation modes, single stage MOS amplifiers. MOSFET internal capacitances and high frequency modes, Frequency response of CS amplifiers, CMOS digital logic inverter, and detection type MOSFET.

UNIT - 2

Single Stage IC Amplifier:
IC Design philosophy, Comparison of MOSFET and BJT, Current sources, Current mirrors and Current steering circuits, high frequency response.

UNIT - 3

Single Stage IC amplifiers:
CS and CF amplifiers with loads, high frequency response of CS and CF amplifiers, CG and CB amplifiers with active loads, high frequency response of CG and CB amplifiers, Cascade amplifiers. CS and CE amplifiers with source (emitter) degeneration source and emitter followers, some useful transfer parings, current mirrors with improved performance. SPICE examples.

UNIT - 4

Differences and Multistage Amplifiers:
The MOS differential pair, small signal operation of MOS differential pair, the BJT differences pair, other non-ideal characteristics and differential pair, Differential amplifier with active loads, frequency response and differential amplifiers. Multistage amplifier. SPICE examples.

UNIT - 5

Feedback
Digital CMOS circuits
Overview, Design and performance analysis of CMOS inverter, Logic Gate Circuits, Pass-transistor logic, Dynamic Logic Circuits, SPICE examples

TEXT/REFERENCE BOOKS


BTEXC504 Digital Signal Processing 3 Credits

Course Objectives:
- To introduce students with transforms for analysis of discrete time signals and systems.
- To understand the digital signal processing, sampling and aliasing.
- To use and understand implementation of digital filters.
- To understand concept of sampling rate conversion and DSP processor architecture.

Course Outcomes:
After successfully completing the course students will be able to:
1. Understand use of different transforms and analyze the discrete time signals and systems.
2. Realize the use of LTI filters for filtering different real world signals.
3. Capable of calibrating and resolving different frequencies existing in any signal.
4. Design and implement multistage sampling rate converter.
5. Design of different types of digital filters for various applications.
DSP Preliminaries
Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing.

Discrete Fourier Transform
DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm

Z transform
Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behavior, causality and stability considerations for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.

IIR Filter Design
Concept of analog filter design (required for digital filter design), Design of IIR filters from analog filters, IIR filter design by impulse invariance method, Bilinear transformation method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Lowpass filter)

FIR Filter Design
Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows
and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form.

UNIT - 6

Introduction to Multirate signal processing
Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter bank, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.

TEXT/REFERENCE BOOKS


BTEXC505 Microcontroller & its Applications 3 Credits

Course Objectives:

- Objective of this course is to introduce to the students the fundamentals of microcontroller.
- After learning Microcontroller course, students will get advantage to pursue higher studies in Embedded Systems or employment in core industries.
- The learner can design microcontroller based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.
- The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.
The students will get acquainted with recent trends in microcontroller like pipelining, cache memory etc.

To understand the applications of Microcontrollers.

To understand need of microcontrollers in embedded system.

To understand architecture and features of typical Microcontroller.

To learn interfacing of real world input and output devices.

To study various hardware and software tools for developing applications.

Course Outcomes:

1. Learner gains ability to apply knowledge of engineering in designing different case studies.

2. Students get ability to conduct experiments based on interfacing of devices or interfacing to real world applications.

3. Graduates will be able to design real time controllers using microcontroller based system.

4. Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.

5. Students can identify and formulate control and monitoring systems using microcontrollers.

6. Students will design cost effective real time system to serve engineering solution for Global, social and economic context.

7. This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation.

8. Learners get acquainted with modern tools like Programmers, Debuggers, cross compilers and current IDE i.e. integrated development environment tools.

9. Learn importance of microcontroller in designing embedded application.

10. Learn use of hardware and software tools.

11. Develop interfacing to real world devices.

UNIT - 1

Fundamentals of Microcontrollers

Introduction to the general structure of 8 and 16 bit Microcontrollers Harward & Von Neumann architecture, RISC & CISC processors. Role of microcontroller in embedded system. Selection criteria of microcontroller Block diagram and explanation of 8051, Port
structure, memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Sample programs (assembly): Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port.

UNIT - 2

Interfacing with 8051 PART I
Software and Hardware tools for development of microcontroller-based systems such as assemblers, compliers, IDE, Emulators, debuggers, programmers, development board, DSO, Logic Analyzer. Interfacing LED with and without interrupt, Keypads, Seven Segment multiplexed Display, LCD, ADC Interfacing. All Programs in assembly language and C.

UNIT - 3

Interfacing with 8051 PART II
8051 timer programming, serial port and its programming, interrupt programming, LCD and keyboard interfacing, ADC and DAC interfacing, interfacing to external memory Interfacing of DAC, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Opto-isolators. All programs in assembly and C.

UNIT - 4

PIC Microcontroller Architecture
PIC 10, PIC12, PIC16, PIC18 series comparison, features and selection as per application. PIC18FXX architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings, timer and its programming. Brief summary of Peripheral support, Overview of instruction set, MPLAB IDE & C18 Compiler.

UNIT - 5

Real World Interfacing Part I
Port structure with programming, Interrupt Structure (Legacy and priority mode) of PIC18F with SFRS. Interfacing of switch, LED, LCD (4&8 bits), and Key board. Use of timers with
interrupts, CCP modes: Capture, Compare and PWM generation, DC Motor speed control with CCP: All programs in embedded C.

UNIT - 6

Real World Interfacing Part I

TEXT/REFERENCE BOOKS
5. Udyashankara V., Mallikarjunaswamy, 8051 microcontroller, TMH.
6. Han-way Huang, using The MCS-51 microcontroller, Oxford university press
7. Ayala, 8051 microcontroller, cengage (Thomson)

BTEXPE506A Probability Theory and Random Processes 3 Credits

Course Objectives:
- To develop basic of probability and random variables.
- The primary objective of this course is to provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in engineering and applied science.

Course Outcomes:
At the end of this course students will demonstrate the ability to
1. Understand representation of random signals
2. Investigate characteristics of random processes
3. Make use of theorems related to random signals
UNIT - 1

Introduction to Probability
Definitions, scope and history; limitation of classical and relative- frequency- based definitions, Sets, fields, sample space and events; axiomatic definition of probability, Combinatorics: Probability on finite sample spaces, Joint and conditional probabilities, independence, total probability; Bayes' rule and applications.

UNIT - 2

Random variables
Definition of random variables, continuous and discrete random variables, cumulative distribution function (cdf) for discrete and continuous random variables; probability mass function (pmf); probability density functions (pdf) and properties, Jointly distributed random variables, conditional and joint density and distribution functions, independence; Bayes' rule for continuous and mixed random variables, Function of random a variable, pdf of the function of a random variable; Function of two random variables; Sum of two independent random variables, mean, variance and moments of a random variable, Joint moments, conditional expectation; covariance and correlation, independent, uncorrelated and orthogonal random variables.

UNIT - 3

Random vector and distributions
Mean vector, covariance matrix and properties, Some special distributions: Uniform, Gaussian and Rayleigh distributions; Binomial, and Poisson distributions; Multivariate Gaussian distribution, Vector- space representation of random variables, linear independence, inner product, Schwarz Inequality, Elements of estimation theory: linear minimum mean - square error and orthogonality principle in estimation; Moment - generating and characteristic functions and their applications, Bounds and approximations: Chebysev inequality and Chernoff Bound.
UNIT - 4

Sequence of random variables and convergence
Almost sure convergence and strong law of large numbers; convergence in mean square sense with examples from parameter estimation; convergence in probability with examples; convergence in distribution, Central limit theorem and its significance.

UNIT - 5

Random process
Random process: realizations, sample paths, discrete and continuous time processes, examples, Probabilistic structure of a random process; mean, autocorrelation and auto-covariance functions, Stationarity: strict-sense stationary (SSS) and wide-sense stationary (WSS) processes, Autocorrelation function of a real WSS process and its properties, cross-correlation function, Ergodicity and its importance.

UNIT - 6

Spectral representation of a real WSS process
Power spectral density, properties of power spectral density, cross-power spectral density and properties; autocorrelation function and power spectral density of a WSS random sequence, Linear time-invariant system with a WSS process as an input: stationarity of the output, auto-correlation and power-spectral density of the output; examples with white-noise as input; linear shift-invariant discrete-time system with a WSS sequence as input, Spectral factorization theorem, Examples of random processes: white noise process and white noise sequence; Gaussian process; Poisson process, Markov Process.

TEXT/REFERENCE BOOKS
2. Probability and Random Processes by Geoffrey Grimmett, David Stirzaker

| BTEXPE506C | Data Structure & Algorithms using Java Programming | 3 Credits |

**Prerequisites:** Basic knowledge of C language is required.

**Course Objectives:**
- To assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- To choose the appropriate data structure and algorithm design method for a specified application.
- To study the systematic way of solving problems, various methods of organizing large amounts of data.
- To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.
- To employ the different data structures to find the solutions for specific problems

**Course Outcomes:**
On completion of the course, student will be able to:
1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. Describe how arrays, records, linked structures are represented in memory and use them in algorithms.
4. To understand basic concepts about stacks, queues, lists trees and graphs.
5. To enable them to write algorithms for solving problems with the help of fundamental data structures.
UNIT - 1

Introduction

UNIT - 2

Stacks and Queues
ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

UNIT - 3

Linked Lists
Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

UNIT - 4

Trees
Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees, B Tree, B+ Tree: definitions, algorithms and analysis.

UNIT - 5

Sorting and Hashing
Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.
UNIT - 6

Graph
Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

TEXT/REFERENCE BOOKS

1. “How to Solve it by Computer”, 2nd Impression by R. G. Dromey, Pearson Education.

Course Objectives:
- 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 students various opportunities in the emerging field of MEMS.
- This will enables student to study applications of micro-sensors and micro-actuators, various MEMS fabrication technologies, MEMS-specific design issues and constraints, Dynamics and modeling of microsystems, getting access to fabrication and testing in academia and industry.

Course Outcomes:
At the end of the course the students will be able to
1. Appreciate the underlying working principles of MEMS and NEMS devices.
2. Design and model MEM devices.
Introduction to MEMS

Control and Materials of MEMS
Controls of MEMS: Analog control of MEMS, Sliding mode control of MEMS, Digital control of MEMS, Materials for MEMS: Substrate and wafers, Active substrate material, silicon, Silicon compound, Silicon piezoresisters, Gallium arsenide, Quartz, piezoelectric crystals, Polymers.

Review of Basic MEMS fabrication modules:
MEMS fabrication modules, Oxidation, Deposition Techniques, Lithography (LIGA), and Etching.

Micromachining
Micromachining, Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding

Mechanics of solids in MEMS/NEMS

Finite Element Method and Electromechanical Systems
Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems

### Course Objectives:
- The objective is to provide students with a strong understanding of the fundamental principles and practical applications of audio and video engineering with latest updates.

### Course Outcomes:
After successfully completing the course students will be able to
1. Understand the concept of basic television signal processing.
2. Identify globally accepted color TV standards.
3. Demonstrate the need of audio and video compression techniques in real life.
4. Acquire knowledge of latest digital TV systems and applications.
5. Describe the attributes of acoustics, sound engineering and storage media.

### UNIT - 1

**Fundamentals of Color Television**
Aspect, scanning, perception of brightness and colour, colour mixing, composite video signal, synchronisation details, digital TV camera, modulation of audio and video, terrestrial signal transmission, video displays: LCD vs LED.
UNIT - 2

Colour Standards and digital video
Standards: NTSC, PAL, SECAM colour system, generalized colour TV receiver block diagram, study of functionality of each block, alignment issues, sampling of video signal, colour sub sampling, composite vs component video, interlace vs progressive scan.

UNIT - 3

Digital TV
Digital video, resolution, notation, digital video formats, digital video quality measure, video restoration, video streaming, DTH, Video compression: MPEG 2, MPEG 4, comparison of SDTV, EDTV and HDTV.

UNIT - 4

Advanced TV Systems and Techniques
Introduction to UHDTV: 4K and 8K, IPTV/web TV, smart TV, Wi-Fi TV, digital surveillance, 3D TV concept, over view of H.264 features, camcorders, webcams, perspective of TV White spaces.

UNIT - 5

Acoustics
Human Hearing and sound, frequency range, dynamic range, masking, digital representation of sound wave, intensity, decibel sound level, sound waves in rooms, reverberation, room/studio acoustics as a component in speech system, PA systems, special types of microphones and speakers.

UNIT - 6

Audio and Video Recording Systems
Digital sound, sound recording, CD/ DVD player, MP3 player, Blue Ray DVD Player, ITU-T(G) compression standards, multichannel/Dolby 5.1 sound in DTV.
TEXT/REFERENCE BOOKS


Course Objectives:

- To introduce basic concepts of computer organization and to illustrate the computer organization concepts by Assembly Language programming.
- To understand operating systems and how they work with the computer and students will understand the relationship between hardware and software specifically how machine organization impacts the efficiency of applications written in a high-level language.
- Students will be able to make use of the binary number system to translate values between the binary and decimal number systems, to perform basic arithmetic operations and to construct machine code instructions and students will be able to design and implement solutions for basic programs using assembly language.
- Students will be able to design logical expressions and corresponding integrated logic circuits for a variety of problems including the basic components of a CPU such as adders, multiplexers, the ALU, a register file, and memory cells and to explain the fetch-execute cycle performed by the CPU and how the various components of the data path are used in this process.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Learn how computers work
2. Know basic principles of computer’s working
3. Analyze the performance of computers
4. Know how computers are designed and built
5. Understand issues affecting modern processors (caches, pipelines etc.).

UNIT - 1

Basics of Computers
Basic Structure of Computers, Functional units, software, performance issues software, machine Instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly Language, Stacks, Queues, Subroutines.

UNIT - 2

Processor organization
Processor organization, Information representation, number formats.

UNIT - 3

ALU design
Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit.

UNIT - 4

Memory organization
Memory organization, device characteristics, RAMS, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

UNIT - 5

System organization
System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces.
Parallel processing

Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network.

TEXT/REFERENCE BOOKS


Course Objectives:

- To introduce students to different power devices to study their construction, characteristics and turning on circuits.
- To give an exposure to students of working & analysis of controlled rectifiers for different loads, inverters, DC choppers, AC voltage controllers and resonant converters.
- To study the different motor drives, various power electronics applications like UPS, SMPS, etc. and some protection circuits.

Course Outcomes:

At the end of this course students will demonstrate the ability to
1. Build and test circuits using power devices such as SCR
2. Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Design SMPS.
UNIT - 1

Characteristics of Semiconductor Power Devices
Thyristor, power MOSFET and IGBT- Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based). Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

UNIT - 2

Controlled Rectifiers
Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

UNIT - 3

Choppers
Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper.

UNIT - 4

Single-phase inverters
Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter.
UNIT - 5

Switching Power Supplies

Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter.

UNIT - 6

Applications

Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.

TEXT/REFERENCE BOOKS

1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.

BTEXPE603A  Digital Communication  3 Credits

Course Objectives:

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.
Course Outcomes:
1. Analyze the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Select the blocks in a design of digital communication system.
4. Analyze Performance of spread spectrum communication system.

UNIT - 1

Digital Transmission of Analog Signal

UNIT - 2

Baseband Digital Transmission
Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol interference, Equalization.

UNIT - 3

Random Processes
Introduction, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components.
Baseband Receivers

Passband Digital Transmission
Pass band transmission model, Signal space diagram, Generation and detection, Error Probability derivation and Power spectra of coherent BPSK, BFSK and QPSK. Geometric representation, Generation and detection of - M-ary PSK, M-ary QAM and their error probability, Generation and detection of -Minimum Shift Keying, Gaussian MSK, Non-coherent BFSK, DPSK and DE PSK ,Introduction to OFDM.

Spread Spectrum Techniques

TEXT/REFERENCE BOOKS


Course Objectives:
- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming.
- To provide a WLAN measurement ideas.
- Discuss, with confidence, what is cloud computing and what are key security and control considerations within cloud computing environments.
- Identify various cloud services.

Course Outcomes:
1. To master the terminology and concepts of the OSI reference model and the TCP-IP reference model.
2. To master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks.
3. To be familiar with contemporary issues in networking technologies.
4. To be familiar with network tools and network programming.
5. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component.
6. For a given problem related TCP/IP protocol developed the network programming.
7. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.
8. To impart fundamental concepts in the area of cloud computing.
9. To impart knowledge in applications of cloud computing.
10. Develop applications for cloud computing.

UNIT - 1

**Physical Layer and Data Link Layer**

UNIT - 2

**Network Layer and Transport Layer**
Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques.

UNIT - 3

**Application Layer**
Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography.

UNIT - 4

**Wireless LANS & Virtual Circuit Networks**
Introduction, Wireless LANS: IEEE 802.11 project, Bluetooth, Zigbee, Connecting devices and Virtual LANS: Connecting devices, Virtual LANS.

UNIT - 5

**Introduction and Cloud Computing Technology**
Shift from distributed computing to cloud computing; principles and characteristics of cloud computing- IaaS, PaaS, SaaS; service oriented computing and cloud environment.
Client systems, Networks, server systems and security from services perspectives; accessing the cloud with platforms and applications; cloud storage.

UNIT - 6

Working with Cloud and Cloud Services

TEXT/REFERENCE BOOKS

6. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

BTEXPE603C Nano Electronics 3 Credits

Course Objectives:

- To convey the basic concepts of Nano electronics to engineering students with no background in quantum mechanics and statistical mechanics.
- Main objective of this is to provide the basic platform and deep information of different Nano electronics devices like MOSFET, FINFET, Nano metrology tools used to design the recently developing VLSI applications.
This subject gives idea about the role and importance of the Nano electronic devices system in engineering world to develop the research ideas in VLSI.

Recent technology proceeds with MOSFET with 64nm technology, the need Nano electronic Devices and Material subject to achieve transistor size which is less than current technology.

The content of this course gives platform to the Nano electronics world and innovative ideas to ensure the knowledge of real time applications which helps students to stand them in Indian and multinational industries.

**Course Outcomes:**

At the end of the course, students will demonstrate the ability to:

1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

**UNIT - 1**

**Overview Nano Technology**

Introduction to nanotechnology, Nano devices, Nano materials, Nano characterization, Definition of Technology node, Basic CMOS Process flow, meso structures.

**UNIT - 2**

**Basics of Quantum Mechanics**

MOS Scaling theory
Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.)

Nano electronics Semiconductor devices
Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation

Properties of Nano devices
Vertical transistors -Fin FET and Surround gate FET. Metal source/drain junctions – Properties of schottky functions on Silicon, Germanium and compound semiconductors - Work function pinning.

Characterization techniques for Nano materials
FTIR, XRD, AFM, SEM, TEM, EDAX Applications and interpretation of results, Emerging nano material, nano tubes, Nano rods and other Nano structures, LB technique, Soft lithography Microwave assisted synthesis, Self assembly.

TEXT/REFERENCE BOOKS
1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
Course Objectives:

- Define the principle of Web page design
- Define the basics in web design
- Visualize the basic concept of HTML.
- Recognize the elements of HTML.
- Introduce basics concept of CSS.
- Develop the concept of web publishing

Course Outcomes:

On completion of the course, student will be able to:

1. Develop the skill & knowledge of Web page design
2. Understand the knowhow and can function either as an entrepreneur or can take up jobs in the multimedia and Web site development studio and other information technology sectors.

UNIT - 1


UNIT - 2

Basics in Web Design, Brief History of Internet, What is World Wide Web, Why create a web site, Web Standards, Audience requirement.

UNIT - 3

Introduction to HTML, HTML Documents, Basic structure of an HTML document, Creating an HTML document, Mark up Tags, Heading, Paragraphs, Line Breaks, HTML Tags.
UNIT - 4

Elements of HTML, Working with Text, Lists, Tables and Frames, Hyperlinks, Images and Multimedia Working with Forms and controls.

UNIT - 5

Introduction to Cascading Style Sheets, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties), CSS Advanced (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector), CSS Color, Creating page Layout and Site Designs.

UNIT - 6

Introduction to Web Publishing or Hosting, Creating the Web Site, Saving the site, Working on the web site, Creating web site structure, Creating Titles for web pages, Themes, Publishing web sites.

TEXT/REFERENCE BOOKS

2. Steven M. Schafer, HTML, XHTML, and CSS Bible, Wiley India, 5th Edition, 2010
Course Objectives:

- The concept and theory of digital Electronics are needed in almost all electronics and telecommunication engineering fields and in many other engineering and scientific disciplines as well.
- The main objective of this course is to lay the foundation for further studies in areas such as communication, VLSI, computer, microprocessor etc. One of the most important reasons for the unprecedented growth of digital electronics is the advent of integrated circuit.
- This course will explore the basic concepts of digital electronics.

Course outcomes:

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

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation.

UNIT - 1

Logic Simplification and Combinational Logic Design

Review of Boolean algebra and De Morgan’s Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT - 2

MSI devices

Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.

UNIT - 3

Sequential Logic Design

Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM,
Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation.

UNIT - 4

Logic Families and Semiconductor Memories
TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing.

UNIT - 5

Memory Elements
Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices.

UNIT - 6

VLSI Design flow
Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

TEXT/REFERENCE BOOKS

Course Objectives:

- This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications.
- Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.
- It deals with Introduction and different architectures of neural network
- It deals with the Application of Neural Networks.
- It deals with Fuzzy Logic Controller.
- It deals with applications of Fuzzy logic

Course Outcomes:

1. The student will be able to obtain the fundamentals and types of neural networks.
2. The student will have a broad knowledge in developing the different algorithms for neural networks.
3. Student will be able analyze neural controllers.
4. Student will have a broad knowledge in Fuzzy logic principles.
5. Student will be able to determine different methods of Deffuzification.

UNIT - 1

Introduction

Biological neurons, McCulloch and Pitts models of neuron, Types of activation function, Network architectures, Knowledge representation, Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules.

UNIT - 2

Single Layer Perception

Perception convergence theorem, Method steepest descent - least mean square algorithms.
UNIT - 3

Multilayer Perception
Derivation of the back-propagation algorithm, Learning Factors.

UNIT - 4

Radial Basis and Recurrent Neural Networks

UNIT - 5

Neuro-dynamics
Attractors, Neuro dynamical model, Adaptive Resonance theory, Towards the Self Organizing Feature Map. Brain-state-in-a-box model,

UNIT - 6

Fuzzy logic

TEXT/REFERENCE BOOKS

1. Simon Haykin, "Neural Network a - Comprehensive Foundation", Pearson Education.
2. Dr. S. N. Sivanandam, Mrs S.N. Deepa Introduction to Soft computing tool Wiley Publication.
6. Ahmad Ibrahim, "Introduction to Applied Fuzzy Electronics', PHI.
9. Christopher M Bishop Neural Networks for Pattern Recognition, Oxford Publication.
11. Dr. S. N. Sivanandam, Dr. S. Sumathi Introduction to Neural Network Using Matlab Tata McGraw-Hill

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BTEXOE604D</td>
<td>Analog Integrated Circuit Design</td>
<td>3</td>
</tr>
</tbody>
</table>

**Course Objectives:**
- Introduction to Circuit Simulation & EM Simulations
- Deep Understanding of MOS Device Physics & Modeling
- Understanding of few transistor circuits like common gate, common source & common drain amplifiers with their frequency response
- Understanding of Operational Amplifier Design & Trade-offs
- Advanced Op-Amps and OTAs
- Temperature Compensated Biasing Schemes.

**Course Outcomes:**
At the end of the course, the student must be able to:
1. Design MOSFET based analog integrated circuits.
2. Analyze analog circuits at least to the first order.
3. Appreciate the trade-offs involved in analog integrated circuit design.
4. Understand and appreciate the importance of noise and distortion in analog circuits.

**UNIT - 1**

**Introduction to Simulations**
UNIT - 2

MOSFET Device Physics & Modeling
MOSFET Structure, Threshold Voltage, Drain Current Equation, Transfer & Output Characteristics, Weak/Moderate/Strong Inversion, Linear/Triode/Saturation Region of Operation, Device Leakages and Losses, Short Channel Effects, High Frequency Small Signal Model of MOSFET, Cubic, BSIM and Materka Models of MOSFET.

UNIT - 3

Few Transistor Circuits

UNIT - 4

Operational Amplifiers & OTAs

UNIT - 5

Biasing Schemes
Voltage and Current References, Vt reference bias, PTAT Current Reference, CTAT and Bandgap Voltage References, High Precision Voltage References, Voltage Level Shifters.

UNIT - 6

Non-Linear Circuits
Course Objectives:
- To understand the embedded system design issues.
- To learn real time operating system concepts.
- To understand the Embedded Linux environment.
- To learn embedded software development and testing process.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Suggest design approach using advanced controllers to real-life situations.
2. Design interfacing of the systems with other data handling / processing systems.
3. Appreciate engineering constraints like energy dissipation, data exchange speeds etc.
4. Get to know the hardware – software co design issues and testing methodology for embedded system.

UNIT - 1

Introduction to Embedded Computing
The concept of embedded systems design, Characteristics of Embedding Computing Applications, Concept of Real time Systems.
**UNIT - 2**

**Design Process**

**UNIT - 3**

**Technological aspects of embedded systems**
Interfacing between analog and digital blocks, signal conditioning, digital signal processing, subsystem interfacing, interfacing with external systems, user interfacing.

**UNIT - 4**

**Design tradeoffs**
Design tradeoffs due to process compatibility, thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

**UNIT - 5**

**Operating System**

**UNIT - 6**

**Scheduling and Inter-process Communication**
Rate-Monotonic Scheduling, Earliest-Deadline First Scheduling, Task Assignment, Fault-Tolerant Scheduling Signals, Shared Memory Communication, Message-Based Communication.

**TEXT/REFERENCE BOOKS**


<table>
<thead>
<tr>
<th>Course Objectives:</th>
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</thead>
<tbody>
<tr>
<td>• To understand the various processes and systems to address human needs by creating tangible Electronic Products.</td>
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<tr>
<td>• To pursue learners with emphasis on learning-by-doing and following a comprehensive process of design, engineering and producing products and systems.</td>
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<thead>
<tr>
<th>Course Outcomes:</th>
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<tbody>
<tr>
<td>On completion of the course, student will be able to</td>
</tr>
<tr>
<td>1. Design electronic products using user centered design process</td>
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<tr>
<td>2. Develop sketches, virtual and physical appearance models to communicate proposed designs</td>
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<tr>
<td>3. Refine product design considering engineering design &amp; manufacturing requirements and constraints.</td>
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<tr>
<td>4. Make mock-up model and working prototype along with design documentation.</td>
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<table>
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<tr>
<th>UNIT - 1</th>
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</thead>
<tbody>
<tr>
<td>Introduction to Industrial Design</td>
</tr>
<tr>
<td>General introduction in the course, role of ID in the domain of industry, product innovation, designer’s philosophy and role in product design. Product development tools and methods.</td>
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<tr>
<th>UNIT - 2</th>
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</thead>
<tbody>
<tr>
<td>Product Design Methodology and Product Planning</td>
</tr>
<tr>
<td>Electronic product design and development, Methodology, creativity techniques, brain storming, documentation, Defining the task, scheduling the task, estimation of labor cost and amount of documentation.</td>
</tr>
</tbody>
</table>
UNIT - 3

Ergonomics
Ergonomics of electronics electronic use of ergonomics at work places and plan layouts, ergonomics of panel design, case study.

UNIT - 4

Aesthetics and Visual Communication Techniques
Elements of aesthetics, aesthetics of control design, Visual Communication Techniques: perspective, band sketching and rendering technique, elements of Engineering drawing, assembly drawing part drawing, exploded views.

UNIT - 5

Product Anatomy and Product Detailing
Layout design, structure design, standard and non-standard structures, Industrials standards, Product detailing in sheet metal and plastics for ease of assembly, maintenance and aesthetics.

UNIT - 6

Product Manufacturing and Value Engineering
Different manufacturing processes in sheet metal and plastics, product finishing, finishing methods like plating, anodization, spray painting, powder coating etc, Introduction to marketing, graphics & packing.

TEXT/REFERENCE BOOKS


Journals
1. Behaviour & Information Technology, Taylor & Francis
2. The Journal of Sustainable Product Design, Publisher: Springer
3. International Journal of Design; College of Design, National Taiwan University of Science and Technology, Taiwan.
4. Virtual & Physical Prototyping, Taylor & Francis

Internet Sites
1. http://www.ulrich-eppinger.net/

**Course Objectives:**

- To help students understand Evolution of Management Thought, Concepts, basic functions and recent trends managerial concepts and practices for better business decisions.
- To introduce students to framework those are useful for diagnosing problems involving human behavior.
- To enable the students apply mathematical, computational and communication skills needed for the practical utility of Operations Research.
To teach students about networking, inventory, queuing, decision and replacement models.

To introduce students to research methods and current trends in Operations Research.

Course Outcomes:
Student will be able to

1. Apply operations research techniques like L.P.P, scheduling and sequencing in industrial optimization problems.

2. Solve transportation problems using various OR methods.

3. Illustrate the use of OR tools in a wide range of applications in industries.

4. Analyze various OR models like Inventory, Queing, Replacement, Simulation, Decision etc and apply them for optimization.

5. Gain knowledge on current topics and advanced techniques of Operations Research for industrial solutions.

UNIT - 1

Definition, need and importance of organizational behaviour, nature and scope, frame work, organizational behaviour models.

UNIT - 2

Organization structure, formation, groups in organizations, influence, group dynamics, emergence of informal leaders and working norms, group decision making techniques, interpersonal relations, communication, control.

UNIT - 3

Evolution of Management thoughts, Contribution of Selected Management Thinkers, Various approaches to management, contemporary management practice, Managing in global environment, Managerial functions.
UNIT - 4
Importance of planning, Types of planning, decision making process, Approaches to decision making, Decision models, Pay off Matrices, Decision trees, Break Even Analysis.

UNIT - 5
Departmentation, Span of Control, Delegation, Centralisation and Decentralisation, Commitees, Line and Staff relationships, Recent trends in organisation structures.

UNIT - 6

TEXT/REFERENCE BOOKS

| BTEXOE605D | Android Programming | 3 Credits |

Course Objectives:
Android Application Development course is designed to quickly get you up to speed with writing apps for Android devices. The student will learn the basics of Android platform and get to understand the application lifecycle.
Course Outcomes:
At the end of the course, students will demonstrate the ability to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

UNIT - 1

Introduction to Mobile Operating Systems and Mobile Application Development

Introduction to Mobile OS:
Palm OS, Windows CE, Embedded Linux, J2ME (Introduction), Symbian (Introduction),

UNIT - 2

Android Activities, UI Design and Database

Understanding Intent, Activity, Activity Lifecycle and Manifest, Form widgets, Text Fields,
Layouts: Relative Layout ,Table Layout, Frame Layout, Linear Layout, Nested layouts.
UI design: Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup.
Menu: Option menu, Context menu, Sub menu.
Database: Introducing SQLite, SQLite Open Helper, SQLite Database, Cursor,
Content providers: defining and using content providers, example- Sharing database among two different applications using content providers, Reading and updating Contacts, Reading bookmarks.

UNIT - 3

Preferences, Intents and Notifications
Preferences: Shared Preferences, Preferences from xml, Intents:Explicit Intents, Implicit intents.
Notifications: Broadcast Receivers, Services (Working in background) and notifications, Alarms.
UNIT - 4

Telephony, SMS and Location Based Services
Telephony: Accessing phone and Network Properties and Status, Monitoring Changes in Phone State, Phone Activity and data Connection.
SMS: Sending SMS and MMS from your Application, sending SMS Manually, Listening for incoming SMS
Location based Services: Using Location Based Services, Working with Google Maps, Geocoder.

UNIT - 5

Accessing Android Hardware
Networking: An overview of networking, checking the network status, communicating with a server socket, Working with HTTP, Web Services.
Bluetooth: Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices, Managing Bluetooth connections, communicating with Bluetooth.

UNIT - 6

Audio Video Handling
Playing Audio and Video, Recording Audio and Video, Using Camera and Taking Picture.

TEXT/REFERENCE BOOKS

2. Lauren Dercy and Shande Conder “Sams teach yourself Android application development”, Sams publishing
Course Objectives:
- To develop analytical abilities.
- To develop communication skills.
- To introduce the students to skills necessary for getting, keeping and being successful in a profession.
- To expose the students to leadership and team-building skills.

Course Outcomes:
On completion of the course, student will be able to:
1. Have skills and preparedness for aptitude tests.
2. Be equipped with essential communication skills (writing, verbal and non-verbal)
3. Master the presentation skill and be ready for facing interviews.
4. Build team and lead it for problem solving.

UNIT - 1
Soft Skills & Communication basics
Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills. Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation- planning, preparing and delivering presentation, Technical writing.

UNIT - 2
Arithmetic and Mathematical Reasoning
Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem).

UNIT - 3
Analytical Reasoning and Quantitative Ability
Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy).
UNIT - 4

Grammar and Comprehension
English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précis writing, Paraphrasing and e-mail writing.

UNIT - 5

Skills for interviews
Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time.

UNIT - 6

Problem Solving Techniques

TEXT/REFERENCE BOOKS

4. Philip Carter, "The Complete Book of Intelligence Test", John Willey & Sons Ltd.
Course Objectives:
- To understand the applications of electromagnetic engineering.
- To formulate and solve the Helmholtz wave equation and solve it for Uniform Plane Wave.
- To analyze and understand the Uniform plane wave propagation in various media.
- To solve the electric field and magnetic fields for a given wire antenna.

Course Outcomes:
After successfully completing the course students will be able to
1. Formulate the wave equation and solve it for uniform plane wave.
2. Analyze the given wire antenna and its radiation characteristics.
3. Identify the suitable antenna for a given communication system.

UNIT - 1

Uniform Plane Waves

UNIT - 2

Wave Propagation

UNIT - 3

Antenna Fundamentals
Introduction, Types of Antenna, Radiation Mechanism, Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation
efficiency, effective length, effective area, reciprocity. Radiation Integrals: Vector potentials A, J, F, M, Electric and magnetic fields electric and magnetic current sources, solution of inhomogeneous vector potential wave equation, far field radiation.

UNIT - 4

Wire Antennas
Analysis of Linear and Loop antennas: Infinitesimal dipole, small dipole, and finite length dipole half wave length dipole, small circular loop antenna. Complete Analytical treatment of all these elements.

UNIT - 5

Antenna Arrays

UNIT - 6

Antennas and Applications
Structural details, dimensions, radiation pattern, specifications, features and applications of following Antennas: Hertz & Marconi antennas, V- Antenna, Rhombic antenna. TW antennas. Loop antenna, Whip antenna, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors.

TEXT/REFERENCE BOOKS

Course Objectives:
- To learn the fundamental concepts of Digital Image Processing.
- To study basic image processing operations.
- To understand image analysis algorithms.
- To expose students to current applications in the field of digital image processing.

Course Outcomes:
After successfully completing the course students will be able to
1. Develop and implement algorithms for digital image processing.
2. Apply image processing algorithms for practical object recognition applications.

UNIT - 1

Fundamentals of Image Processing
Steps in image processing, Human Visual System, Sampling & quantization, Representing digital images, Spatial & gray-level resolution, Image file formats, Basic relationships between pixels, Distance Measures, Basic operations on images-image addition, subtraction, logical operations, scaling, translation, rotation, Image Histogram, Color fundamentals & models – RGB, HSI YIQ.

UNIT - 2

Image Enhancement and Restoration

UNIT - 3

Image Compression
UNIT - 4

Image Segmentation and Morphological Operations


UNIT - 5

Representation and Description


UNIT - 6

Object Recognition and Applications

Feature extraction, Patterns and Pattern Classes, Representation of Pattern classes, Types of classification algorithms, Minimum distance classifier, Correlation based classifier, Bayes classifier. Applications: Biometric Authentication, Character Recognition, Content based Image Retrieval, Remote Sensing, Medical application of Image processing.

TEXT/REFERENCE BOOKS

Course Objectives:
- To teach the students Lossless and Lossy compression techniques for different types of data.
- To understand data encryption techniques.
- Network security and ethical hacking.

Course Outcomes:
After successfully completion of the course, students will able to:
1. Implement text, audio and video compression techniques.
2. Understand symmetric and asymmetric key cryptography schemes.
3. Understand network security and ethical hacking.

UNIT - 1
Data Compression
Compression Techniques: Loss less compression, Lossy compression, measure of performance, modeling and coding, different types of models, and coding techniques
Text Compression: Minimum variance Huffman coding, extended Huffman coding, Adaptive Huffman coding. Arithmetic coding, Dictionary coding techniques, LZ 77, LZ 78, LZW

UNIT - 2
Audio Compression
High quality digital audio, frequency and temporal masking, lossy sound compression, µ-law and A-law companding, and MP3 audio standard.

UNIT - 3
Image and Video Compression

UNIT - 4
Data Security
Security goals, cryptography, stenography cryptographic attacks, services and mechanics, Integer arithmetic, modular arithmetic, and linear congruence, Substitution cipher,
transposition cipher, stream and block cipher, and arithmetic modes for block ciphers, Data encryption standard, double DES, triple DES, attacks on DES, AES, key distribution center.

<table>
<thead>
<tr>
<th>UNIT - 5</th>
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<tbody>
<tr>
<td><strong>Number Theory and Asymmetric Key Cryptography</strong></td>
</tr>
<tr>
<td>Primes, factorization, Fermat’s little theorem, Euler’s theorem, and extended Euclidean algorithm, RSA, attacks on RSA, Diffie Hellman key exchange, key management, and basics of elliptical curve cryptography, Message integrity, message authentication, MAC, hash function, H MAC, and digital signature algorithm.</td>
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<th>UNIT - 6</th>
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<tr>
<td><strong>System Security</strong></td>
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<tr>
<td>Malware, Intruders, Intrusion detection system, firewall design, antivirus techniques, digital Immune systems, biometric authentication, and ethical hacking.</td>
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</tbody>
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<tr>
<th>TEXT/REFERENCE BOOKS</th>
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</table>
Course Objectives:
- Learn the concepts of parallel processing as it pertains to high-performance computing.
- Learn to design parallel programs on high performance computing.
- Discuss issues of parallel programming.
- Learn the concepts of message passing paradigm using open source APIs.
- Learn different open source tools.
- Learn the concepts of Multi-core processor

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Describe different parallel processing platforms involved in achieving High Performance Computing.
2. Discuss different design issues in parallel programming.
3. Develop efficient and high performance parallel programming.
4. Learn parallel programming using message passing paradigm using open source MPIs.
5. Design algorithms suited for Multicore processor and GPU systems using Open MP and CUDA.

UNIT - 1

Parallel Programming Platforms

UNIT - 2

Principles of Parallel Algorithm Design algorithms
UNIT - 3

Basic Communication Operations and Algorithms
One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations.

UNIT - 4

Analytical Modeling of Parallel Programs
Sources of Overhead in Parallel Programs, Performance Metrics for Parallel Systems, Effect of Granularity and Data Mapping on Performance, Scalability of Parallel Systems, Minimum Execution Time and Minimum Cost-Optimal Execution Time, Asymptotic Analysis of Parallel Programs, Other Scalability Metrics.

UNIT - 5

Programming Using the Message Passing Paradigm

UNIT - 6

Programming Shared Address Space Platforms Thread Basics
Threads, the POSIX Thread Application Programmer Interface, Synchronization Primitives in POSIX, Controlling Thread and Synchronization Attributes, Thread Cancellation, Composite Synchronization Constructs.

TEXT/REFERENCE BOOKS

1. Introduction to parallel programming, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Publication.
2. Introduction to Parallel Processing, M. SasiKumar, Dinesh Shikhare P.Raviprakash, PHI Publication.
Course Objectives:

- Students will be explored to the interconnection and integration of the physical world and the cyber space.
- To provide ability to design and develop IOT devices.

Course Outcomes:

1. Learner will be able to understand the meaning of internet in general and IOT in terms of layers, protocols, packets peer to peer communication.
2. Learner will be able to interpret IOT working at transport layer with the help of various protocols.
3. Learner will be able to understand IOT concept at data link layer.
4. Learner will be able to apply the concept of mobile networking to the internet connected devices.
5. Learner will be able to measure and schedule the performance of networked devices in IOT.
6. Learner will be able to analyze the challenges involve in developing IOT architecture.

Introduction

What is the Internet of Things: History of IoT, about objects/things in the IoT, Overview and motivations, Examples of applications, IoT definitions, IoT Frame work, General observations, ITU-T views, working definitions, and basic nodal capabilities.

Fundamental IoT Mechanisms & Key Technologies:

Identification of IoT objects and services, Structural aspects of the IoT, Environment characteristics, Traffic characteristics, scalability, Interoperability, Security and Privacy, Open architecture, Key IoT Technologies, Device Intelligence, Communication capabilities, Mobility support, Device Power, Sensor Technology, RFID technology, Satellite Technology.
UNIT - 3

Radio Frequency Identification Technology:

UNIT - 4

Wireless Technologies For IoT : Layer ½ Connectivity :
WPAN Technologies for IoT/M2M, Zigbee /IEEE 802.15.4, Radio Frequency for consumer Electronics (RF4CE), Bluetooth and its low-energy profile , IEEE 802.15.6 WBANS, IEEE 802.15 WPAN TG4j, MBANS, NFC, dedicated short range communication( DSRC) & related protocols. Comparison of WPAN technologies cellular & mobile network technologies for IoT/M2M.

UNIT - 5

Governance of The Internet of Things:

TEXT/REFERENCE BOOKS
2. Daniel Minoli,Building the Internet of Things with IPv6 and MIPv6 The Evolving World of M2M Communications, Wiley Publications
Course Objectives:
- To introduce the emerging research areas in the field of wireless sensor networks
- To understand different protocols and their uses in WSN.

Course Outcomes:
At the end of the course, the students will be able to
1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN.

UNIT - 1

Introduction
Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT - 2

Networks

UNIT - 3

Protocols
Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT - 4

Dissemination protocol for large sensor network, Data dissemination, data gathering, and data fusion: Quality of a sensor network; Real-time traffic support and security protocols.
UNIT - 5

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT - 6

Single-node architecture, Hardware components & design constraints, Operating systems and execution environments.

TEXT/REFERENCE BOOKS

5. Philip Levis, And David Gay "TinyOS Programming” by Cambridge University Press 2009

BTEXPE703C CMOS Design 3 Credits

Course Objectives:

- To develop an understanding of design different CMOS circuits using various logic families along with their circuit layout.
- To introduce the student how to use tools for VLSI IC design.

Course Outcomes:

At the end of the course the students will be able to

1. Design different CMOS circuits using various logic families along with their circuit layout.
2. Use tools for VLSI IC design.

UNIT - 1

Review of MOS transistor models, Non-ideal behavior of the MOS Transistor, Transistor as a switch, Inverter characteristics.
UNIT - 2
Integrated Circuit Layout: Design Rules, Parasitics

UNIT - 3
Delay: RC Delay model, linear delay model, logical path efforts

UNIT - 4
Power, interconnect and Robustness in CMOS circuit layout

UNIT - 5
Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic

UNIT - 6
Sequential Circuit Design: Static circuits, Design of latches and Flip-flops.

TEXT/REFERENCE BOOKS

5. L. Glaser and D. Dobberpuhl, The Design and Analysis of VLSI Circuits, Addison Wesley, 1985

BTEXPE703D Process Instrumentation 3 Credits

Course Objectives:

Course Outcomes:
At the end of the course the students will be able to
1. Understand various processes.
2. Develop Instrumentation for these processes.
3. Apply the control strategies for various process applications.
4. Mapping with PEOs.

<table>
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<th>UNIT - 1</th>
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**Instrumentation for heat exchangers and dryers**
Operation of heat exchanger, controlled and manipulated variables in heat exchanger control problem, instrumentation for feedback, feed-forward, cascade control strategies for heat exchanger, types and operation of dryers, controlled and manipulated variables in dryer control problem, instrumentation for feedback and feed-forward control of various types of dryers.

<table>
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<th>UNIT - 2</th>
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**Instrumentation for evaporators & crystallizer**
Types and operation of evaporators, Controlled and manipulated variables in evaporator control problem, instrumentation for feedback, feed-forward, cascade control strategies for evaporators, types and operation of crystallizers, controlled and manipulated variables in crystallizer control problem, instrumentation for control of various types of crystallizers.

<table>
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<th>UNIT - 3</th>
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**Instrumentation for distillation columns**
Operation of distillation column, manipulated and controlled variables in distillation column control, instrumentation for flow control of distillate, top and bottom composition control, reflux ratio control, pressure control schemes.

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<th>UNIT - 4</th>
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**Boiler Instrumentation**
Operation of boiler, manipulated and controlled variables in boiler control, safety interlocks and burner management system, instrumentation for boiler pressure controls, air to fuel ratio controls, boiler drum level controls, steam temperature control, optimization of boiler efficiency, operation and types of reactors, instrumentation for temperature, pressure control in CSTRs.
UNIT - 5

Instrumentation for pumps
Types and operation of pumps, manipulated and controlled variables in pump control problem, pump control methods and instrumentation for pump control.

UNIT - 6

Instrumentation for compressors
Types and operation of compressors, capacity control methods of compressors, instrumentation for control of different variables in centrifugal, rotary and reciprocating compressors including surge and anti-surge control.

TEXT/REFERENCE BOOKS


BTEXPE704A Microwave Theory and Techniques 3 Credits

Course Objectives:
- To lay the foundation for microwave engineering
- To understand the applications of microwave engineering
- Carryout the microwave network analysis.

Course Outcomes:
After successfully completing the course students will be able to
1. Formulate the wave equation in wave guide for analysis.
2. Identify the use of microwave components and devices in microwave applications.
3. Understand the working principles of all the microwave tubes
4. Understand the working principles of all the solid state devices
5. Choose a suitable microwave tube and solid state device for a particular application
6. Carry out the microwave network analysis
7. Choose a suitable microwave measurement instruments and carry out the required measurements.
UNIT - 1

**Transmission Lines and Waveguides**
Introduction to Microwaves engineering: History of Microwaves, Microwave Frequency bands, Applications of Microwave, General solution for TEM, TE and TM waves, Parallel plate waveguide, and rectangular waveguide, Wave guide parameters, Introduction to coaxial line, Rectangular waveguide cavity resonators, Circular waveguide cavity resonators.

UNIT - 2

**Microwave Components**
Multi-port junctions: Construction and operation of E-plane, H-plane, Magic Tee and Directional couplers.
Ferrites components: - Ferrite Composition and characteristics, Faraday rotation, Construction and operation of Gyrator, Isolator and Circulator.
Striplines: Structural details and applications of Striplines, Microstrip line, Parallel Strip line, Coplanar Strip line, Shielded Strip Line.

UNIT - 3

**Microwave Network Analysis**
Introduction and applications of Impedance and Equivalent voltages and currents, Impedance and Admittance matrices, The Transmission (ABCD) matrix
Scattering Matrix:-Significance, formulation and properties. S-Matrix calculations for-2 port network junction, E plane, H-plane and E-H (Magic Tee) Tees, Directional coupler, Isolator and Circulator, Related problems

UNIT - 4

**Microwave Tubes**
Limitations of conventional tubes, O and M type classification of microwave tubes, reentrant cavity, velocity modulation

**O type tubes.**

Two cavity Klystron: Construction and principle of operation, velocity modulation and bunching process Applegate diagram.

**Reflex Klystron:** Construction and principle of operation, velocity modulation and bunching process, Applegate diagram, Oscillating modes, o/p characteristics, efficiency, electronic & mechanical tuning.
M-type tubes

**Magnetron:** Construction and Principle of operation of 8 cavity cylindrical travelling wave magnetron, hull cutoff condition, modes of resonance, PI mode operation, o/p characteristics, Applications.

**Slow wave devices**

**Advantages of slow wave devices, Helix TWT:** Construction and principle of operation, Applications.

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**UNIT - 5**

**Microwave Solid State Devices**

Microwave bipolar transistor, FET, MESFET, Varactor Diode, PIN Diode, Shottky Barrier Diode, Tunnel Diode, TEDs, Gunn Diodes, IMPATT diode and TRAPATT diode. Structural details, Principle of operation, various modes, specifications, and applications of all these devices.

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**UNIT - 6**

**Microwave Measurements**

Measurement devices: Slotted line, Tunable detector, VSWR meter, Power Meter, S-parameter measurement, frequency measurements, Power measurement, Attenuation measurement, Phase shift measurement, VSWR measurement, Impedance measurement, Q of cavity resonator measurement.

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**TEXT/REFERENCE BOOKS**

Course Objectives:

- To provide students with good depth of knowledge in radar and Satellite communication.
- Knowledge of theory and practice of advanced communication techniques e.g. TDMA, CDMA, FDMA.
- This will equip the students for further studies and research knowledge of modern applications in radar and Satellite communication.

Course Outcomes:

At the end of the course, the students will have:
2. Ability to identify, formulate and solve engineering problems related to radar and Satellite communication.
3. The student would be able to analyze the various aspects of establishing a geostationary satellite communication link.
5. Acquired knowledge about Radar and Radar Equations.

UNIT - 1

Radar Communication
Basic principles and fundamentals, block diagram of basic radar, classification, radar performance factors, radar range equation, factors influencing maximum range, effects of noise, Pulsed radar systems, block diagram and description, antennas and scanning, display methods, moving target indication, radar beacons, other radar systems such as CW Doppler radar, FM CW Doppler radar, phased array radars, planar array radars, various applications of radar such as navigational aids, military, surveillance.

UNIT - 2

Basic Principles satellite communication systems
General features, frequency allocation for satellite services, properties of satellite communication systems, Earth Station: Introduction, earth station subsystem, different types of earth stations

Satellite Orbits
Introduction, Kepler's laws, orbital dynamics, orbital characteristics, satellite spacing and orbital capacity, angle of elevation, eclipses, launching and positioning, satellite drift and station keeping.

### UNIT - 3

**Satellite Construction (Space Segment)**

Introduction; attitude and orbit control system; telemetry, tracking and command; power systems, communication subsystems, antenna subsystem, equipment reliability and space qualification.

### UNIT - 4

**Satellite Links**

Introduction, general link design equation, system noise temperature, uplink design, downlink design, complete link design, effects of rain.

### UNIT - 5

**The Space Segment Access and Utilization**

Introduction, space segment access methods: TDMA, FDMA, CDMA, SDMA, assignment methods.

### UNIT - 6

**The Role and Application of Satellite Communication**

Introduction to Digital Satellite and Mobile Satellite Communication.

### TEXT/REFERENCE BOOKS

1. Skolnik, “Principles of Radar Engineering” MCH.
2. Timothy Pratt, Charles W. Bostian, Satellite Communications, John Wiley & Sons
5. M. O. Kolawole, Satellite Communication Engineering, Marcel Dekker, Inc. NY
Course Objectives:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes
- Understand the functionality of each of the components that comprise a fiber-optic communication system: transmitter, fiber, amplifier, and receiver.
- Understand the properties of optical fiber that affect the performance of a communication link.
- Understand basic optical amplifier operation and its effect on signal power and noise in the system.
- Apply concepts listed above to the design of a basic communication link.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the principles fiber-optic communication, the components and the bandwidth advantages.
2. Understand the properties of the optical fibers and optical components.
3. Understand operation of lasers, LEDs, and detectors
4. Analyze system performance of optical communication systems
5. Design optical networks and understand non-linear effects in optical fibers

Introduction

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

Types of optical fibers
Different types of optical fibers, Modal analysis of a step index fiber, Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT - 3

Optical sources
LEDs and Lasers, Photo-d Detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

UNIT - 4

Optical switches
Coupled mode analysis of directional couplers, electro-optic switches.

UNIT - 5

Optical amplifiers
EDFA, Raman amplifier, WDM and DWDM systems, Principles of WDM networks.

UNIT - 6

Nonlinear effects in fiber optic links
Nonlinear effects in fiber optic links, Concept of self-phase modulation, group velocity dispersion and solition based communication.

TEXT/REFERENCE BOOKS

Course Objectives:

- The objective of the course is to introduce the Concepts of basic wireless mobile communication systems.
- To learn and understand the basic principles of Telecommunication switching, traffic and networks.
- To learn and understand basic concepts of cellular system, wireless propagation and the techniques used to maximize the capacity of cellular network.
- To learn and understand architecture of GSM and CDMA system.
- To understand mobile management, voice signal processing and coding in GSM and CDMA system.

Course Outcomes:

After successfully completing the course students will be able to

1. Explain and apply the concepts telecommunication switching, traffic and networks.
2. Analyze the telecommunication traffic.
3. Analyze radio channel and cellular capacity.
4. Explain and apply concepts of GSM and CDMA system.

UNIT - 1

Introduction and Cellular Concept

Existing technology, Evolution in wireless systems, Trends in cellular system Frequency Reuse channel Assignment Strategies, Handoff Strategies, Interference and System Capacity, Cellular System, Design in worst case with an omni Directional Antenna, Co-Channel Interference Reduction with use of Directional Antenna, Improving Coverage and Capacity in Cellular systems, Trunking and Grade of service

UNIT - 2

Wireless Communication Systems GSM
GS Services and features, GSM Architecture and interfaces, GSM Radio Sub System, GSM Channel Types, Traffic Channels, Control Channels, Example of a GSM call, Frame structure for GSM, Signal Processing in GSM, GPRS.

### UNIT - 3

**Wideband Modulation Techniques and OFDM**

Basic Principles, OFDM Signal Mathematical representation, Block Diagram, Selection Parameters for modulation, Pulse shaping, Windowing, Spectral Efficiency, Synchronization

### UNIT - 4

**Wireless Communication Systems CDMA IS95**

Direct sequence Spread Spectrum, Spreading codes, Multipath Signal Propagation and RAKE receiver, Frame Quality and BER Requirements, Critical challenges of CDMA, TIA IS95 System, Physical and Logical Channels of IS95, CDMA IS95 call processing, soft hand off and power control in CDMA, Access and Paging Channel Capacity, Reverse and Forward Link Capacity of a CDMA System.

### UNIT - 5

**Wireless Communication Systems**

CDMA 2000: CDMA layering structure, CDMA 2000 channels, logical channels, forward link physical, forward link features, reverse physical channels, CDMA 2000 Media Access control and LAC sub layer, Data services, Data services in CDMA 2000, mapping of logical channels to physicals, evolution of CDMA IS95 to CDMA 2000.

### UNIT - 6

**More Wireless Communication Systems**

Bluetooth, Wi-Fi Standards, WIMAX, Wireless Sensor Networks, Zigbee, UWB, IEEE 802.20 and Beyond.

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**TEXT/REFERENCE BOOKS**

Introduction To Electronics Manufacturing

Components and Packaging

Introduction to the SMT Process, SMT Equipment and Material Handling Systems
Handling Of Components And Assemblies – Moisture Sensitivity And ESD, Safety And Precautions Needed, IPC And Other Standards, Stencil Printing Process – Solder Paste Material, Storage And Handling, Stencils And Squeegees, Process Parameters, Quality Control.

Soldering- Process and Component Placement
Component Placement- Equipment Type, Flexibility, Accuracy of Placement, Throughput, Packaging of Components For Automated Assembly, Cp And Cpk And Process Control.
UNIT - 5

Inspection and Testing

UNIT - 6

Repair, Rework, Quality and Reliability of Electronics Assemblies

TEXT/REFERENCE BOOKS

Course Objectives:
- To introduce how to handle the practical situations where mixed signal analysis is required.
- To analyze and handle the inter-conversions between signals.
- To introduce the students how to design systems involving mixed signals.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand the practical situations where mixed signal analysis is required.
2. Analyze and handle the inter-conversions between signals.
3. Design systems involving mixed signals.

UNIT - 1
Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous-time filters: passive and active filters.

UNIT - 2
Basics of analog discrete-time filters and Z-transform.

UNIT - 3
Switched-capacitor filters- Non idealities in switched-capacitor filters, Switched-capacitor filter architectures, Switched-capacitor filter applications.

UNIT - 4
Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

UNIT - 5
Mixed-signal layout, Interconnects and data transmission, Voltage-mode signaling and data transmission, Current-mode signaling and data transmission.

UNIT - 6
Introduction to frequency synthesizers and synchronization, Basics of PLL, Analog PLLs, Digital PLLs, DLLs.

Course Objectives:
- To understand the basic signals in the field of biomedical.
- To study origins and characteristics of some of the most commonly used biomedical signals, including ECG, EEG, evoked potentials, and EMG.
- To understand Sources and characteristics of noise and artifacts in bio signals.
- To understand use of bio signals in diagnosis, patient monitoring and physiological investigation.
- To explore research domain in biomedical signal processing.
- To explore application of established engineering methods to complex biomedical signal problems.

Course Outcomes:
After successfully completing the course students will be able to:
1. The student will be able to model a biomedical system
2. The student will be able to understand various methods of acquiring bio signals.
3. The student will be able to understand various sources of bio signal distortions and its Remedial techniques
4. The students will be able to analyze ECG and EEG signal with characteristic feature points.
5. The student will have a basic understanding of diagnosing bio-signals and classifying them.

UNIT - 1

Introduction to Biomedical Signals
ECG, EEG, EMG, ENG etc. Event related potentials Biomedical Signal Analysis- Computer Aided Diagnosis. Concurrent, coupled and correlated processes - illustration with case studies. Noise Filtering: Random noise structured noise and physiological interference- noise and artifacts in ECG.

UNIT - 2

Time domain filters and Frequency domain Filters

UNIT - 3

Event Detection

UNIT - 4

Fourier Spectrum, Estimation of power spectral density
Moments and spectral power ratio. Power Cepstrum- Complex Cepstrum Biomedical applications of Cepstrum analysis.

UNIT - 5

Modeling of Biomedical systems:
UNIT - 6

Pattern classification and diagnostic decision:

TEXT/REFERENCE BOOKS


Course Objectives:

- This Multirate Signal Processing course covers advanced techniques for the design of digital filters, which are essential components in almost every digital signal processing system, as well as cyclostationary signals, so important to the understanding of modulation systems.
- The course then moves on to treat multi-rate systems and presents multi-rate processing of both deterministic and random signals, culminating in a full case study exercise.
- To analyze multi-rate systems and the effects of interpolation and decimation on deterministic signals.
- To analyze the effects of interpolation and decimation on random signals.
Dr. Babasaheb Ambedkar Technological University, Lonere.

- To design interpolation and decimation filters to a given specification.

Course Outcomes:
After successfully completing the course students will have:

1. Ability to understand the concepts of sampling rate conversions, Decimation and Interpolation as part of Signal Processing techniques.
2. Able to explain how the multirate implementation of ADC and DAC converters works.
3. Able to describe basic sampling rate conversion algorithms.
4. Able to draw and describe different kinds of interpolator and decimator.
5. Able to analyze how the interpolated FIR filter works.
6. Able to do sampling rate conversion.

UNIT - 1

Fundamentals of Multirate Systems
Introduction, Basic multirate operations, Interconnection of building blocks, Polyphase representation, Multistage implementation, Some application of multirate systems, Special filter and filter banks.

UNIT - 2

Maximally Decimated Filter Banks
Introduction, Errors created in the QMF bank, A simple alias free QMF system, Power symmetric QMF banks, M-channel filter banks, Polyphase representation, Perfect reconstruction system, alias free filter banks, Treestructured filter banks, Transmultiplexer.

UNIT - 3

Paraunitary Perfect Reconstruction Filter Banks
Introduction, Lossless transfer matrices, Filter banks properties induced by paraunitariness, Two channel FIR paraunitary QMF banks, Two channel paraunitary QMF lattice, M-channel FIR paraunitary filter banks, Transformcoding and LOT.
UNIT - 4

Linear Phase and Cosine Modulated Filter Banks

Introduction, Some necessary conditions, Lattice structure for linear phase FIR PR banks, formal synthesis of linear phase FIR PR QMF Lattice. Pseudo QMF banks, Design of the pseudo QMF bank, Efficient polyphase structure, Cosine modulated perfect reconstruction system.

UNIT - 5

The Wavelet Transform and its Relation to Multirate Filter Banks

Introduction, Background and outline, Short time fourier transform, The Wavelet transform, DT orthonomal Wavelets, Continuous time orthonormal Wavelet basis.

UNIT - 6

Multidimensional, Multivariable and Lossless Systems


TEXT/REFERENCE BOOKS

Course Objectives:
- To understand time-frequency nature of the signals.
- To introduce the students how wavelets can be applied on the signals.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand time-frequency nature of the signals.
2. Apply the concept of wavelets to practical problems.
3. Mathematically analyze the systems or process the signals using appropriate wavelet functions.

Introduction
Introduction to time frequency analysis; the how, what and why about wavelets, Short-time Fourier transform.

Continuous and Discrete Wavelet Transform
Wigner-Ville transform, Continuous time wavelet transform, discrete wavelet transform

Construction of Wavelets
Tiling of the time-frequency plane and wave packet analysis, Construction of wavelets

Multi Resolution Analysis
Multi resolution analysis, Introduction to frames and biorthogonal wavelets

Filter Bank Theory
Multirate signal processing and filter bank theory.
Applications
Application of wavelet theory to signal denoising, image and video compression, multi-tone digital communication, transient detection.

**TEXT/REFERENCE BOOKS**

Course Objectives:
- To provide an overview of Mobile Communication Networks area and its applications in communication engineering.
- To appreciate the contribution of mobile communication networks to overall technological growth.
- To explain the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Mobile Communication Networks.

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance.

UNIT - 1

Cellular concepts
Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards.

UNIT - 2

Signal propagation
Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate, Capacity of flat and frequency selective channels.

UNIT - 3

Antennas
Antennas for mobile terminal- monopole antennas, PIFA, base station antennas and arrays
UNIT - 4

Multiple access schemes
FDMA, TDMA, CDMA and SDMA, Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM

UNIT - 5

Receiver structure
Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme, MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff

UNIT - 6

Performance measures
Outage, average SNR, average symbol/bit error rate, System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

TEXT/REFERENCE BOOKS

Course Objectives:
- Maximizing the efficiency of planning and decision making
- Integrating information from multiple sources

Course Outcomes:
At the end of the course, students will be able to map, analyze, manipulate and store geographical data in order to provide solutions to real world problems and help in planning for the future.

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**Introduction to Geo-informatics**
Introduction to GIS, History of GIS, Early developments in GIS, Applications of GIS.

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**Maps and Projection**

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**Spatial DBMS and Data Models**
Introduction, Data Storage, Database Structure Models, Database Management system, Entity Relationship Model, Normalization, GIS Data Model, Vector Data Structure, Raster Data structure, Geo-database and metadata.

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**Spatial Data Analysis**
Primary Data, Secondary Data, Data Editing, Introduction to spatial analysis, Vector Operations and Analysis, Network Analysis, Raster Data Spatial Analysis

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**Cartographic Principles and Design**
Introduction, Map layout, Data presentation, Toposheet Indexing, Distribution Maps.
UNIT - 6

Interpolation and Web GIS

Introduction to Interpolation, Global Methods of Interpolation, Local Methods of Interpolation, Introduction to Web GIS, OGC Standards and services.

TEXT/REFERENCE BOOKS


BTEXPE802D Software Defined Radio 3 Credits

Course Objectives:

- The objective of this course is to provide knowledge of fundamental and state-of-the art concepts in software defined radio.
- To understand the various components of software-defined-radios with the understanding of their limitation and application of ‘software-defined-solutions’ to overcome such limitations.
To Understanding the interplay of analog and digital signal processing for power as well as spectrum efficient transmission and reception of signal leads to an optimized, yet, practical radio solution.

**Course Outcomes:**

1. The student will study Needs, Characteristics, Benefits and Design Principles of a Software Radio.
2. The student will study design aspects of software radios.
3. The student will understand concept of Smart Antennas.
4. The student will study key hardware elements and related Trade-Offs.

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**UNIT - 1**

**Fundamentals of SDR:**
Software Radios, Needs, Characteristics, Benefits, Design Principles of a Software Radio, Radio frequency implementation issues, Principal Challenge of Receiver Design

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**UNIT - 2**

**RF and SDR:**
RF Receiver Front-End Topologies, Enhanced Flexibility of the RF Chain with Software Radios, Transmitter Architectures and their issues, Noise and Distortion in the RF Chain, Timing Recovery in Digital Receivers Using Multirate Digital Filters

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**UNIT - 3**

**Signals in SDR:**
Approaches to Direct Digital Synthesis, Analysis of Spurious Signals, Spurious Components due to Periodic Jitter, Band-pass Signal Generation, Hybrid DDS-PLL Systems, Generation of Random Sequences, Parameters of data converters

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**UNIT - 4**

**Smart Antennas:**
Concept of Smart Antennas, Structures for Beam-forming Systems, Smart Antenna Algorithms, Digital hardware choices, Key Hardware Elements, DSP Processors, Field Programmable Gate Arrays, Trade-Offs in Using DSPs, FPGAs and ASICs.
Case studies in Radio System:
Power Management Issues, Object-oriented representation of radios and network resources, Mobile Application Environments, Joint Tactical Radio System, Case studies in software radio design.

TEXT/REFERENCE BOOKS


BTEXPE802E Entrepreneurship Development 3 Credits

Course Objectives:

- To Develop and Strengthen Entrepreneurial Quality and Motivation in Students and
- To Impart Basic Entrepreneurial Skills and Understanding to Run a Business Efficiently and Effectively.
- The students develop and can systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully.

Course Outcomes:

After the completion of the course, the students will be able to:

1. Have the ability to discern distinct entrepreneurial traits.
2. Know the parameters to assess opportunities and constraints for new business ideas.
3. Understand the systematic process to select and screen a business idea.
4. Design strategies for successful implementation of ideas.
5. Write a business plan.
Entrepreneurship
Entrepreneur – Types of Entrepreneurs – Difference Between Entrepreneur And Intrapreneur
Entrepreneurship In Economic Growth, Factors Affecting Entrepreneurial Growth.

Motivation
Major Motives Influencing An Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives

Business


Financing and Accounting

Support to Entrepreneurs
Dr. Babasaheb Ambedkar Technological University, Lonere.

TEXT/REFERENCE BOOKS


BTEXOE803A Advance Industrial Automation 3 Credits

Course Objectives:
After the successful completion of this course, the student will be able:

- To identify potential areas for automation and justify need for automation.
- To select suitable major control components required to automate a process or an activity.
- To translate and simulate a real time activity using modern tools and discuss the benefits of automation.

Course Outcomes:

1. To identify suitable automation hardware for the given application.
2. To recommend appropriate modeling and simulation tool for the given manufacturing application.

UNIT - 1

Introduction:
UNIT - 2

Material handling and Identification Technologies:

UNIT - 3

Automated Manufacturing Systems:

UNIT - 4

Control Technologies in Automation:

UNIT - 5

Computer Based Industrial Control:

UNIT - 6

Modeling and Simulation for Plant Automation:
TEXT/REFERENCE BOOKS

3. An Introduction to Automated Process Planning Systems- Tiess Chiu Chang & Richard A. Wysk

BTEXOE803B Electronics in Smart City 3 Credits

Course Objectives:

Course Outcomes:

UNIT - 1

Necessity of SMART CITY
The Smart City Philosophy, Development of Asian Cities, Megacities of India: Current Challenges, The India Story of Smart Cities, Conceptual Basis of a Smart City, Global Smart City Programs, Recommendations for Smart City Framework in GCC.

UNIT - 2

SMART CITY and IOT
Introduction to Internet of Things, applications in smart city & their distinctive advantages - smart environment, smart street light and smart water & waste management. What is an IOT? Role and scope of IOT in present and future marketplace.

UNIT - 3

SMART Objects
Smart objects, Wired – Cables, hubs, etc., Wireless – RFID, WiFi, Bluetooth, etc. Different functional building blocks of IOT architecture.
UNIT - 4

Smart Cities: Distributed Intelligence and Central Planning
On the Interplay between Humans and Smart Devices, Theoretical Tools, Intelligence-Artificial Intelligence (Machine Intelligence), Information Dynamics, Synergetic, Information Dynamics and Allometry in Smart Cities.

UNIT - 5

Wireless Protocols for Smart Cities

UNIT - 6

Leveraging Smart City Projects for Benefitting Citizens: The Role of ICTs
Smart City and ICT: Using Technologies to Improve the Citizens’ Quality of Life, Smart City Goals: The Impact on Citizens’ Well-Being and Quality of Life, Critical Dimensions: Urbanization, Local Climate Change, and Energy Poverty, Environmental Issues: The Role of Local and Global Climate Chang.
Course Objectives:
To expose the students to the Engineering fundamentals of various Drives and its control, Dynamic operation and their Applications

Course Outcomes:
At the end of the course, students will demonstrate the ability to gain an ability to design and conduct performance experiments, as well as to identify, formulate and solve drives related problems.

UNIT - 1

Electrical Drives:

UNIT - 2

Selection of Motor Power Rating:
Thermal Model of Motor for Heating and Cooling, Classes of Motor Rating, Determination of Motor Rating.

UNIT - 3

Control of Electrical Drives:
Modes of Operation, Speed Control, Drive Classification, and Closed loop Control of Drives

UNIT - 4

DC Drives:
Review of Speed Torque relations for Shunt, Series and Separately excited Motors, Review of Starting, Braking (Regenerative, Dynamic, Plugging), Review of Speed control, Controlled rectifier fed DC drives (separately excited only): Single phase fully-controlled
Rectifier, Single phase Half controlled Rectifier, Three phase fully-controlled Rectifier, Three phase Half-controlled Rectifier, Dual Converter Control, Chopper Control – Motoring and Braking of separately excited and Series Motor. (No numerical from this module)

UNIT - 5

AC Drives:
Induction Motor drives, Review of Speed-Torque relations, Review of Starting methods, Braking (Regenerative, Plugging and AC dynamic braking), Transient Analysis, Speed Control: Stator voltage control, Variable frequency control from voltage source, Static Rotor Resistance control, Slip Power Recovery - Static Scherbius Drive, Review of d-q model of Induction Motor, Principle of Vector Control, Block diagram of Direct Vector Control Scheme, Comparison of Scalar control and Vector control, Basic Principle of Direct Torque Control (block diagram) of induction motor. Introduction to Synchronous Motor Variable Speed drives.

UNIT - 6

Special Motor Drives:
Stepper Motor drives- Types, Torque vs. Stepping rate characteristics, Drive circuits, Introduction to Switched reluctance motor drives and Brushless DC motor drives.

TEXT/REFERENCE BOOKS

1. Fundamentals of Electrical Drives by G. K. Dubey, Narosa Publication
5. Special Electrical Machines by E.G. Janardanan, PHI.
Course Objectives:

- To prepare students with basics of robotics
- To familiarize students with kinematics & dynamics of robots
- To familiarize students with path & Trajectory planning of robots
- To familiarize students with robot vision.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Describe kinematics and dynamics of stationary and mobile robots
2. Describe trajectory planning for robots.
3. Implement trajectory generation and path planning various algorithms
4. Work in interdisciplinary projects

UNIT - 1

Fundamentals of Robotics

Robot Classification, Robot Components, Degrees of freedom, Joints, Coordinates, Coordinate frames, workspace, applications.

UNIT - 2

Forward & Inverse Kinematics of Robots

Homogeneous transformation matrices, Inverse transformation matrices, Forward and inverse kinematic equations – position and orientation, Denavit-Hatenberg representation of forward kinematics, Inverse kinematic solutions, Case studies.

UNIT - 3

Velocity Kinematics & Dynamics

Robot Motion Planning
Concept of motion planning, Bug Algorithms – Bug1, Bug2, Tangent Bug

Potential Functions and Visibility Graphs
Attractive/Repulsive potential, Gradient descent, wave-front planner, navigation potential functions, Visibility map, Generalized Voronoi diagrams and graphs, Silhouette methods

Trajectory planning
Trajectory planning, Joint-space trajectory planning, Cartesian-space trajectories

Robot Vision
Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation, Iterative processing, Perspective transform.

TEXT/REFERENCE BOOKS
Course Objectives:

Course Outcomes:
At the end of the course, students will demonstrate the ability to:

UNIT - 1

Introduction to Block chain
History: Digital Money to Distributed Ledgers, Design Primitives: Protocols, Security, Consensus, Permissions, and Privacy.

UNIT - 2

Block chain Architecture and Design
Basic crypto primitives: Hash, Signature, Hash chain to Block chain, Basic consensus mechanisms

UNIT - 3

Consensus
Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspects of Block chain consensus protocols, Permissioned Block chains: Design goals, Consensus protocols for Permissioned Block chains

UNIT - 4

Hyperleder Fabric
Hyperledger Fabric I: Decomposing the consensus process, Hyperledger fabric components, Chain code Design and Implementation
Hyperledger Fabric II: Beyond Chain code: fabric SDK and Front End, Hyperledger composer tool

UNIT - 5
Use Cases
Use case II: Block chain in tradesupply chain: Provenance of goods, visibility, trade supply chain finance, invoice management discounting, etc
Use case III: Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system social welfare systems

Blockchain Cryptography Privacy and Security on Blockchain
Research aspects I: Scalability of Block chain consensus protocols, Case Study “Various recent works on scalability,"
Research aspects II: Secure cryptographic protocols on Block chain, Case Study “Secured Multi-party Computation, Block chain for science: making better use of the data-mining network, Case Studies: Comparing Ecosystems - Bitcoin, Hyperledger, Ethereum and more

TEXT/REFERENCE BOOKS
1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos
2. Blockchain by Melanie Swa, O'Reilly