# Syllabus for
# B.Tech (1st Year)
# (2022 Admission Batch)

# All Branches

**(Approved by Academic Council and Board of Studies)**


**GIFT Autonomous College**
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)
Recognised under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, Pincode: 752054

# 1st Year

## First Semester

### Theory

| Sl. No. | Category | Course Code | Course Title | WCH L-T-P | Credit |
|---|---|---|---|---|---|
| 1 | BS | BTBS-T-BS-101 | Introduction to Mathematics I | 4-1-0 | 3 |
| 2 | BS | BTBS-T-BS-102/ BTBS-T-BS-103 | Elements of Engineering Physics / Applied Chemistry | 4-1-0 | 2 |
| 3 | ES | BTES-T-ES-101/ BTES-T-ES-102 | Basic Electrical and Electronics Engineering / Basic Mechanical and Civil Engineering | 4-1-0 | 3 |
| 4 | ES | BTES-T-ES-103 | Basic Programming Skills | 4-1-0 | 3 |
| 5 | HS | BTBS-T-HS-101 | Communicative English-1 | 1-0-0 | 1 |
| 6 | EEC | BTSC-T-SC-101 | (Skill Enhancement and Personality Development) | 2-0-0 | 1 |
| 7 | MC | BTMC-T-MC101/ BTMC-T-MC102 | Information Technology & Information System /Constitution of India | 2-0-0 | 0 |
| | | | Total Hours/ Credit**(Theory)** | 25 | 13 |

### Practical

| | | | | | |
|---|---|---|---|---|---|
| 1 | BS | BTBS-P-BS-102/ BTBS-P-BS-103 | Elements of Engineering Physics Lab/ Applied Chemistry Lab | 0-0-2 | 1 |
| 2 | ES | BTES-P-ES-101/ BTES-P-ES-102 | Basic Electrical and Electronics Engineering. Lab/ Basic Mechanical and Civil Engineering Lab | 0-0-2 | 1 |
| 3 | ES | BTES-P-ES-103 | Basic Programming Skill Lab | 0-0-4 | 2 |
| 4 | ES | BTES-P-ES-104/ BTES-P-ES-105 | Engineering Graphics with AutoCAD / Workshop Practice-I | 0-0-3 | 1.5 |
| 5 | HS | BTHS-P-HS-101 | Communicative English Lab-I | 0-0-3 | 1.5 |
| | | | Total Hours/ Credit(Practical) | 14 | 7 |
| | | | Grand Total Hours/ Credit(Practical) | **39** | **20** |

## Second Semester

### Theory

| Sl. No. | Category | Course Code | Course Title | WCH L-T-P | Credit |
|---|---|---|---|---|---|
| 1 | BS | BTBS-T-BS-201 | Introduction to Mathematics II | 4-1-0 | 3 |
| 2 | BS | BTBS-T-BS-102/ BTBS-T-BS-103 | Elements of Engineering Physics / Applied Chemistry | 4-1-0 | 2 |
| 3 | ES | BTES-T-ES-101/ BTES-T-ES-102 | Basic Electrical and Electronics Engineering./ Basic Mechanical and Civil Engineering | 4-1-0 | 3 |
| 4 | ES | BTES-T-ES-203 | Programming Using Data Structure | 4-1-0 | 3 |
| 5 | HS | BTBS-T-HS-101 | Communicative English-II | 1-0-0 | 1 |
| 6 | EEC | BTSC-T-SC-201 | SEPD-1 (Skill Enhancement and Personality Development) | 2-0-0 | 1 |
| 7 | MC | BTMC-T-MC-101/ BTMC-T-MC-102 | Information Technology & Information System /Constitution of India | 2-0-0 | 0 |
| | | | Total Hours/ Credit**(Theory)** | 25 | 13 |

### Practical

| | | | | | |
|---|---|---|---|---|---|
| 1 | BS | BTBS-P-BS-102/ BTBS-P-BS-103 | Elements of Engineering Physics Lab/ Applied Chemistry Lab | 0-0-2 | 1 |
| 2 | ES | BTES-P-ES-101/ BTES-P-ES-102 | Basic Electrical and Electronics Engineering. Lab/ Basic Mechanical and Civil Engineering Lab | 0-0-2 | 1 |
| 3 | ES | BTES-P-ES-203 | Programming Using Data Structure Lab | 0-0-4 | 2 |
| 4 | ES | BTES-P-ES-104/ BTES-P-ES-105 | Engineering Graphics with AutoCAD / Workshop Practice-I | 0-0-3 | 1.5 |
| 5 | HS | BTHS-P-HS-201 | Communicative English Lab-I | 0-0-3 | 1.5 |
| | | | Total Hours/ Credit(Practical) | 14 | 7 |
| | | | Grand Total Hours/ Credit(Practical) | **39** | **20** |

**SUMMER INTERNSHIPTRAINING for 30Days**

## Program Outcomes (UG Engineering)

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The Program Outcomes (POs) for UG Engineering programmes defined by NBA are:

PO1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the

engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Types & Definitions

| | |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Laboratory / Practical / Sessional |
| WCH | Weekly Contact Hours |
| BS | Basic Sciences |
| HS | Humanities & Social Sciences (including Management) |
| ES | Engineering Sciences |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| SC | Skill Course |
| EEC | Employability Enhancement Course |
| SEPD | Skill Enhancement and Personality Development |

# Part I
# 1st Year B. Tech.
# (Common to All Branches)

# Contents

## First Year B.Tech

### Curriculum Structure

**B.Tech (1st Semester & II nd Semester)**

**Evaluation process**

**1. Evaluation Process of Theory Subjects:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| Quiz Test | 5 | 2 | Concerned Faculty |
| Surprise Test | 5 | 2 | Concerned Faculty |
| Assignment | 5 | 2 | Concerned Faculty |
| Attendance | 5 | Closing of Instruction | To be retrieved from CMS |
| Mini Project | 10 | 1 (Before Closing of Instruction) | Concerned Faculty |
| Mid-Semester Examination | 20 | 1 | Examination Cell |
| End-Semester Examination | 100 | 1 | Examination Cell |
| **Total** | **150** | | |

**2. Evaluation Process of Practical Subjects:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| Attendance | 10 | Closing of Instruction | To be retrieved from CMS |
| Daily Performance & Viva-voce | 40 | On the day of Experiment | Concerned Faculty (Upload in CMS in weekly basis) |
| Lab Record | 20 | On the day of Experiment | Concerned Faculty |
| End-Semester Lab Test | 30 | 1 | At the end of the semester as per the schedule published by Examination Cell |
| **Total** | **100** | | |

**3. Evaluation Process of Skill Courses:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| End-Semester Examination | 100 | 1 | Examination Cell/ Concerned Faculty |
| **Total** | **100** | | |

**4. Evaluation Process of Mandatory Courses:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| In-Semester Evaluation | 100 | 1 | Examination Cell/ Concerned Faculty |
| **Total** | **100** | | |
| | | | |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-T-BS-101 | **Introduction to Mathematics - I** | 4-1-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | The objective of this course is to familiarize the students with the knowledge and concepts of ordinary differential equations and applications, solution of system of linear equations using matrix, Eigen vectors & Eigen values of matrices with applications. |
| **Pre-Requisites** | A good knowledge of trigonometry along with basics of differential and integral calculus of one variable and coordinate geometry of two and three dimensions. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| ***Speed Math*** | Average, Problems on Ages, Percentage, Profit and Loss, Ratio and Proportion, Time | |
| **Module-1** | Solution of first order differential equations, Linear equation, Bernoulli's equation. Second order differential equations with constant coefficients, Euler-Cauchy equation. Non-homogeneous equations: Method of undetermined coefficients, Variation of Parameters, Applications to Electric Circuits. | **10 Hours** |
| **Module-2** | Introduction to vector space, subspace, span, linearly independent and linearly dependent vectors, solution of system of linear equations, Gauss elimination, Determinant, Rank of a matrix, Inverse of a matrix by Gauss-Jordan Method. | **8 Hours** |
| **Module-3** | Eigen value, Eigen vector, Symmetric, Skew-symmetric and Orthogonal matrices, Hermitian, Skew-Hermitian, and Unitary matrices, Similarity of matrices, Diagonalization, Quadratic Form. | **8 Hours** |
| **Module-4** | Partial differentiation, Maxima and Minima for function of two variables. Vector Differential Calculus: Vector and Scalar functions and Fields, Derivatives, Curves, Tangents and Arc length, Gradient, Divergence, and Curl. | **11 Hours** |
| **Total** | | **45 Hours** |

**Text Books**:

T1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India.
T2. B. V. Raman, Higher Engineering Mathematics, Mc Graw Hill Education Pvt. Ltd.

**Reference Books**:

R1. S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press.
R2. P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.

R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.
R4. A. Sharma, Quantitative Aptitude, Mc Graw Hill Education Pvt. Ltd
R5. R. S. Aggarwal, Quantitative Aptitude For Competitive Examinations, S. Chand publication.

**Online Resources**:

1. https://nptel.ac.in/courses/111106100
2. https://nptel.ac.in/courses/111105121
3. https://nptel.ac.in/courses/111104137
4. https://nptel.ac.in/courses/111107108
5. https://nptel.ac.in/courses/111106051
6. https://nptel.ac.in/courses/111105134

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

| | |
|---|---|
| CO1 | Know the basic concepts of quantitative aptitude to meet real life requirements. |
| CO2 | Find the general solution of first and second order ordinary differential equations and use the general solution to find the specific solution for given initial value problems. |
| CO3 | Solve and demonstrate various physical models through second order differential equations. |
| CO4 | Use the understanding of matrix algebra to solve systems of linear equations, harmonics problems, population models etc. arising in various engineering fields. |
| CO5 | Demonstrate knowledge and applications of Eigen value problems related to engineering disciplines. |
| CO6 | Understand the vector function and fields for design and construction of systems. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-T-BS-102 | **Elements of Engineering Physics** | 4-0-0 | 2 | 150 |

| | |
|---|---|
| **Objectives** | 1. To expose students to the fundamental principles and laws of mechanics in Physics to understand the types of motion.<br>2. To analyze the concepts of mechanics, oscillations, waves and optics to prepare the students for advanced level courses.<br>3. To demonstrate the ability to identify and apply the appropriate analytic, numerical, and mathematical reasoning, to situations of the physical world.<br>4. To adaptability to new developments in science and technology. |
| **Pre-Requisites** | Class $12^{th}$ level Physics course |
| **Teaching Pedagogy** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Oscillation, waves and Mechanical Properties**<br>Simple, damped and forced oscillations, resonance, coupled oscillations.<br>Wave and wave equation, Superposition of waves.<br>Interference, Young's double slit experiment, Newton's rings, Diffraction, Fraunhofer diffraction by single slit, Diffraction Grating, Polarization, Malus' Law, Brewster's Law.<br>Mechanical Properties of Matter Stress, strain, Hooke's law, elastic constants and their relations, stress-strain diagrams | **12 Hours** |
| **Module-2** | **Electromagnetism and Concept of Quantum mechanics**<br>Divergence, Curl and Gradient, Line, Surface and volume integral, Gauss divergence theorem, Stokes theorem (Only Statements, no proof), Gauss's law, Ampere's law and Faraday's law of electromagnetic induction, Maxwell's equations in integral and differential form.<br>Black body radiation, Planck's law, photo electric effect (concept and equation), Matter waves, de Broglie hypothesis, Heisenberg's Uncertainty Principle and its application, Schrodinger's wave equation – Time independent and Time dependent equations, Free particle, Particle in a one dimensional rigid box. | **10 Hours** |

| | | |
|---|---|---|
| **Module-3** | **Engineering Materials**<br>Semiconducting Material: Defects in solids (Elementary idea)**,** Concept of energy bands in solids, carrier concentration and conductivity in semiconductors with temperature dependence, construction and working of PN junction diode.<br>Dielectric materials, Dielectric Polarization, Dielectric Breakdown, Dielectric constant and loss, Electromagnetic wave in dielectric medium.<br>Superconducting materials: Superconductivity, Critical parameters, Meissner effect, Type I & Type II superconductors, BCS theory, applications of super conducting materials.<br>Nano material: Classifications, Quantum confinement, surface to volume ratio, Graphene and its structure, Application. | **10 Hours** |
| **Module-4** | **Quantum Statistics and Optoelectronic devices**<br>Statistical Mechanics: Statistical distributions: Maxwell-Boltzmann, Molecular Energies in an ideal gas, Bose-Einstein and Fermi-Dirac statistics.<br>Laser: Spontaneous and stimulated emission, Einstein's coefficients, Population inversion, Light amplification, Basic laser action, Types of laser, Ruby and He-Ne lasers, applications.<br>Fiber Optics: Optical fiber and its principle, acceptance angle, numerical aperture for step and graded index fibers, attenuation mechanism in optical fibers, applications of optical fibers. | **12 Hours** |
| **Total** | | **44 Hours** |

**Text Books**:

T1. Principles of Engineering Physics-Vol. I and II by M. Khan & S. Panigrahi, Cambridge university Press
T2. Engineering Physics: D. R Joshi, McGraw Hill Education Press
T3. Engineering Physics: H. K Mallik, A. K Singh, McGraw Hill Education Press

**Reference Books**:

R1. Electronic Devices and Circuits - Millman, Halkias and Jit, Tata McGraw Hill
R2. Concepts of Modern Physics : A Beiser, S Mahajan, S. Raichoudhury
R3. Optics: A. K. Ghatak
R4. Introduction to Solid State Physics: S. O. Pillai
R5. Properties of matter: D. S. Mathur

**Online Resources**:

1. https://nptel.ac.in/courses/122106027
2. https://nptel.ac.in/courses/115105121
3. https://onlinecourses.nptel.ac.in/noc22_ph06/preview
4. https://nptel.ac.in/courses/115105097
5. https://nptel.ac.in/courses/108106161

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

| | |
|---|---|
| CO1 | Understand the concepts of waves, oscillation and its significance. |
| CO2 | Acquire skills to apply formulas of optics and wave physics. |
| CO3 | Gain Acquire Knowledge of basic concepts of electric and magnetic fields. |
| CO4 | Develop the concept of different engineering material and their applications. |
| CO5 | Understand the basic knowledge of thermodynamic and use them to solve practical problems. |
| CO6 | Develop a comprehension of the current basis of broad knowledge in Modern physics. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-T-BS-103 | **Applied Chemistry** | 4-1-0 | 2 | 150 |

| | |
|---|---|
| **Objectives** | The objective of this course is to build knowledge of students about basic concepts and application of Chemistry from Industrial, Pharmaceutical, research, agriculture and life science point of view. |
| **Pre-Requisites** | A fundamental knowledge of Quantum, Inorganic chemistry, along with basics of Periodic table, properties of metal are to be clear. |
| **Teaching Pedagogy** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Quantum Mechanics and its application**: Failure of classical mechanics and introduction to quantum mechanics, Photoelectric effect, Postulates of Quantum mechanics, Schrodinger's wave equation (Derivation not required), Particle in One dimensional box, Significance of eigen value and eigen function. Zero point energy.<br>**Phase rule and its application**: Definition of phase, component and degree of freedom ,one component system, Water, Sulphur system, Curves and triple points, meta stable triple point, Two component alloy systems: Bi-Cd, eutectic | **7+5=12 Hours** |
| **Module-2** | **Electro Chemistry and its application**: Electro chemical cells, Dry cell, Alkaline battery, Ni-Cd battery, Li-ion Battery, Pb-acid storage cell<br>**Fuel Cells:** Definition, Different types of fuel cell, Hydrogen blue fuel cell, FCEVs<br>**Corrosion**: Theory and mechanism of corrosion, Types, differential aeration corrosion, water line corrosion, Pitting, stress, SCC, galvanic corrosion, Caustic embrittlement, Factors affecting corrosion, Corrosion Control, corrosion inhibitors: Cathodic protection, Metal coatings | **5+2+6=13 Hours** |

| | | |
|---|---|---|
| **Module-3** | **Fuel**: Classification, calorific value, refining of crude oil, cracking, fuel for I/C engine, knocking, anti-knocking, Octane rating. Diesel engine fuels, Cetane rating, Combustion calculations. Gaseous fuel: LPG, CNG, Biogas fuel, Alternate Fuels, carbon foot print, carbon trading<br>**Polymer**: Degree of polymerization, Thermosetting and thermoplastic polymer with examples: Polethene, PVC, Nylon-6, Teflon and their applications, Rubber: Natural rubber, Vulcanized rubber. | **8+4=12 Hours** |
| **Module-4** | **Nano materials**: Introduction, Classification, characteristics, 0D,1D, 2D Nanomaterials, Synthesis: Top Down & Bottom Up approach, Application to Pharmaceutical and Research . | **8 Hours** |
| **Total** | | **45 Hours** |

**Text Books:**

T1.Theory & Practical's of Engineering Chemistry, By Shashi Chawla, Publisher: Dhanpati Rai & CO.(Pvt.) Ltd

T2. Engineering Chemistry Vol-I & II, Author: Jain & Jain, Publisher: Dhanpati Rai Publishing Company.

T3. Engineering Chemistry, Author: Prasant Rath, 2015, Cenage Learning India Pvt, Ltd

T4. Textbook on Engineering chemistry. Author: Achyutananda acharya & Biswit Samantaray, publisher: Pearson

**Reference Books:**

R1. Theory & practical's of engineering chemistry, by Shashi Chawla, publisher: Dhanpati Rai & CO.(Pvt.) Ltd

R2. Engineering chemistry vol-i & II, author: Jain & Jain, publisher: Dhanpati Rai publishing company.

R3. A textbook of engineering chemistry, author: Dr. Rajshree Khare publisher: S.K. Kataria & sons.

R4. Textbook of nanoscience and nanotechnology. Mcgraw Hill Education (India) Pvt. Ltd., 2012.

R5. Nanostructures & Nanomaterials: synthesis, properties and applications- g. Cao and Y. Wang, world scientific Pvt. Ltd.; 2nd edition

**Online Resources**:

1. https://www.energy.gov/eere/fuelcells/fuel-cells
2. https://www.britannica.com/science/polymer
3. https://www.niehs.nih.gov/health/topics/agents/sya-nano/index.cfm
4. https://afdc.energy.gov/vehicles/fuel_cell.html
5. https://www.researchgate.net/publication/258761372

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

| | |
|---|---|
| CO1 | Describe graphs of one and two component system (curves) and their characteristics. |
| CO2 | Solve quantum energy related problem and determine the quantized energy of different energy levels. |
| CO3 | Explain the methodology of corrosion occurrence in different cases and its prevention to optimum level. |
| CO4 | Explore the concepts and methods of blending of fuels with better Cetane and Octane number. |
| CO5 | Use the concept of Polymer Synthesis, new material synthesis methodologies and types of nanomaterial. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-T-ES-101 | **Basic Electrical and Electronics Engineering** | 4-2-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | To expose to the field of electrical &electronics engineering, and to acquire the fundamental knowledge in the field. |
| **Pre-Requisites** | Knowledge of Physics and Mathematics in Secondary Education |
| **Teaching Pedagogy** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to Electrical power system: An overview of Electrical Engineering, Sources of energy, steam, hydro and nuclear power generation, Renewable source of Power generating station and general structure of electrical Transmission, Distribution, Utilization & Conservations. DC Circuits: Study of Electrical Elements (R, L, C). Ohm's Law. Series & Parallel combination. KCL, KVL, Nodal & Mesh analysis. Star Delta Conversion. AC fundamentals: Sinusoidal Wave form, Peak, RMS, Average value. Concept of Real Power, Reactive Power, Apparent Power &Power factor. Analysis of 1- phases AC circuit. Introduction to 3- phase system. Line & Phase quantity in star and delta connection, Analysis of 3- phases balanced AC circuit. | **9 Hours** |
| **Module-2** | Magnetic circuits: Electro magnetism, simple magnetic circuit, magnetic material, B-H curve. Electrical Machines: Construction, working principle & Application of DC generator, DC Motor, single phase & 3-phase transformer, 3 phase & single phase induction motor, Alternator & Special Motors ( Stepper & BLDC) Electrical Installations & wiring: Layout of LT switchgear, Switch fuse unit (SFU), MCB, ELCB, MCCB, Type of earthing & Different types of Domestic Wiring. Electrical Safety: Safety Procedure for working on electrical mains & Apparatus, Electrical hazard, its preventions & Protections, Fire preventions & protection for electrical installations. First aid in electrical Injuries. Artificial respiration & chest compression for accidents victims. IE rules and Electrical License rules. Different Illumination, Batteries and their applications | **13 Hours** |
| **Module-3** | Introduction to Electronics and Communication Engineering: Basic Electronics components (active, passive), Signal, Spectrum, Frequency Band and Industrial application (VLSI, Microwave, RF, Telecommunication, Fiber Optics, RADAR, Signal Processing). Basic Communication Block Diagram and concept of Transmitter, Receiver and Channel.<br>Diodes: Overview of Semiconductors. Working principle and characteristics of PN junction. Diode applications (half-wave and full-wave rectifier, clipper, | **13 Hours** |

| | | |
|---|---|---|
| | clamper and zener /Avalanche Breakdown).<br>Bipolar Junction Transistor :Construction, Operation of Bipolar Junction Transistor and Transistor Biasing : Fixed Bias, Voltage divider bias, CB, CE, CC (Relationship between α, β, γ) circuit configuration Input-output characteristics, Transistor as a switch, as an Amplifier .<br>Op-Amp: The Operational Amplifier (Op-Amp): The Ideal Op-Amp Characteristics, Virtual ground concept, Inverting and non-inverting configurations, Application of Op-Amp (Summing amplifier, Integrator, Differentiator. Unit Gain Amplifier), 555 Timer. | |
| **Module-4** | Basics of Digital Electronics :<br>Number System, Boolean Algebra Digital logic Gates (AND, OR, NOT, NAND, NOR, EXOR, EX-NOR); Realization of Basic logic gates using universal gates, Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor, fundamentals flip-flops, registers and shift registers .<br>Introduction to Microprocessors and Microcontrollers: Basic block diagram: input, output, ALU, CU, Registers, Difference between microprocessor and microcontroller.<br>Introduction to Sensors and their Applications : Introduction to different types of Sensors: Temperature sensor, Moisture Sensor, Rain Sensor, LDR, IR, Smoke Sensor | **9 Hours** |
| **Total** | | **44 Hours** |

**Text Books**:

T1.D. P. Kothari and I. J. Nagrath, " Basic Electrical Engineering", Tata McGraw Hill.

T2. Principles of Electrical Safety, Peter E. Sutherland, Wiley-IEEE Press.

T3.Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylestad and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.

T4.Digital Design, 5th Edition M. Morris Mano and Michael D Ciletti Pearson

**Reference Books**:

R1."Basic Electrical Engineering" by Mittle, V and Arvind Mittle, Tata McGraw Hil.

R2.E. Hughes, "Electrical and Electronics Technology", Pearson.

R3.V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India.

R4.Microelectronic Circuits, 7th Edition Adel S Sedra and Kenneth C Smith Oxford University Press

R5.Fundamentals of Digital Circuits, 4th Edition A Anand Kumar PHI

R6. Integrated Electronics, 2nd Edition Jacob Millman and Christos Halkias Tata McGraw Hills

R7. A course in Electrical and Electronic Measurements and Instrumentation Author: AK Sawhney Publisher :

Dhanpat Rai & Co. (P) Limited

R8. A Textbook of Electrical Technology, by Theraja B L and Theraja A K, S Chand.

R9. Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand.

R10."Basic Electrical Engineering" by C L Wadhwa, New Age pub.

R11.D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

R12.Electrical Safety Handbook, 4th Edition Hardcover by John Cadick Mary Capelli-Schellpfeffer Dennis Neitzel Al Winfield

R13 B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications

**Online Resources**:

1. https://onlinecourses.nptel.ac.in/noc23_ee62
2. https://onlinecourses.nptel.ac.in/noc23_ee17
3. https://onlinecourses.nptel.ac.in/noc23_ee65
4. https://onlinecourses.nptel.ac.in/noc23_ee66
5. https://onlinecourses.nptel.ac.in/noc23_ee15
6. https://onlinecourses.nptel.ac.in/noc22_ee90
7. https://onlinecourses.nptel.ac.in/noc22_ee93

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

| | |
|---|---|
| CO1 | Introduce fundamentals idea & techniques about electrical engineering & to provide knowledge about DC, AC & Magnetic Circuits |
| CO2 | Impart conceptual analysis of electrical machineries & to familiarize the students with electrical safety equipment & domestic wiring. |
| | Inculcate sound understanding of illumination scheme. |
| CO4 | Acquire knowledge about basic electronic components , industrial applications and fundamentals of communication. |
| CO5 | Understand basic operation and applications of Diode, BJT and Op-Amp. |
| CO6 | Explain the basics of digital concepts, sensors , microprocessors and microcontrollers |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-T-ES-102 | **Basic Mechanical and Civil Engineering** | 4-2-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | To expose to the field of civil and mechanical engineering, and to acquire the fundamental knowledge in the field. |
| **Pre-Requisites** | Knowledge of Physics and Mathematics in Secondary Education |
| **TeachingPedagogy** | Regular classroom lectures with use of ICTas and when required,sessions are planned to be interactive with focus on problemsolving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-I** | **Introduction to Mechanical Engineering and Materials:** Introduction to mechanical engineering & Mechanical systems (Hydraulic, Mechanical & Pneumatic), Robot anatomy, classification based on robots configuration; Polar, cylindrical, Cartesian Coordinate and spherical. Mechanical Sensors, Automation. **Power transmission devices:** Belt, Rope, Gear & Gear drives. Coupling,clutch,brakes. (Working principle only), Mechanical Advantage, Velocity ratio. **Engineering Materials:** Classification of engineering material, Properties-Physical, Chemical & Mechanical, Composition of Cast iron and Carbon steels, Alloy steels their applications., Composites , Plastics and ceramics. Concepts on Metallurgy. Smart materials. **Mechanical Measurement:** Concept of measurements, errors in measurement, measurement of Temperature, Pressure, Velocity, and Flow.(working principle only.) | **1 Hours** |
| **Module-II** | **Fundamentals of Thermodynamics: Application** of thermodynamics in daily life, Refrigerants,Steam formation& its properties. Evaporation and Condensation, Desalination, Dry ice Vs Liquid Nitrogen, Aircraft engines and its classifications, Fuels, Rockets. **Application:** Steam power plant, I.C Engine, Refrigerators and Air- Conditioners (Brief description of different components with Schematic diagram only.) BS-VI**. Fluid Properties and their Applications:** Fluid properties, Pascal's Law its application, Bernoulli's theorem.Hydraulic machines: turbines, pumps, their types. Cryogenics. | **11 Hours** |

| | | |
|---|---|---|
| **Module-III** | **Introduction to Construction materials and Field Survey:** Basics of Civil Engineering & Broad disciplines of Civil Engineering, Building components and Materials – Brick, Stone, Cement, Concrete, Steel, Timber (composition, function and uses).concept of smart building., New and smart Materials – flyash, new-age concrete, recycling of materials. Infrastructure – habitat, megacities, current and futuristic vision.<br>Scale, plan, map, principles of survey, Linear measurements, Ranging, Compass Survey, Bearing of a line, Introduction to Modern Survey Instruments (EDM and Total Station), GIS and GPS (Introduction only). | **10 Hours** |
| **Module-IV** | **Fundamentals of Soil Mechanics, Hydrology and Transportation:** Fundamentals of soil classification, properties, foundation (deep and shallow) and types. Fundamentalsof Irrigation engineering- sources and hydrologic cycle. Introduction to hydraulic structures like canals, siphons, weirs, dams etc.<br>Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water. Different modes of transport, classification of road, Traffic sign and Road Marking, Introduction to Railway,Airport,Bridges, concept of Tunnels and Metro rail(underground and overhead). Basics of Port and Harbor – Concept of inland waterways. | **12 Hours** |
| **Total** | | **44 Hours** |

**TextBooks**:


T1. Basic Mechanical Engineering by Pravin Kumar, Pearson .
T2. Text book of Elements of Mechanical Engineering, S T Murthy, Universities press.
T3. Cengal, Y., Boles, "Thermodynamics", Mc-Graw Hill, 2001.
T4. Nakra & Chaudhary , Instrumentation and Measurements, TMH .
T5. Basic Civil Engineering, S.Gopi, Pearson.
T6. Basic of Civil Engineering, M.S. Palanichamy, McGraw Hill.


**ReferenceBooks**:


R1. Basic Mechanical Engineering by BasantAgrawal, C M Agrawal,Willey .
R2. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey.
R3. Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press.
R4. Basic Mechanical Engineering by .D. Mishra, P.K Parida, S.S.Sahoo, India Tech Publishing.
R5. Engineering Materials, S C Rangwala, Charotar Publishing House .
R6. Surveying Vol -1, RAgor, Khanna Publisher.
R7. Water supply ana Waste water engineering, S.K. Garg.
R8. Introduction to Bridge Engineering, D. Jhonson Victor.

R9. Engineering Materials, S C Rangwala, Charotar Publishing House.

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

| | |
|---|---|
| **CO-1** | Understand the fundamental of robotics, its application & power transmission system. |
| **CO-2** | Learn about engineering materials application and some measuring devices. |
| **CO-3** | Impart knowledge on thermodynamics, its application & fluid mechanics. |
| **CO-4** | Acquire knowledge about importance of Civil Engineering Materials and the aspects of field |
| **CO-5** | Understand the soil mechanics and fundamentals of irrigation engineering |
| **CO-6** | Formulate an idea in planning and design aspects of transportation engineering |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-T-ES-103 | **Basic Programming Skills** | 4-1-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | To expose to the field of Problem Solving and Programing |
| **Pre-Requisites** | Knowledge of Mathematics in Secondary Education |
| **Teaching Pedagogy** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

## Detailed Syllabus

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Algorithm, Representation of Algorithm: Flowchart/Pseudo-code with examples. From algorithms to programs; C Program source code, C Program structure, basic syntax, data types, variables, constants, storage class, syntax and logical errors in compilation, object and executable code, Arithmetic expressions, operators and precedence. | **10 Hours** |
| **Module-2** | Decision making: Conditional Branching, if statement, if else statement, nested if else statement, switch, nested switch statements, Iteration and loops, break, continue, Decision making Application in solving real life problems. | **8 Hours** |
| **Module-3** | Arrays: Arrays (1-D, 2-D), initialization, Accessing Array Elements, Matrix applications, Character arrays and Strings, Pointers, Pointer arithmetic, dynamic memory allocation, pointer to array and array of pointers Linear Search, Bubble Sort | **8 Hours** |
| **Module-4** | Functions, Parameter passing in functions, call by value, idea of call by reference, recursion with examples of Finding Factorial, Fibonacci series, and passing arrays to functions, nested function, local and global variables, static variables. | **8 Hours** |
| **Module-5** | Structures, Array of structures, union, structure vs union, passing structure to function, File handling: ASCII and binary Files. | **6 Hours** |
| **Total** | | **40 Hours** |

**Text Books**:


1. E. Balagurusamy, Programming in ANSI C, 8th Edition, Tata McGraw Hill, 2019
2. Herbert Schild, C: The Complete Reference, Tata McGraw Hill

**Reference Books**:

1. A.K.Rath and A. K. Jagadev, "Data Structures and Program Design using C", 2nd Edition, Scitech Publications, 2011
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication Pvt. Ltd
3. Rajaraman, V., Computer Programming in C, PHI Publications
4. Somashekara, M. T., Guru, D. S. , Manjunatha, K. S., Problem Solving With C, PHI
5. Yashavant Kanetkar, Let Us C, 17th Edition, BPB Publications New Delhi, 2019

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

| | |
|---|---|
| CO1 | Formulate simple algorithms for problem solving and translate the algorithms to programs. |
| CO2 | Execute the programs and correct syntax and logical errors. |
| CO3 | Implement different conditional branching and loops for problem solving. |
| CO4 | Decompose a problem into functions and synthesize a complete program using divide and conquer approach. |
| CO5 | Use arrays, pointers and structures to formulate algorithms and programs. |
| CO6 | Apply programming to solve searching and sorting problems. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-T-HS-101 | **Communicative English-I** | 2-0-0 | 1 | 150 |

| | |
|---|---|
| **Objectives** | To develop the Listening skills to comprehend various forms of communication. |
| | To evaluate the speaking skills with communicative efficiency. |
| | To distinguish different types of reading comprehension for better understanding and an |
| | To implement the requisite skills for effective writing. |
| **Pre-Requisites** | To have basic knowledge on LSRW skills |
| **Teaching Pedagogy** | Regular classroom lectures with use of PPT when required, sessions are planned to be interactive with examples to be acquainted with different types of communication |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Relevance of Communication:**<br>Importance of communication in English Language for Technocrats<br>Process and Factors of Communication<br>Applied Grammar (Parts of Speech, Modals, Subject – Verb Agreement, Vocabulary and usage) | **10 hours** |
| **Module-2** | **Reading and Writing**<br>Process of Reading, Skimming, Scanning, inferential Reading<br>Process of Writing ,Summarizing and Paraphrasing, Note Making, Notice Writing Minutes & Preparing Agenda | **05 Hours** |
| **Module-3** | **Oral Communication**<br>Sounds of English: Vowels and Consonants Sounds, Syllable and its Structure, Word Stress, Indian English and Standard English.<br>Listening :Process and Types of Listening, Strategy of Listening | **10 Hours** |
| | **Total** | **25 Hours** |

**Text Books**:
T1. Effective Technical Communication- M Ashraf Rizvi- Tata Mc Graw Hill
T2. Communication Skills- Sanjay Kumar & Puspalata- Oxford
T3. Soft Skills- Dr. K. Alex- S. Chand

**Reference Books**:
R1. An Introduction to Professional English and Soft Skills - Das et al.- Foundation Books
R2. Corporate Soft Skills-Sarvesh Gulati- Rupa Publications
R3. Corporate Communication- Pragyan Rath,K.Shalini, Debankita Ray-Cengage
R4. The Art of Communicating- Thich Nhat Hanh- Rhuk
R5. Communication Skills- Anjana Tiwari- Khanna Publishing (1st Ed.)

**Online Resources**:
www.britishcouncil.in
www.eltai.in

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

| | |
|---|---|
| CO1 | Develop the understanding of communication in different environment. |
| CO2 | Evaluate the various Types of Communication |
| CO3 | Analyze the rules for Pronunciation English Language effectively. |
| CO4 | Understand the importance of Reading |
| CO5 | Identify the different forms of Business Writing |
| CO6 | Practice LSRW in the Professional Place |

| Type | Code | Skill Enhancement and Personality Development (SEPD)-I | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTBS-T-SC-101 | | 2-0-0 | 1 | 100 |

| | |
|---|---|
| **Objectives** | To significantly raise the employability of the students to a level where they are able to clear campus selection process and at the same time develop an attitude of constant self-improvement throughout their career. |
| **Pre-Requisites** | Self-discipline |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on personality development |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Self – knowledge:**<br>1. Exploring habits, attitudes, preferences and experience<br>2. becoming aware of strengths and weaknesses, talents and problems, emotions and ideas<br>3. Identifying the optimum means of improving personal performance<br>4. Identifying areas of expertise and use these to solve problems in new contexts<br>5. Knowing your ambitions, goals, and values<br>6. Understanding feelings and emotions: primary feelings and secondary feelings, Self-regulating emotions | **10 Hours** |
| **Module-2** | **Self-management**<br>1. IQ, EQ, SQ, MI<br>2. Understanding of life story<br>3. Focusing on Internal narratives<br>4. Managing change, confusion and uncertainty<br>5. Sharpening the Intellect<br>6. Schooling the mind<br>7. Socializing the individual | **10 Hours** |
| **Total** | | **20 Hours** |

**Text Books**:
T1.Personality Development by D.P.Sabharwal
T2. Personality Development by L.Kendo
**Reference Books:**
R1.Here,There & Everywhere by Sudha Murty

R2. Personality Development by Swami Vivekananda

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

| | |
|---|---|
| CO1 | Improve habits, attitudes, preferences and experience |
| CO2 | Identify their own potentials and accept their own limitations |
| CO3 | Overcome their limitations and move towards self esteem |
| CO4 | Maximize self-potential in enabling a holistic development |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTBS-T-MC-101 | **Information Technology and Information Systems (IT & IS)** | 0-0-2 | 0 | 100 |

| | |
|---|---|
| **Objectives** | To expose to the fundamental usage of Computer. |
| **Pre-Requisites** | Basic knowledge of English in Secondary Education |
| **Teaching Scheme** | Regular Lab with use of ICT. Each session is planned to be interactive with focus on real life activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module 1** | Introduction Windows OS, OS Commands and operations, Introduction to MS Office | **10 Hours** |
| | MS-Word: Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles. | |
| | MS-WORD: Insert tab: Cover page, blank page, page break, table, picture, clip art. | |
| | MS-WORD: Insert tab: shape, chart, hyperlink, header and footer, textbox, word art, equation and symbols. | |
| | MS-WORD: Mailing tab: Mail merge, Page Layout tab: margin, orientation, size, columns, watermark, page color, page border, Review tab: spelling and grammar checking, Thesaurus. | |
| **Module 2** | MS-EXCEL: Create workbook, Home tab, Insert tab : Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art. | **10 Hours** |
| | MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, print area, Background | |
| | MS-EXCEL: Formulas tab : Auto sum( sum, average, count numbers, max, min), Insert Function( if, sum if, count if, average if, max if, min if) | |
| | MS-EXCEL: Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group. | |
| | MS-POWER POINT: Create file, Home tab, Insert new slide, change layout, Insert tab : Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art, Header Footer, movie, sound. | |
| | MS-POWERPOINT: Design tab : Theme, color, font, background style. Animation Tab: Custom animation, Transition( style, sound, speed), Slide show. | |
| | MS-ACCESS: Overview, Home Tab: Views, Records, Sort & Filter Create | |

| | | |
|---|---|---|
| **Module 3** | Tab: Create new Table, | **10 Hours** |
| | MS-ACCESS: Table: Template, Table Design, Insert data. External Data Tab: Import, Export | |
| | Create a resume using MS-Word. Create a table named Student Mark Entry to enter rollno, name, mark of 6 subjects. Enter total and average mark. | |
| | Create a datasheet contains 100 student information using MS-Excel. Create a column chart named Student Mark Graph that contains name, mark of 6 subjects for five students. | |
| | **Total** | **20 Hours** |

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

| | |
|---|---|
| **CO1** | Remember basic understanding of computer and basic concepts of Editing and Publishing |
| **CO2** | Understand the concepts of Paragrapghs, tables, Margins Page Setting |
| **CO3** | Learn to concise and precise on implementing Tables and Graphs |
| **CO4** | Illustrate the usages of formulae and fundamental Calculations |
| **CO5** | Select the data structure for different applications |
| **CO6** | Develop projects using MS Office and MS Access |

**Indicative Projects**

**MS WORD**

1. Preparing a CV
2. Application Writing
3. Mail merge
4. Cover Page and Certificate Design

**MS Excel**

1. Customer Bill generation
2. Grade sheet preparation
3. Student Performance Analysis
4. Attendance tracking project
5. Daily expense tracking
6. Weather Monitoring Report

**Power Point**

1. Poster Design
2. Banner Design

3. Information Brochure Design
4. Presentation on GIFT Autonomous College

**MS Access**

1. Student Database
2. Inventory Management
3. Room Reservation System
4. E-Commerce Database

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTBS-T-MC-102 | **Constitution of India** | 2-0-0 | 0 | 100 |

| | |
|---|---|
| **Objectives** | The objective of this subject is to provide understanding of the basic concepts of Indian Constitution and various organs created by the constitution including their functions. The course acquaints students with the constitutional design of state structures and institutions, and their actual working overt ime. |
| **Pre-Requisites** | Basic knowledge of Indian history, overall idea on India's political system. |
| **Teaching Pedagogy** | Regular classroom lectures with use of ICT as and when required and each session is planned to be interactive. |

**Evaluation Scheme**

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to Indian Constitution, Historical perspective of the constitution of India. Preamble of Indian constitution, Salient features of Indian constitution, Fundamental rights, Fundamental Duties and its legal status, Directive principles of state policy -its importance and Implementation. | **8 Hours** |
| **Module-2** | Federal structure and distribution of legislative and financial powers between the Union and the States, The Union legislature - The Parliament - The Lok Sabha and the Rajya Sabha, Composition, powers and functions, Union executive, President of India (with powers and functions), Vice-President, The Council of Ministers and the Prime Minister - Powers and functions. | **6 Hours** |
| **Module-3** | State Government, The State Legislature - composition, powers and functions, State executive, Governor (with powers and functions). | **5 Hours** |
| **Module-4** | Amendment of the Constitutional Powers and Procedure, Emergency Provisions: National Emergency, President Rule, Financial Emergency. Scheme of the Fundamental Right to Equality Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21. Local Self Government - Constitutional Scheme in India. | **5 Hours** |

| | | |
|---|---|---|
| **Module-5** | The Indian Judicial System - the Supreme Court and the High Court's composition, jurisdiction and functions, Judicial review, Judicial activism, independence of Judiciary in India. | **4 Hours** |
| **Total** | | **28 Hours** |

**Text Books**:

T1. D. D. Basu, Introduction of Constitution of India, 22nd Edition, LexisNexis, 2015.

T2. K. Subas, An Introduction to India's Constitution and Constitutional Law, 5th Edition, National Book Trust India, 2011.

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

| | |
|---|---|
| CO1 | Provide basic information about Indian constitution. |
| CO2 | Analyze the legalities and related issues of drafting, adoption and enforcement of the Indian Constitution as a fundamental law of the nation and the provisions and privileges of Indian Citizenship. |
| CO3 | Understand and judiciously use the fundamental rights and privileges envisaged in the constitution. |
| CO4 | Analyze the major dimensions of Indian Political System and to contribute in protecting and preserving the sovereignty and integrity of India. |
| CO5 | Know the successful functioning of democracy in India |
| CO6 | Understand their obligations, responsibilities, privileges & rights, duties and the role that they have to play in deciding the Administrative Machinery of the country. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-T-BS-201 | **Introduction to Mathematics - II** | 4-1-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | The objective of this course is to familiarize the students with the knowledge and concepts of numerical methods to solve the system of linear equations & ordinary differential equations, interpolation, and applications of vector integral calculus. |
| **Pre-Requisites** | A sound knowledge of linear algebra, basic calculus, and matrix algebra. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| | Series Completion, Coding-Decoding, Data Sufficiency, Random variable, | |
| **Module-1** | Root finding of algebraic and transcendental equations: Bisection method, Secant and Regula-falsi methods, Newton's method, Fixed point iteration method, Rate of convergence. | **8 Hours** |
| **Module-2** | Interpolation: Lagrange interpolation, Newton's divided difference interpolation, Newton's forward and backward interpolation, Introduction to Numerical Differentiation. | **8 Hours** |
| **Module-3** | Numerical Integration: Newton-Cotes quadrature formula, Trapezoidal rule, Simpson's rule, 2-point and 3-point Gauss Legendre rule. Solution of ordinary differential equations: Euler's method, Modified Euler's method, Runge-Kutta method ($2^{nd}$ and $4^{th}$ order). | **10 Hours** |
| **Module-4** | Vector Integral Calculus: Line Integrals, Independence of Path, Double Integrals, Green's Theorem, Surface Integrals, Triple Integrals, Gauss Theorem, and Stokes's Theorem (without proof). | **12 Hours** |
| **Total** | | **45 Hours** |

**Text Books**:

T1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India.
T2. B. V. Raman, Higher Engineering Mathematics, Mc Graw Hill Education Pvt. Ltd.

**Reference Books**:

R1. S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press.
R2. P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.
R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.
R4. B. P. Acharya, R. N. Das, A Course on Numerical Analysis, Kalyani Publishers

R5. R. S. Aggarwal, A Modern Approach to Verbal & Non-verbal reasoning, S. Chand publication.

**Online Resources**:

1. https://nptel.ac.in/courses/127106019
2. https://nptel.ac.in/courses/111102111
3. https://nptel.ac.in/courses/111105122
4. https://nptel.ac.in/courses/111105121
5. https://nptel.ac.in/courses/111105134

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

| | |
|---|---|
| CO1 | Know the basic concepts of verbal, non-verbal reasoning and logical ability for better employability. |
| CO2 | Apply the numerical methods to find the approximate solutions of algebraic and transcendental equations. |
| CO3 | Understand the basic concepts of mathematical theory of probability. |
| CO4 | Solve the numerical solution of differential equations and use of various techniques for evaluating the integrals. |
| CO5 | Calculate line integrals in two dimensions for differential forms and also calculate double integrals in Cartesian and polar coordinates over the domains. |
| CO6 | Apply Green's theorem, Gauss theorem and Stokes's theorem to evaluate line or double or triple integrals. |

| Type | Code | Programming Using Data Structure | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-T-ES-203 | | 4-1-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | Exploring basic data structures concept used in Industries |
| **Pre-Requisites** | Knowledge of Mathematics in Secondary Education and basic Programming concept. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction: Basic Terminologies: Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Asymptotic Notations, classification of data structure. Basic data st ructure:1d-Array and 2d-Array Data Structure Operations: insertion, deletion, traversal Sparse matrix, address calculation of Array , ADT(Abstract Data type),DMA(Dynamic memory allocation),pointer, Self-referential structure. A comparison between DMA and SMA. De-allocation Strategy, Buddy System, Compaction. | **10 Hours** |
| **Module-2** | **Stacks and Queues**: ADT Stack array representation and its operations: Algorithms Applications of Stacks: Expression Conversion and evaluation of expression and corresponding algorithms, application of stack. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Array representation and Operations on each types of Queues: Algorithms and their analysis, application of queue.(Simulation, CPU Scheduling in Multiprogramming Environment, Round Robin Algorithm).. Priority Queues. | **8 Hours** |
| **Module-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. | **8 Hours** |
| **Module-4** | **Sorting and searching:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort; Performance and Comparison among all the methods, Searching: Linear search, Binary search and time complexity and space complexity analysis, Hashing: Hash function and technics of hashing, External sorting. | **8 Hours** |

| | | |
|---|---|---|
| **Module-5** | **Trees**: Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree, Tree Traversing, 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, Red black trees: definition and operation, Applications of all trees.<br>**Graph**: Basic Terminologies and Representations (Adjacency matrix and linked list representation), Graph search and traversal algorithms and complexity analysis, classification of graph Minimum spanning tree (Kruskal and prims algorithm), Shortest path algorithm: Dijkstra's algorithm, topological sorting. | **6 Hours** |
| **Total** | | **40 Hours** |

**Text Books**:

T1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press

T2. Data Structures with C (Schaum's Outline Series), Seymour Lipschutz, TMH

**Reference Books**:

R1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning

R2. Data Structures And Algorithms A.V.Aho, J. E. Hopcroft, and J. D. Ullman, Ⅱ, Pearson Education, First Edition Reprint 2003R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.

R3. How to solve it by Computer, 2nd Impression by R. G. Dormey, Pearson Education

R4. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education

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

| | |
|---|---|
| CO1 | Understand the concept of Dynamic memory management, data types, algorithms, Big O |
| CO2 | Understand basic data structures such as arrays, linked lists, stacks and queues. |
| CO3 | Understand the implementation and application of linear data structure |
| CO4 | Understanding of tree traversal techniques and their application |
| CO5 | Understand the graph traversal and its application In real life. |
| CO6 | Understand Algorithm for different sorting, searching techniques and their running complexity, and basic concept of hash function |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-T-HS-201 | **Communicative English-II** | 2-0-0 | 1 | 150 |

| | |
|---|---|
| **Objectives** | |
| | To develop interpersonal skills |
| | To enhance presentation skills |
| | To distinguish different types of letters |
| | To understand the nuances of business etiquettes. |
| | Describe the appropriateness of the written contents |
| | Define various kinds of texts and compose effective business messages. |
| **Pre-Requisites** | To have basic knowledge on corporate communication |
| **Teaching Pedagogy** | Regular class room lectures with use of PPT when required, sessions are planned to be interactive with activity based teaching. |

**DetailedSyllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Corporate Communication**<br><br>Interpersonal Communication ,Non-Verbal Communication, Elements of Non-verbal communication, Presentation-Oral and Power Point Presentation, Group Discussion-Factual GD & Controversial GD | **10 Hours** |
| **Module-2** | **Writing Skills**<br><br>Formal Letters- Letter for placing an order, Letter of Complaint, Job Application Letter Resume Building-Chronological, Functional& Combinational<br>Reports-Format and Components of Long Report ,Format and Components of Short Report, Proposals-Format and Components of Proposal | **8Hours** |
| **Module-3** | **Soft Skills**<br>Professional Etiquette, Team work Negotiation Skills | **7 Hours** |
| | | |

**TextBooks**:

T1. Corporate Communication-Pragyan Rath, K.Shalini, Debankita Ray
T2. Communication Skills- Sanjay Kumar & Puspalata- Oxford
T3. Soft Skills- Dr. K. Alex- S. Chand

**ReferenceBooks**:

R1. Corporate Soft Skills-Sarvesh Gulati- Rupa Publications
R2. Corporate Communication-Dr, Sapna. M.S.-Trends and Features
R3. Business Communication- Pooja Khanna- Vikas Publishing
R4. Communication Skills- Anjana Tiwari- Khanna Publishing (1st Ed.)

**Online Resources**:

https://communicationmgmt.usc.edu
www.britishcouncil.org
https://eltai.ac.in

**CourseOutcomes**: At the end of this course, the students will be able to:

| | |
|---|---|
| CO1 | Enhance the elements of communication in a corporate world |
| CO2 | Develop skills to meet the placement challenges |
| CO3 | Justify the different forms of business correspondence |
| CO4 | Implement different forms of writing for business needs |
| CO5 | Identify the different shades of business etiquettes |
| CO6 | Define the importance of teamwork and negotiation skills |

| Type | Code | Skill Enhancement and Personality Development (SEPD)-II | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTBS-T-SC-201 | | 2-0-0 | 1 | 100 |

| | |
|---|---|
| **Objectives** | The objective of this course is to help students work on their personality development through an understanding of Soft skills, participate in Group Discussions (GD), present their views in public, perform well in Personal Interviews, and become successful in a corporate scenario |
| **Pre-Requisites** | The objective of this course is to help students work on their personality development through an understanding of Soft skills, participate in Group Discussions (GD), present their views in public, perform well in Personal |
| **Teaching Scheme** | Ample tasks designed to facilitate communication through pair work, group/team work, individual and group presentations, discussions, role plays, listening to audios, watching videos, business writing and vocabulary |

## Detailed Syllabus

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Introduction to Group Discussions (GD):**<br>1. Mock GD 1<br>2. Mock GD 2.<br>**Interview skills:**<br>1. Preparing for interviews through mock interview session.<br>2. Writing a good and effective C.V. and SWOC presentation | **10 Hours** |
| **Module-2** | **Assertiveness and EI:**<br>1. Theory inputs and activities.<br>2. Conducting Mock Interviews<br>**Team work activity:**<br>1. Building blocks of a team - discussion & activity.<br>2. Panel Discussion.<br>**Summarizing and note making**:<br>1. Techniques and important tips.<br>**Personality assessment:**<br>1. self-assessment and discussion | **10 Hours** |
| | **Total** | **20 Hours** |

**Text Books**:

T1.Personality Development by D.P.Sabharwal
T2. Personality Development by L.Kendo
T3.Effective Technical communication by M.A.Rijvi
T4.English Phonetics of Indian Students by T.Balasubramaniam

**Reference Books:**

T1.Here, There & Everywhere by Sudha Murty
T2. Personality Development by Swami Vivekananda
T3.Technical communication: Principle and practice by M.Raman and S,Sharma

**Online Resources**:

1. https://nptel.ac.in/courses/109104107
2. https://nptel.ac.in/courses/109104031

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

| | |
|---|---|
| CO1 | Improve habits, attitudes, preferences and experience |
| CO2 | Identify their own potentials and accept their own limitations |
| CO3 | Overcome their limitations and move towards self esteem |
| CO4 | Maximize self-potential in enabling a holistic development |
| CO5 | Participate effectively in Group Discussions. |

| Type | Code | Elements of Engineering Physics Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-P-BS-102 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| **Objectives** | The laboratory should help students to understand the role of direct observation in physics and to distinguish between inferences based on theory and on the outcomes of experiments. |
| **Pre-Requisites** | Knowledge of Physics in Secondary Education |
| **Teaching Pedagogy** | Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities. |

## Detailed Syllabus

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | Determination of acceleration due to gravity (g) by bar pendulum. | **2 Hours** |
| **Experiment-2** | Determination of rigidity modulus by using Barton's apparatus. | **2 Hours** |
| **Experiment-3** | Determination of surface tension of a given liquid by capillary rise method. | **2 Hours** |
| **Experiment-4** | Determination of wavelength of an unknown monochromatic source of light using Newton's ring apparatus. | **2 Hours** |
| **Experiment-5** | Plotting of V~I characteristics of PN junction diode. | **2 Hours** |
| **Experiment-6** | Determination of Young's modulus by using Searle's apparatus | **2 Hours** |
| **Experiment-7** | Plotting of input and output characteristics of BJT (Bipolar junction | **2 Hours** |
| **Experiment-8** | Determination of grating element of a plane diffraction grating. | **2 Hours** |
| **Experiment-9** | Determination of co-efficient of thermal conductivity of a bad conductor by Lee's disc method. | **2 Hours** |
| **Experiment-10** | Verification of laws of vibrations in a stretched string using Sono metre. | **2 Hours** |
| | **BEYOND SYLLABUS** | **2 Hours** |
| **Experiment-11** | To find out the resistance of unknown wire by using Meter bridge. | **2 Hours** |
| **Total** | | **22 Hours** |

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

| | |
|---|---|
| CO1 | Understand the laws to various process and real system. |
| CO2 | Study basics of semiconductor & devices and their applications in different areas. |

| | |
|---|---|
| CO3 | Distinguish the importance of different properties of material. |
| CO4 | Design new instruments with practical knowledge. |
| CO5 | Analyze, interpret and summarize the experimental results and compare with theoretical |
| CO6 | Troubleshoot effectively in laboratory settings. |

**Indicative Projects**

1. To make a periscope to understand the laws of reflection.
2. To make an electromagnet.
3. To make a line following Robot.
4. To make a portable Mobile charger.
5. To make a Rain Alarm /soil moisture Detector.
6. To make an Automatic street light.
7. To make a proto type solar panel.
8. To make a gas leakage detector.
9. To make a temperature sensor.
10. To build an earthquake alarm.
11. To make a coin cell by using super capacitor material.

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-P-BS-103 | **Applied Chemistry Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| **Objectives** | The laboratory will help the students on the volumetric analysis, calculations based on mass- volume relation etc.<br>The students will get knowledge on the synthesis of different medicines, preparation of soap & detergents etc.<br>The students will get knowledge on the operation of different equipment's. |
| **Pre-Requisites** | Knowledge of chemistry in Secondary Education. |
| **Teaching Pedagogy** | Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities. |

## Detailed Syllabus

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | Standardization of KMnO4 by using sodium oxalate. Determination of $Fe2^{+}$ ion in a double salt. | **2 Hours** |
| **Experiment-2** | Preparation of Aspirin | **2 Hours** |
| **Experiment-3** | Determination of rate constant for saponification of ester with an alkali-titrimetric | **2 Hours** |
| **Experiment-4** | Determination of turbidity of different samples of water by | **2 Hours** |
| **Experiment-5** | Estimation of $Ca^{2+}$ ion in a sample of limestone | **2 Hours** |
| **Experiment-6** | Determination of partition coefficient of $I_2$ between benzene and water. | **2 Hours** |
| **Experiment-7** | Determination of flash and fire point of an oil by Pensky Martine's apparatus. | **2 Hours** |
| **Experiment-8** | Determination of viscosity of lubricating oil by Redwood viscometer. | **2 Hours** |
| **Experiment-9** | Determination of available chlorine in a sample of bleaching powder | **2 Hours** |
| **Experiment-10** | Determination of TH value of water by EDTA method. | **2 Hours** |
| | **BEYOND SYLLABUS** | |
| **Experiment-11** | Preparation of soap and detergent. | **2 Hours** |
| | **Total** | **22 Hours** |

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

| | |
|---|---|
| CO1 | Acquire knowledge on the basic volumetric analysis. |
| CO2 | Classify various fuels based on combustion parameters and understand the working Principle based on their properties. |
| CO3 | Know the importance of analytical techniques, instrumentation and applications |
| CO4 | Impart knowledge on of water quality parameters and treatment of water. |
| CO5 | Acquire Knowledge about synthesis and preparation of drugs, soap etc. |

**Indicative Projects**

1. Preparation Detergent Powder From Paddy Husk
2. Quantity of Presence of Casein in Different Samples of Milk
3. Preparation of Organic Dye.
4. Preparation of Toilet Soaps
5. Presence of Oxalate Ions in Guava Fruit and Different Stages of Ripening.
6. Sterilization of Water Using Bleaching Powder.
7. Preparation of ash brick.
8. Preparation of Gelatin.
9. Preparation of Paracetamol.
10. Preparation of Ink.
11. Effect of Potassium Bisulphate as a Food Preservative.

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-101 | **Basic Electrical and Electronics Engineering Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| **Objectives** | To train the students in conducting load tests on electrical machines.<br>To gain practical experience in characterizing electronic devices.<br>To train the students to use CRO and DSO for measurements |
| **Pre-Requisites** | Knowledge of Physics and Mathematics in Secondary Education |
| **Teaching Pedagogys** | Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | Study of Different Electrical measuring Instruments and other electrical equipment | **2 Hours** |
| **Experiment-2** | Measurement of Voltage, current, power and power factor calculation in series R-L-C circuit. | **2 Hours** |
| **Experiment-3** | Connection and Running of DC Motors, DC generators, 3- phase Induction motors and 1- phase Transformers. | **2 Hours** |
| **Experiment-4** | Connection and Demonstration of Domestic Wiring System. | **2 Hours** |
| **Experiment-5** | Model Study & Connection of Different Lamps ( Mercury Vapor Lamp, Tungsten, LED Bulbs, Fluorescents, CFL) | **2 Hours** |
| **Experiment-6** | A:- Identification of electronic components, devices and Basic Sensors,<br>B: - Study and use of CRO/ DSO, Function generator to view and measure different wave forms. | **2 Hours** |
| **Experiment-7** | Design of Simple Diode Circuit and Study of V-I characteristics of semiconductor Diode & calculation of DC and AC Resistance | **2 Hours** |
| **Experiment-8** | Design of Half – wave rectifier and full wave rectifier circuits, and calculation of efficiency | **2 Hours** |
| **Experiment-9** | Design of inverting and non- inverting amplifiers using Op-Amp to view and measure waveforms | **2 Hours** |
| **Experiment-10** | Study and truth table verification of logic gates. | **2 Hours** |
| | **BEYOND SYLLABUS** | |
| **Experiment-11** | Design of simple BJT Bias circuit to draw VI characteristics (input & output ) of a NPN transistor (in CE configuration) | **2 Hours** |

| | | |
|---|---|---|
| **Experiment-12** | Verification of Ohm's Law | **2 Hours** |
| **Total** | | **24 Hours** |

**Online Resources**:

1. http://vlabs.iitkgp.ernet.in/be/
2. http://sl-coep.vlabs.ac.in/

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

| | |
|---|---|
| CO1 | Identify different Electrical Instruments and measure different parameters. |
| CO2 | Study connection and demonstration of DC generators, motors and wiring systems. |
| CO3 | Study design and connection of Different Lamps |
| CO4 | Identify active and passive electronic components and handle measuring instruments like |
| CO5 | Design different circuits using diode, BJT and opamps. |
| CO6 | Design and analyze logic gates |

**Indicative Projects**

| SL. NO. | NAME OF THE PROJECT |
|---|---|
| 1 | Night light using LDR. |
| 2 | Automatic Fan ON/OFF using Temperature Sensor. |
| 3 | Moisture Controller using Moisture Sensor. |
| 4 | IR based security system using IR sensor (Transmitter & Receiver) |
| 5 | Fire Alarm using Temperature Sensor. |
| 6 | Light ON /OFF using Piezo Sensor. |
| 7 | Clap sound Operated using Sound Sensor. |
| 8 | Smoke Detector MQ3 |
| 9 | Light ON /OFF using Metal Detector Sensor. |
| 10 | Light ON /OFF using Alcohol Detector MQ. |
| 11 | Sound system on/off Rain Detector |
| 12 | Motion detector using IR pair. |

| Type | Code | Basic Mechanical and Civil Engineering Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-102 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| **Objectives** | To train the students in conducting different test on engineering materials.<br>To gain practical experience in characterizing soil and handling hydraulic machines.<br>To train the students to use different measuring instruments. |
| **Pre-Requisites** | Knowledge of Physics and Chemistry in Secondary Education |
| **Teaching Pedagogy** | Regular practical classes with use of virtual labas and when required, sessions are planned to be interactive with focus on problem-solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | Cut-section of two stroke & four stroke petrol and diesel engine. | **2 Hours** |
| **Experiment-2** | Centrifugal pump apparatus, Reciprocating pump apparatus. Gear oil Pump | **2 Hours** |
| **Experiment-3** | Pelton & Francis Turbine. | **2 Hours** |
| **Experiment-4** | Simple ,Compound & reverted Gear train | **2 Hours** |
| **Experiment-5** | Model of Domestic refrigerator | **2 Hours** |
| **Experiment-6** | Compressive Strength of Brick | **2 Hours** |
| **Experiment-7** | Bearing of Line. | **2 Hours** |
| **Experiment-8** | Compressive Strength of Cement | **2 Hours** |
| **Experiment-9** | Determination of Specific gravity of soil | **2 Hours** |
| **Experiment-10** | Study of water quality (pH, Turbidity, TS) | **2 Hours** |
| | **BEYOND SYLLABUS** | **2 Hours** |
| **Experiment-11** | CNC Wood Router | **2 Hours** |
| **Experiment-12** | Study of Total Station. | **2 Hours** |
| **Total** | | **24 Hours** |

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

| | |
|---|---|
| CO-1 | Acquire knowledge on different components and working of IC Engines, turbines and pumps |
| CO-2 | Understand the kinematics of machinery using gear trains |
| CO-3 | Analyze the operation of domestic appliances |

| | |
|---|---|
| CO-4 | Identify different properties of building materials. |
| CO-5 | Study the engineering properties of soil. |
| CO-6 | Explore the uses of different instruments used in civil engineering work |

**Indicative Projects (Mechanical)**

1. Component Preparation using 3D Printing
2. Specimen preparation technique for Metallurgical study.
3. To prepare a ship model for verification of Archimedes principle.
4. Model of Steam power plant.
5. Overhead gantry crane of 3-axis movements.
6. Leading & Trailing brake arrangement in Drum Brake
7. High speed reduction in gear drive by using worm & worm wheel.
8. Specimen preparation and its test in UTM.
9. Wind Turbine Model.
10. Preparation hexagonal headed Bolt (Facing & Turning)
11. Specimen preparation and its test in Fatigue testing machine.
12. Water turbine Project Model
13. Preparation hexagonal headed Bolt (Step Turning & Thread Cutting)
14. Preparation of Components/names in CNC Wood Router
15. Bio-fuel preparation and Study.
16. Compound gear train using by using Spur gear.
17. Fast and loose pulley arrangement using Belt drive
18. Development of cone clutch for power transmission.
19. Conversion of Reciprocating to rotary motion using Crank & Connecting rod.

**Indicative Projects (Civil)**

1. Intelligent transportation system. – prototype
2. Glass fiber reinforced concrete.
3. pH test of drinking water in gift campus.
4. Preparation of building blocks.
5. Identification of different parts of dam – prototype
6. Pavement layer identification – prototype
7. Concept of suspension bridge –prototype
8. Construction of English bond in cement mortar.
9. Study of properties for the locally available Soil .
10. Testing of compressive strength of the local stone in Khordha.
11. Admixtures used in RMC – visit to plant
12. Preparation of fly ash brick.
13. Seasoning of timber.
14. Types of timber used in construction.
15. Tensile strength test of steel in construction
16. Identification of components of a building – prototype

17. Various field test of cement.

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-103 | **Basic Programming Skills Laboratory** | 0-0-4 | 2 | 100 |

| | |
|---|---|
| **Objectives** | To expose to the field of Problem Solving and Programing |
| **Pre-Requisites** | Knowledge of Mathematics in Secondary Education |
| **Teaching Pedagogy** | Regular Lab with use of ICT. Each session is planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| Experiment-1 | Familiarity with basic UNIX/LINUX command, vi editor. Sample C Program. | 2 Hours |
| Experiment-2 | Programs on arithmetic expressions, operators, and precedence. | 2 Hours |
| Experiment-3 | Programs on Conditional Branching. | 2 Hours |
| Experiment-4 | Programs on Loops. | 4 Hours |
| Experiment-5 | Programs on single dimensional array and Strings | 2 Hours |
| Experiment-6 | Programs on two-dimensional array. | 4 Hours |
| Experiment-7 | Programs on Functions. | 4 Hours |
| Experiment-8 | Programs on Recursive Functions. | 2 Hours |
| Experiment-9 | Programs on Pointers. | 4 Hours |
| Experiment-10 | Programs on Structure and Union | 4 Hours |
| Experiment-11 | Programs on File Handling. | 4 Hours |
| Experiment-12 | Project | 6 Hours |
| | **Total** | **40 Hours** |

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

| | |
|---|---|
| **CO1** | Remember basic understanding of computer and basic concepts of running programs. |
| **CO2** | Understand the concepts of decision making and looping for solving problems. |
| **CO3** | Learn to concise and precise on implementing pseudo code using functions |
| **CO4** | Illustrate the usages of array, function and pointer in programming. |
| **CO5** | Select the user define data type structure, union and enum for problem solving. |
| **CO6** | Develop projects using different file handling functions. |

**Projects using C Programing**

1) Unit Converter
2) Customer Billing System in a Shopping Mall
3) Banking Management System
4) University Grading System
5) Bus Ticket Reservation System
6) Home Automation System
7) Digital Wall Clock
8) Book Support Automation
9) Lab Management System
10) Nursery Management System

**Arduino based Project**

1) Obstacle detection using Arduino
2) Controlling 4 LEDs to make different patterns
3) Voice Activation System
4) Use Humidity Sensor using Arduino
5) Arduino Based Color Detector
6) Touch Dimmer Switch Circuit Using Arduino
7) Wireless Door Bell
8) Arduino Traffic Light Controller
9) Frequency Counter Using Arduino
10) Arduino 4-Digit 7-Segment LED Display
11) Arduino based Digital Thermometer
12) Arduino Light Sensor
13) Portable Ultrasonic Range Meter
14) Security Alarm System Using Arduino
15) Arduino Alarm Clock
16) Interfacing LCD with Arduino

| Type | Code | Communicative English Lab-I | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-P-HS-101 | | 0-0-3 | 1.5 | 100 |

| | |
|---|---|
| **Objectives** | |
| | To develop the skills in communication. |
| | To evaluate the speaking skills with communicative efficiency. |
| | To distinguish the sub skills of reading comprehension for better understanding. |
| | To implement the process of effective writing. |
| | Describe the appropriateness of the written contents |
| | Define various kinds of texts and compose effective business messages. |
| **Pre-Requisites** | To have basic knowledge on LSRW skills |
| **Teaching Pedagogy** | Regular classroom lectures with use of PPT when required, sessions are planned to be interactive with examples to be acquainted with different types of communication |

**Detailed Syllabus**

| SL No | NAME OF THE ACTIVITY | HOURS |
|---|---|---|
| ACTIVITY 1 | Role Play | 2 Hours |
| ACTIVITY 2 | Speech | 2 Hours |
| ACTIVITY 3 | Narration | 2 Hours |
| ACTIVITY 4 | Parts of Speech(New) | 2 Hours |
| ACTIVITY 5 | Subject- Verb Agreement | 2 Hours |
| ACTIVITY 6 | Auxiliary Verbs | 2 Hours |
| ACTIVITY 7 | Sounds of English | 2 Hours |
| ACTIVITY 8 | Reading Comprehension | 2 Hours |
| ACTIVITY 9 | Formal Letters | 2 Hours |
| ACTIVITY 10 | Preparing Agenda & Minutes | 2 Hours |
| **Total** | | **20 Hours** |

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

| | |
|---|---|
| CO1 | Develop the understanding of application of language. |
| CO2 | Evaluate the rules of language for effective communication |
| CO3 | Experiment the Pronunciation English Language. |
| CO4 | Application of methods and strategies for Reading. |
| CO5 | Recognize the different forms of Formal Writing |
| CO6 | Discuss LSRW in support to the English language |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-104 | **Engineering Graphics with Auto-CAD Laboratory** | 0-0-3 | 1.5 | 100 |

| | |
|---|---|
| **Objectives** | To develop the ability to produce simple Engineering Drawings based on current practice and to increase the skill to read the Product, Manufacturing, and Construction drawings used in Industries. |
| **Pre-Requisites** | Basic Knowledge on simple Geometry And shape of Simple Solid's |
| **Teaching Pedagogy** | Regular practical classes with use of virtual labs and when required sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | To prepare a sheet on Lines and their uses. | **3Hours** |
| **Experiment-2** | To prepare a sheet on Lettering, dimensioning. | **3Hours** |
| **Experiment-3** | To prepare a sheet on Projection of point and lines. | **3Hours** |
| **Experiment-4** | To prepare a sheet on Projection of planes & Solids . | **3Hours** |
| **Experiment-5** | To draw Lines/Planes/ solids using Auto CAD. | **3Hours** |
| **Experiment-6** | To prepare a sheet on section of Solid and development of surfaces. | **3Hours** |
| **Experiment-7** | To draw the Ortho graphics projections of solids and sectioning using Auto CAD. | **3Hours** |
| **Experiment-8** | To Prepare a sheet on isometric projections. | **3Hours** |
| **Experiment-9** | To draw isometric view of solids using Auto CAD. | **3Hours** |
| **Experiment-10** | To prepare a sheet on Building Drawing. | **3Hours** |
| | **BEYOND SYLLABUS** | |
| **Experiment-11** | To draw Ortho Graphic views of standard Isometric Solids. | **3 Hours** |
| **Total** | | **33 Hours** |

After completing this course the students should be able to:

| | |
|---|---|
| CO1 | Understand the visual aspect of engineering drawing, scales and Orthographic Projections |
| CO2 | Acquire knowledge on projection of points, lines and plane surfaces and solids. |
| CO3 | Understand the basics of Auto CAD, Commands and Toolbar. |
| CO4 | Apply modern engineering tools like Auto CAD and creating working drawings on sectioning of Solids and development of surfaces. |
| CO5 | Able to draw Isometric view of standard Solids using Auto CAD. |

| | |
|---|---|
| CO6 | Apply the knowledge to create building drawings |

**Indicative Projects**

1. 2D Drawing from Simple 3D Object With given Specification.
2. Component Diagram of Simple Physical Sheet Metal Part, Worm Gear, Hub-Shaft.
3. Nut-Bolt-Washer assembly, simple Plastic component
4. 2D Drawing from Simple 3D Object of Agriculture component..
5. Drawing of simple Storage Bin/Silo.
6. Drip Layout Sketch.
7. Drawing of Rooftop Garden Planning
8. Drawing of switch, Led monitor.
9. Drawing of Plug socket, Diode & Transistor.
10. House Wiring Diagram For a room having 1-Lamp, 1-Fan and 1-Plug socket.
11. 2D drawing of Disc Antenna, Common electronics components
12. 2D drawing of Electronics components symbol diagram with circuit.
13. Drawing Of All Simple Graphic Element & Monitor stand..
14. Drawing monitor
15. 2D drawing of Keyboard and CPU.

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-105 | **Workshop Practice –I Laboratory** | 0-0-3 | 1.5 | 100 |

| | |
|---|---|
| **Objectives** | The laboratory should help students to understand the role of different tools & its function for different operation by manually or by machine to get different job as required |
| **Pre-Requisites** | Knowledge of different geometry in Secondary Education |
| **Teaching Pedagogy** | Regular practical classes with use of virtual labs and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | To make a V-fit from the given mild steel piece | **3 Hours** |
| **Experiment-2** | To make a V-Square fit from the given mild steel piece | **3 Hours** |
| **Experiment-3** | To prepare a Lap Joint with Electric Arc welding. | **3 Hours** |
| **Experiment-4** | To prepare a butt Joint with V-Groove Electric Arc welding. Method. | **3 Hours** |
| **Experiment-5** | To prepare joint by Soldering | **3 Hours** |
| **Experiment-6** | To prepare joint by brazing. | **3 Hours** |
| **Experiment-7** | To prepare a job on given specimen in machine shop. (turning, threading ,knurling,milling,drilling and shaping | **3 Hours** |
| **Experiment-8** | To make the Mortise &tenon –joint wood | **3 Hours** |
| **Experiment-9** | To make the dovetail joint on wood. | **3 Hours** |
| **Experiment-10** | To make tray from sheet metal | **3 Hours** |
| | **BEYOND SYLLABUS** | **3 Hours** |
| **Experiment-11** | To prepare a T-welding by using electric arc welding | **3 Hours** |
| **Total** | | **33 Hours** |

After completing this course the students should be able to:

| | |
|---|---|
| CO1 | Learn the safety measures, different tools and equipment used in mechanical workshop. |
| CO2 | Understand the concept of metal joining process and its engineering application. |
| CO4 | Improve understanding of various fitting jobs & its application. |
| CO4 | Understand the various machining process in Machine shop. |
| CO5 | Learn Hands on practices & Job making in Carpentry Shop. |

| | |
|---|---|
| CO6 | Discuss the application of Sheet metal Operation. |

**Indicative Projects**

1. To make Gas cylinder stand by M.S. flat
2. To make Refrigerator stand by wooden plank
3. To make Wooden table
4. To make Partial Parshall flume (Venturi)
5. To make Drop spill way(wooden)
6. To make Indigenous plough(wooden)
7. To make Tray drier(sheet metal)
8. To make T.W. switch board for three switches and one socket
9. To make Sheet metal box to conduit wiring
10. To make Simple open water turbine
11. To make Soldering rod
12. To make Monitor stand
13. To make Phone or Tab stand
14. To make Support IOT kit implementation in ceiling fan hanging support rod
15. To make multimeter board.

| Type | Code | Programming Using Data Structure Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTBS-P-ES-203 | | 0-0-4 | 2 | 100 |

| | |
|---|---|
| **Objectives** | Exploring basic data structures such as stacks and queues |
| **Pre-Requisites** | Knowledge of Mathematics in Secondary Education and basic Programming concept. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Experiment-1** | Write a C program to perform matrix addition and multiplication using array | **2Hours** |
| **Experiment-2** | Write a C program to create a stack using an array and perform<br>(i) push operation<br>(ii) pop operation | **2Hours** |
| **Experiment-3** | Write a C program to create a queue and perform<br>(i) Push<br>(ii) Pop<br>(iii) Traversal | **2Hours** |
| **Experiment-4** | Write a C program that converts infix expression into postfix expression Using Stack operations. | **2Hours** |
| **Experiment-5** | Write a C program that evaluates postfix expression using Stack operations | **2Hours** |
| **Experiment-6** | Write a C program that uses functions to perform the following operations on Single linked list:<br>(i) Creation<br>(ii) Insertion<br>(iii) Deletion<br>(iv) Traversal | **2Hours** |
| **Experiment-7** | Write a C program that uses functions to perform the following operations on Double linked list:<br>(i) Creation<br>(ii) Insertion<br>(iii) Deletion<br>(iv) Traversal in both ways | **2Hours** |
| **Experiment-8** | Write a C program that uses functions to perform the following operations on Binary Search Tree:<br>(i) Creation<br>(ii) Insertion | **2Hours** |

| | | |
|---|---|---|
| | (iii) Deletion | |
| **Experiment-9** | Write a C programs that use both recursive and non-recursive functions to perform the Linear search operation for a Key value in a given list of integers Write C program that use both recursive and non-recursive functions to perform the Binary search operation for a Key value in a given list of integers | **2Hours** |
| **Experiment-10** | Write a C program that implement Bubble Sort method to sort a given list of integers in descending order | **2Hours** |
| **Experiment-11** | Write a C program that implements Quick Sort method to sort a given list of integers in ascending order | **2Hours** |
| **Experiment-12** | Write a C program that implements Insertion method to sort a given list of integers in ascending order | **2Hours** |
| **Experiment-13** | Write a C program that implements merge sort method to sort a given list of integers in ascending order | **2Hours** |
| **Experiment-14** | Write a C program that implements heap sort method to sort a given list of integers in ascending order | **2Hours** |
| **Experiment-15** | Write a C program that implements selection sort method to sort a given list of integers in ascending order | **2Hours** |

| | |
|---|---|
| **CO1** | To insert and delete elements from appropriate position in an array. |
| **CO2** | To search an element and print the total time of occurrence in the array.. |
| **CO3** | To represent a Sparse Matrix. |
| **CO4** | To delete all occurrence of an element in an array. |
| **CO5** | Array implementation of Stack. |
| **CO6** | Array implementation of Linear Queue. |

**Indicative Projects**

**Arduino based Project**

1) Contacts directory System
2) Texting editor relied on Stacks
3) BST which follows the Memorization procedure
4) Search system ( in Library)
5) Snakes and Ladders Game
6) Sorted_double_sentinel_list
7) Phone directory application using doubly-linked lists
8) Spatial indexing with quadtrees
9) Numerical representations with random access lists
10) Stack-based text editor
11) Personal Diary Management System
12) Tic-Tac-Toe Game

13) Tank Game
14) Travel Agency Management System
15) Pharmacy Management System

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-P-HS-201 | **Communicative English Laboratory-II** | 0-0-3 | 1.5 | 100 |

| | |
|---|---|
| Objectives | Objective of this course is to enhance presentation skills , equip the students with different forms of business writing and to acquaint them with business etiquette to face corporate challenges |
| Pre-Requisites | Basic knowledge on corporate communication |
| Teaching Pedagogy | Regular practical classes with use of virtual lab as and when required and activity and game based session are also planned. |

**DetailedSyllabus**

| SL No | NAME OF THE ACTIVITY | HOURS |
|---|---|---|
| ACTIVITY 1 | Interpersonal Communication | 2 Hours |
| ACTIVITY 2 | Non Verbal Communication | 2 Hours |
| ACTIVITY 3 | Presentation | 2 Hours |
| ACTIVITY 4 | Group Discussion | 2 Hours |
| ACTIVITY 5 | Personal Interview | 2 Hours |
| ACTIVITY 6 | Formal Letters | 2 Hours |
| ACTIVITY 7 | Building Resume | 2 Hours |
| ACTIVITY 8 | Report Writing | 2 Hours |
| ACTIVITY 9 | Team Work | 2 Hours |
| ACTIVITY 10 | Negotiation Skills | 2 Hours |
| **Total** | | **20 Hours** |

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

| | |
|---|---|
| **CO1** | Develop knowledge in interpersonal communication |
| **CO2** | Evaluate skills for corporate readiness. |
| **CO3** | Implement the different forms of business correspondence. |
| **CO4** | Recognize better pronunciation and accent in English Language, |
| **CO5** | Execute the analytical skills and problem solving skill in a Team. |
| **CO6** | Identify the business etiquettes and competent |

# Syllabus for
# B.Tech (2nd Year)
# (2022 Admission Batch)

# Electronics and Communication Engineering

**(Approved by Academic Council and Board of Studies)**

**GIFT Autonomous Bhubaneswar**
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)
Recognised under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, Pincode: 752054

# 2nd Year Course Structure

| Third Semester | | | | | |
|---|---|---|---|---|---|
| **Theory** | | | | | |
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **WCH L-T-P** | **Credit** |
| 1 | BS | BTBS-T-BS-301 | Mathematics -III | 4-0-0 | 3 |
| 2 | PC | BTEC-T-PC-301 | Digital Electronics | 4-0-0 | 3 |
| 3 | PE | BTEC-T-PE-301 | Semiconductor and optoelectronic Devices | 4-0-0 | 3 |
| 4 | PC | BTEC-T-PC-302 | Signals & Systems | 4-0-0 | 3 |
| 5 | HS | BTBS-T-HS-301/ BTBS-T-HS-302 | Organizational Behavior/Engineering Economics | 3-0-0 | 3 |
| 6 | PE | BTCS-T-ES-301 | Object-Oriented Programming using JAVA | 4-0-0 | 3 |
| 7 | AEC | BTSC-T-SC-301 | Employability Enhancement Training-B | 2-0-0 | 1 |
| 8 | MC | BTMC-T-MC-301 | Essence of Indian Knowledge Tradition-I | 2-0-0 | 0 |
| | | | Total Hours/ Credit**(Theory)** | 27 | 19 |
| **Practical** | | | | | |
| 1 | PC | BTEC-P-PC-301 | Digital Electronics Laboratory | 0-0-2 | 1 |
| 2 | PC | BTEC-P-PC-302 | Signal and system Laboratory | 0-0-2 | 1 |
| 3 | PE | BTCS-P-ES-301 | Object-Oriented Programming using JAVA Laboratory | 0-0-2 | 1 |
| 4 | PS | BTPS-P-PS-301 | Seminar-1 | 0-0-3 | 1 |
| 5 | PS | BTSC-P-SC-301 | Evaluation of Summer Internship-1 | 0-0-3 | 2 |
| | | | Total Hours/ Credit(Practical) | 12 | 6 |
| | | | Grand Total Hours/ Credit(Practical) | **39** | **25** |

| Fourth Semester | | | | | |
|---|---|---|---|---|---|
| **Theory** | | | | | |
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **WCH L-T-P** | **Credit** |
| 1 | PE | BTEC-T-PE-401 | Electromagnetic Theory | 4-1-0 | 3 |
| 2 | PC | BTEC-T-PC-401 | Analog Electronics Circuit | 4-1-0 | 3 |
| 3 | PC | BTCS-T-PC-402 | Programming using Python | 4-1-0 | 3 |
| 4 | HS | BTBS-T-HS-401/ BTBS-T-HS-402 | Organizational Behavior/ Engineering Economics | 4-1-0 | 3 |
| 5 | PC | BTEE-T-PC-401 | Network Theory | 4-1-0 | 3 |
| 6 | OO | BTEC-T-OO-401 | NPTEL | 2-0-0 | 3 |
| 7 | AEC | BTSC-T-SC-401 | Employability Enhancement Training-C | 2-0-0 | 1 |
| 8 | MC | BTMC-T-MC-401 | Environmental Engineering | 1-0-0 | 0 |
| | | | Total Hours/ Credit**(Theory)** | 30 | 19 |
| **Practical** | | | | | |
| 1 | PC | BTEC-P-PC-401 | Analog Electronics Circuit Laboratory | 0-0-2 | 1 |
| 2 | PC | BTCS-P-PC-402 | Programming using Python Laboratory | 0-0-2 | 1 |
| 3 | PC | BTEE-P-PC-401 | Network Theory Laboratory | 0-0-2 | 1 |
| 4 | PS | BTPS-P-PS-401 | Project 3 | 0-0-3 | 2 |
| | | | Total Hours/ Credit(Practical) | 9 | 5 |
| | | | Grand Total Hours/ Credit(Practical) | **39** | **24** |
| **SUMMER INTERNSHIPTRAINING for 30Days** | | | | | |

# Program Outcomes (UG Engineering)

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The Program Outcomes (POs) for UG Engineering programmes defined by NBA are:

PO1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

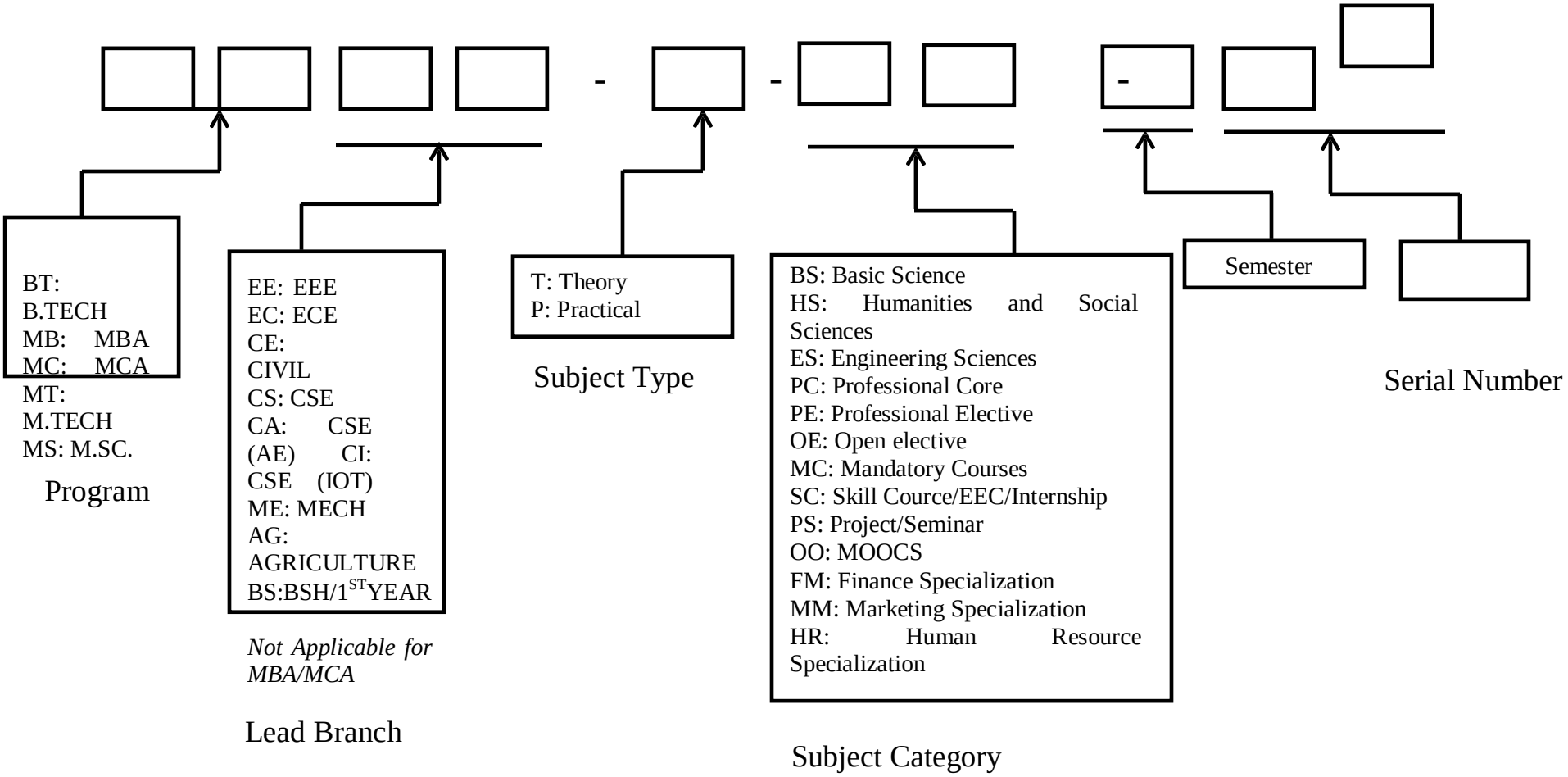
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Types & Definitions

| | |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Laboratory / Practical / Sessional |
| WCH | Weekly Contact Hours |
| BS | Basic Sciences |
| HS | Humanities & Social Sciences (including Management) |
| ES | Engineering Sciences |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| SC | Skill Course |
| EET | Employability Enhancement Training |
| SEPD | Skill Enhancement and Personality Development |

# Subject Code Format



## Evaluation Scheme

**Mark Distribution for Internal & External Examinations for all Courses- 2023-24**

| Proposed Internal Examination (B. Tech, Autonomous) | | | | | |
|---|---|---|---|---|---|
| **Sr No** | **Type of Test** | **Mark** | **Frequency** | **Total Mark** | **Reduced Mark** |
| 1 | Modular Test | 25 | 4 | 100 | **50** |
| 2 | Online Quiz Test | 10 | 4 | 40 | **10** |
| 3 | Assignment | 10 | 2 | 20 | **10** |
| 4 | Subject Specific Project | 15 | 1 | 15 | **15** |
| 5 | Attendance | 15 | 1 | 15 | **15** |
| **TOTAL** | | | | 190 | **100** |
| **Pass Mark** | | | | | **45** |

| Proposed External Examination (B. Tech, Autonomous) | | | | |
|---|---|---|---|---|
| **Sl No** | **Type of Test** | **Mark** | **Frequency** | **Total Mark** |
| 1 | End Semester Examination | 100 | 1 | **100** |
| **Pass Mark** | | | | **35** |

**Instructions:**

1. Each student must appear in all of the above internal examinations without fail.
2. No exemption or accommodation of request will be entertained.
3. In case of exigency, or self-illness the student must submit ample evidence to re-appear the test. Since the schedule of the examination is non-negotiable, the request shall be sent to the competent authority.
4. Appearance of modular tests is part of the curriculum; hence each student is urged to appear for each modular test. Due penalty as per the examination rule shall be imposed.
5. For not qualifying or to improve the individual subject score in internal the student must appear on the improvement test after successful registration in CMS.

**Evaluation Process of Practical Subjects:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| Attendance | 10 | Closing of Instruction | To be retrieved from CMS |
| Daily Performance & Viva-voce | 40 | On the day of Experiment | Concerned Faculty (Upload in CMS in weekly basis) |
| Lab Record | 20 | On the day of Experiment | Concerned Faculty |
| End-Semester Lab Test | 30 | 1 | At the end of the semester as per the schedule published by Examination Cell |
| **Total** | **100** | | |

**Evaluation Process of Mandatory Courses:**

| Components | Marks | Frequency | Assigned To |
|---|---|---|---|
| In-Semester Evaluation | 100 | 1 | Examination Cell/ Concerned Faculty |
| **Total** | **100** | | |
| | | | |

# Third Semester

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| BS | BTBS-T-BS-301 | **Mathematics - III** | 4-0-0 | 3 | 150 |

| | |
|---|---|
| **Objectives** | The objective of this course is to familiarize the students with t h e knowledge and concepts of ordinary differential equations and applications, solution of system of linear equations using matrix, Eigen vectors & Eigen values of matrices with applications. |
| **Pre-Requisites** | A good knowledge of trigonometry along with basics of differential and integral calculus of one variable and coordinate geometry of two and three dimensions. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Laplace transformation, Inverse Laplace transformation, Unit step function, Dirac's delta function, | **6 Hours** |
| **Module-2** | Convolution, applications in solving differential equations, and Integral Equations, Fourier series, Fourier expansion of functions of any period, | **8 Hours** |
| **Module-3** | Even and odd functions, Half range Expansion, Fourier transform and Fourier Integral,Power series solutions to ordinary differential equations, | **7 Hours** |
| **Module-4** | Solution of Legendre differential Equation, Generating functions, Rodrigue's formula, Bessel's function and its properties. | **7 Hours** |
| **Module-5** | Complex analysis: Complex plane, polar form, power and roots, analytic function, Cauchy Reimann equations, harmonic function, Laplace functions. | **6 Hours** |
| **Module-6** | Probability: Random variables, Probability distributions, Mean and variance of a distribution, Binomial, Poisson and Normal distributions. | **6 Hours** |
| **Total** | | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | E. Kreyszig, Advanced Engineering Mathematics, Wiley India. |
| **2** | B. V. Raman, Higher Engineering Mathematics, Mc Graw Hill Education Pvt. Ltd. |
| **Reference Books:** | |
| **1** | S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press. |
| **2** | P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning. |
| **3** | B. S. Grewal, Higher Engineering Mathematics, Khanna Publication |

**Online Resources:**

1. https://nptel.ac.in/courses/111104075/
2. https://nptel.ac.in/courses/111104078/
3. https://nptel.ac.in/courses/111104092/
4. https://nptel.ac.in/courses/122104017/
5. https://nptel.ac.in/courses/122104017
6. https://nptel.ac.in/courses/111102111/
7. https://nptel.ac.in/courses/111105035/287
8. https://nptel.ac.in/courses/111105035/28

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

| | |
|---|---|
| CO1 | Apply the knowledge of Laplace transform to solve the complex engineering problems. |
| CO2 | Find the Fourier series and Fourier transforms of functions. |
| CO3 | Illustrate the applications of Laplace & Fourier Transformations. |
| CO4 | Understand the concepts of power series solution and some important special functions. |
| CO5 | Understand the concepts of Analytic function. |
| CO6 | Understand the basic concept on probability and various distributions. |

| Type | Code | Digital Electronics | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-301 | | 4-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To introduce the students to the world of digital electronics and its system applications. |
| Pre-Requisites | Basic Electronics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | **Number System:** Introduction to various number systems and their Conversion. Arithmetic Operation using 1's and 2`s Compliments, Signed Binary and Floating-Point Number Representation. Introduction to Binary codes and their applications. **Boolean Algebra and Logic Gates:** Boolean algebra and identities, Complete Logic set, logic gates and truth tables. Universal logic gates, realization using universal logic gates. | **6 Hours** |
| **Module-2** | Algebraic Reduction, Canonical Logic Forms, Extracting Canonical Forms, NAND and NOR Logic Implementations, K-Map, QM Method. Combinational Logic Design: Analysis, Design: Specifying the Problem, Concept of Digital Components | **8 Hours** |
| **Module-3** | Binary Adders, Subtraction and Multiplication, An Equality Detector and comparator, Line Decoder, encoders, Multiplexers and De-multiplexers, Tristate Buffer. Hazards and Hazard free circuits. Sequential Logic Design: Flip flop and Timing circuit: set-reset laches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop | **8 Hours** |
| **Module-4** | Serial in/Serial out shift register, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register. | **6 Hours** |
| **Module-5** | Analysis, Design: Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter,Johnson counter, ring counter, sequence generator | **6 Hours** |
| **Module-6** | **Basic hardware description language:** Introduction to Memory :<br>RAM and ROMs, Programmable Logic Array, Programmable Array Logic. | **6 Hours** |
| | **TOTAL** | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | Digital Design, 3rd Edition, Moris M. Mano, Pearson Education. |
| **2** | A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc. |
| **Reference Books:** | |
| **1** | Fundamentals of digital circuits, 8th edition, A. Anand Kumar, PHI |
| **2** | Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi. |
| **3** | Digital Electronics, G. K. Kharate, Oxford University Press. |
| **4** | Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education. |

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

| | |
|---|---|
| CO1 | Understand the basic components and laws of digital circuits. |
| CO2 | Learn the representation and simplification of digital circuits |
| CO3 | Analyse and design various Combinational circuits. |
| CO4 | Analyse and design various Sequentialal circuits. |
| CO5 | Apply the HDL for digital circuits. |
| CO6 | Validate combinational logic circuits using programmable logic devices. |

**Experiential Learning:**

1-Design of logic gates using discrete components.
2-Design of different combinational circuits using gates.
3-Simulation of different combinational circuits using EDA tools.
2-Design of different sequential circuits using gates.
3-Simulation of different sequential circuits using EDA tools.

| Type | Code | Semiconductor and Optoelectronic Devices | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| ES | BTEC-T-PE-301 | | 4-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To impart knowledge about the principles of semiconductor devices. |
| Pre-Requisites | Basic Electronics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Electrons and Holes in semiconductors: Silicon crystal structure; Donors and acceptors in the band model; electron effective mass; Density of states; Thermal equilibrium; and Fermi-Dirac distribution function for electrons and holes; Fermi energy. Equilibrium distribution of electrons & holes: derivation of n and p from D(E) and f(E), Fermi level and carrier concentrations; The np product and the intrinsic carrier concentration. General theory of n and p; Carrier concentrations at extremely high and low temperatures: complete ionization, partial ionization and freeze-out; Energy-band diagram and Fermilevel, Variation of EF with doping concentration and temperature. | **8 Hours** |
| **Module-2** | Motion and Recombination of Electrons and Holes: Carrier drift: Electron and hole mobilities; Mechanism of carrier scattering; Drift current and conductivity.<br>Carrier diffusion: diffusion current, Total current density; relation between the energy diagram and potential, electric field; Einstein relationship between diffusion coefficient and mobility; Electron-hole recombination; Thermal generation. PN Junction: Building blocks of the pn junction theory: Energy band diagram and depletion layer of a pn junction, Built-in potential; Depletion layer model: Field and potential in the depletion layer, depletion-layer width; Reverse-biased | **7 Hours** |
| **Module-3** | PN junction: Capacitance-voltage characteristics; Junction breakdown: peak electric field. Tunneling breakdown and avalanche breakdown; Carrier injection under forward bias-Quasi-equilibrium boundary condition; current continuity equation; Excess carriers in forward-biased pn junction; PN diode I-V characteristic, Charge storage. | **6 Hours** |
| **Module-4** | The Bipolar Transistor: Introduction, Modes of operation; Minority Carrier distribution, Collector current, Base current, current gain, Base width Modulation by collector current, Breakdown mechanism, Equivalent Circuit Models – Ebers -Moll Model. | **6 Hours** |
| **Module-5** | Fundamental of fiber optics, Different generations of optical fiber communication systems. Optical fiber structure, Fiber types, step index fiber and graded index fiber, ray propagation, total internal reflection, Numerical Aperature, acceptance angle. | **6 Hours** |

| | | |
|---|---|---|
| **Module-6** | Wave propagation in a cylindrical wave guides, modal concept, V-number, power flow in step index fiber and graded index fiber, attenuation (absorbtion, scattering and bending) and dispersion (inter and intramodal, chromatic, wave guide and polarization) in fiber, dispersion shifted and dispersion flattened fiber. | **7 Hours** |
| | **TOTAL** | **40 Hours** |

| **Text Books:** | |
|---|---|
| **1** | Modern Semiconductor Devices for Integrated Circuits-Chenming Calvin Hu, Pearson Education/Prentice Hall, 2009. |
| **2** | Semiconductor Physics and Devices-Donald A. Neamen, Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition. |
| **3** | Optical Fiber Communications, Keiser G, Tata McGraw Hill Education Private Limited, 4th Edition. |
| **Reference Books:** | |
| **1** | Solid State Electronics Devices-Ben. G. Streetman and Sanjay Banarjee, Pearson Education, New Delhi, 6th Edition. |
| **2** | Optical Fiber Communication Principles and practice, Senior J, Prentice Hall of India. |
| **3** | Physics of Semiconductor Devices-S.M. Sze and Kwok K. Ng, Wiley India Pvt. Limited, New Delhi, 3rd Edition |
| **4** | Physics of Semiconductor Devices-Dillip K. Roy, University Press (India) Pvt. Ltd., Hyderabad, 2nd Edition |
| **5** | Semiconductor Physics and Devices- Fowler, Oxford University Press. |
| **6** | 6. Solid State Electronics Devices-D.K. Bhattacharya and Rajnish Sharma, Oxford University Press, New Delhi, 2nd Edition |
| **7** | Fundamentals of Semiconductor Devices-M.K. Achuthan and K.N. Bhatt, Tata McGraw Hill Publishing Company Limited, New Delhi. |

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

| | |
|---|---|
| CO1 | Describe the mechanism of electrons and holes in semiconductor electronics. |
| CO2 | Analyze Energy band diagrams and Fermi levels. |
| CO3 | Understand formation of pn junction. |
| CO4 | Explain Capacitance and voltage relationship in diode. |
| CO5 | Describe different modes of operation of BJT |
| CO6 | Understand the basics concepts of fiber optics and optoelectronic devices. |

**Experiential Learning:**

1-Diode as a switch
2-BJT as a switch
3-BJT as an amplifier
4-Attenuation in optical fiber

| Type | Code | Signals and Systems | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-302 | | 4-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To provide a thorough understanding and analysis of signals and systems |
| Pre-Requisites | **Basic Electronics, Mathematics** |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Signals: Introduction, Classification, Signals and vectors analogy, Concept of Vector space and Orthogonally, Sampling and reconstruction of band limited signals, Representation of analog and discrete time signals in terms of impulses, Representation of discrete time signals and Basic operation on signals. Sequences: Classification based on length, symmetric, periodicity, energy power, special sequences, and arithmetic operations on sequences. | **8 Hours** |
| **Module-2** | **Systems:** Introduction, Classification, LTI systems, Linear Convolution, Causality and stability of LTI systems, Representation of causal LTI systems, Order of systems, IIR and FIR systems, | **7 Hours** |
| **Module-3** | Correlation Fourier Analysis: Significance of Fourier series in LTI systems, Continuous time Fourier series formula and derivation, Dirichlet conditions & properties, Approximation of Fourier series to Fourier transform for aperiodic signals, Properties, examples ,amplitude and power spectra, Analysis of LTI systems using Fourier Transform | **7 Hours** |
| **Module-4** | **Laplace Transform:** Introduction, Properties with examples, Relationship between Fourier and Laplace transform, Pole-Zero plots, Analysis of LTI systems, Transfer function. | **6 Hours** |
| **Module-5** | **Z-transform:** Introduction, Definition, ROC of the Z – Transform, System Transfer Function, Poles and zeros, Properties of Z – Transform, | **6 Hours** |
| **Module-6** | **Inverse Z – Transform**, Solution of difference equations using one sided Z – Transform, Response of pole-zero systems with Non-Zero initial conditions, Causality and stability of LTI systems in the Z-domain. | **6Hours** |
| | **TOTAL** | **40 Hours** |

| Text Books: | |
|---|---|
| 1 | Signals and Systems by Alan V. Oppenheim, Alan S. Wilsky and Nawab, Prentice Hall |
| 2 | Signals and Systems by K. Gopalan, Cengage Learning (India Edition) |
| 3 | Signals & Systems – P. Ramesh Babu –Scitec,4th Edition. |
| **Reference Books:** | |
| 1 | Linear Systems and Signals by B.P.Lathi, Oxford University Press |
| 2 | Signal, Systems and Transforms by Charles L. Philips, J. M. Parr and E. A. Riskin, Pearson Education |
| 3 | Signal and Systems by Anand Kumar, 3rd Edition, PHI |

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

| | |
|---|---|
| CO1 | Differentiate between various types of signals and operate on signals. |
| CO2 | Classify various types of systems and differentiate between convolution, de-convolution and correlation of arbitrary signals. |
| CO3 | Analyze LTI systems and signals using Laplace transforms and Fourier transforms. |
| CO4 | Differentiate between Laplace transforms and Fourier transforms. |
| CO5 | Define and classify analog filters and find the frequency plots of various filters. |
| CO6 | Differentiate between Z-transforms and Fourier transforms. |

**Experiential Learning:**

1. To explore the commutation of even and odd symmetries in a signal with algebraic operations.
2. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling, and time-shifting).
3. To explore the various properties of the impulse signals.
4. To visualize the complex exponential signal and real sinusoids.
5. Locating the Zeros and Poles and plotting the Pole-Zero maps in S plane and Z- Plane for the given transfer function.
6. Transformation of signals into time and frequency domains.
7. Design, analysis and application of Low pass and High pass filters.
8. Sampling Theorem Verification.
9. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power
10. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
11. Design, analysis and application of Band Pass and Band stop filters

| Type | Code | Organizational Behavior | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-T-HS-301 | | 3-0-0 | 3 | 15 |

| | |
|---|---|
| Objectives | To understand the concepts and theories useful for diagnosing human behavior in modern-day organizations. To examine different aspects of organizational structure such as formation of organizational systems, structure, and processes. To develop an understanding of these theories and of related ideas and concepts and critically evaluate them. To develop skills to deeply analyze human behavior and apply the learning's to organizational context. Understanding the group dynamics and Leadership in the Organization. |
| Pre-Requisites | To stimulate specific goals and achieve optimal performance from workers, it is useful to explore ways of stimulating fruitful behaviors from workers by studying organizational behavior. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as needed. Each session is planned to be interactive with focus on real-world problem solving through case lets. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module -1** | Introduction- Nature, Scope, Purpose, Function, Elements of OB. Evolution of OB - Classical, Scientific, Administrative, Human Relation Movement, Bureaucracy, System Theory. Contribution to the field of Management by different Disciplines, Model of OB, Application of OB. **Case Let.** | **10 hours** |
| **Module -2** | Perception & Learning- Understanding of perception and its basic elements, perceptual selection, social perception, self –perception and identity, perceptual biases. Learning in organization and classical and operant conditioning.<br>Personality- Meaning of Personality, Personality Development, Determinants of personality, Personality Theories, Self-esteem & Self-awareness, Application of personality in the organizational level. **Case Let.** | **10 hours** |
| **Module -3** | Motivation- Concept of motivation, motivation and behavior, Misbehavior, Types of motives, Management Intervention. Theories of<br>motivation, Need theory, Hygiene theory, Theory X and Theory Y, ERG Theory, Vroom's Expectancy Theory, Equity Theory, Elements of sound motivational system, Money as a motivator, Motivation in Indian organization. **Case Let.** | **6 hours** |
| **Module -4** | Attitude- Definition, key elements and related concepts (value, opinion, belief and ideology), characteristics of attitudes, attitude formation and measurement, changing attitude, attitude at workplace (job satisfaction, work attitude and organizational commitment). Emotions at workplace;Definition, types, related concepts (mood, temperament), Managing emotions at workplace, emotional intelligence , meaning of stress , Work Stressors, Stress at work place, General Adaption syndrome, emotional labor, Balancing work and<br>Life. **Case Let.** | **4 hours** |
| **Module -5** | Leadership- Meaning, Leader Vs. Manager, leadership theories, Leadership styles, Leadership in Indian Organization. Group Dynamics- Define Groups & teams, Types of Group, Group Behavior, Group Formation, Group Decisions, and Techniques to improve group decision, merits and de-merits of group decision. | **6 hours** |
| **Module -6** | Organizational Change- Meaning and Nature of organizational change, Factors of organizational change, Resistance to change, Managing resistance to change, Overcoming resistance to change. Organizational culture- Impact of culture on individuals, Cultural dimensions, Types of culture. | **4 hours** |
| | **Total** | **40 hours** |

| Text Book | |
|---|---|
| 1. A Textbook of Organizational Behavior, by S.S. Khanka, S Chand. | |
| 2. Organizational Behaviour, by M. N. Mishra, Vikas Publishing House. | |
| 3. Organizational behavior by N. Kumar & R. Mittal, Anmol Publication. | |
| 4. A Textbook of Organizational Behavior by C. B. Gupta, S Chand. | |
| 5. Organizational Behaviour, by Robbins/Vohra, Pearson. | |
| **Reference Books** | |
| 1 | Organizational Behavior, K. Aswathappa, Sadhana Dash, Himalaya Publishing House. |
| 2 | Organizational Behavior. Arun Kumar and N. Meenaskshi .Vikas Publishing House, 2009 |
| 3 | Managing Organizational Behavior, Moorhead & Griffin. CENGAGE Learning, 2014. |
| 4 | Human Behavior at Work. Keith Davies, 2002. |
| 5 | Understanding Organizational Behaviour . Pareek, U. Oxford University Press, (2012). |

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

| | |
|---|---|
| CO1 | To discuss the development of the field of organizational behavior and explain the micro and |
| CO2 | To analyses and compare different models used to explain individual behavior related to motivation and rewards |
| CO3 | To explain group dynamics and demonstrate skills required for working in groups. |
| CO4 | To identify the various leadership styles and the role of leader in a decision making process. |
| CO5 | To explain organizational culture and de4scribe its dimensions and to examine various Organizational designs. |
| CO6 | To discuss the implementation of organizational change. |

| Type | Code | Object Oriented Programming using JAVA | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTCS-T-PC-305 | | 3-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To expose in the field of Programing Language (Core java) |
| Pre-Requisites | Knowledge of programming in 'C' |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Object oriented paradigm:** Evolution of programming paradigm, structured versus object-oriented development, Introduction to Object oriented programming concepts: Objects, classes, encapsulation and abstraction, inheritance, polymorphism, dynamic binding, message passing. Executing the program, Architecture of JVM. Understanding First Program and a step forward, Java Tokens, Data types, Operators, Typecasting, Control Structures and Arrays, Conditional Statements, Jumping Statements. | **8 Hours** |
| **Module-2** | **Java I/O:** Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.<br>**Object and Classes:** class and object, functions and data members, static members.<br>**Constructors** - default constructor, parameterized constructor. | **6 Hours** |
| **Module-3** | **Inheritance:** Derived and base classes, public, private, and protected derivations, constructors in derived classes, Constructor call in Inheritance, super keyword, this keyword.<br>**Data Abstraction:** Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple Inheritance Using Interfaces. | **6 Hours** |
| **Module-4** | **Polymorphism:** Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching.<br>**String Manipulations:** Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer.<br>**Wrapper Classes:** Introduction to wrapper classes, Different predefined wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing. | **6 Hours** |
| **Module-5** | **Packages:** Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages.<br>**Multithreading:** Thread in Java, Thread naming and Priorities, Thread execution prevention methods. (yield (), join (), sleep ()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread. | **6 Hours** |
| **Module-6** | **Exception handling:** Error and Exception Handling, Types of exceptions, Hierarchy of Exception classes, Default exception handling in Java, User defined/Customized Exception Handling (try, catch, finally, throw, throws).<br>**Abstract Window Toolkit (AWT):** Description of Components and Containers, Component/Container hierarchy, Understanding different components/Container classes and their constructors, swing. | **8 Hours** |
| **Total** | | **40 Hours** |

| Text Book | |
|---|---|
| 1. **JAVA Complete Reference (9th Edition)** Herbal Scheldt | |
| 2. CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication | |
| **Reference Books** | |
| 1 | Programming in Java. Second Edition. OXFORD HIGHER EDUCATION. (SACHIN MALHOTRA / SAURAV CHOUDHARY) |
| 2 | **Effective Java 3rd Edition** by Joshua Bloch (Author) |
| 3 | **Java For Dummies 6th Edition** by Barry A. Burd (Author) |

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

| | |
|---|---|
| CO1 | Understand the Object-oriented programming concepts and every term of the program. |
| CO2 | Test and execute the programmes by Object and Class and implement inheritance property. |
| CO3 | Implement polymorphism and string manipulation. |
| CO4 | Determine data abstraction and wrapper classes to achieve code reusability. |
| CO5 | Analyse the multithreading and package implementation. |
| CO6 | Understand the hierarchy of file stream classes and the concept of exception handling. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTMC-T-MC-301 | **ESSENCE OF INDIAN KNOWLEDGE TRADITION** | 2-0-0 | 0 | 150 |

| | |
|---|---|
| **Objectives** | The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system. |
| **Pre-Requisites** | |
| **Teaching Pedagogy** | |

## Detailed Syllabus

| Module | Topics | Hours |
|---|---|---|
| **Module -1** | • Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाङ्ग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र) | **10 Hours** |
| **Module -2** | Modern Science and Indian Knowledge System | **10 Hours** |
| **Module -3** | Yoga and Holistic Health care | **10 Hours** |
| **Module -4** | Case Studies. | **10 Hours** |
| | **Total** | **40 Hours** |

**Text Book:**


1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life


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

Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.

| Type | Code | Employability Enhancement Training-B | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTSC-T-SC-301 | | 2-0-0 | 1 | 150 |

| | |
|---|---|
| Objectives | To significantly raise the employability of the students to a level where they are able to clear campus selection process and at the same time develop an attitude of constant self-improvement throughout their career |
| Pre-Requisites | To help students practiced and understand the various company pattern tests. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to pre- placement talk, Speed maths (speed & accuracy in Addition, Subtraction, Multiplication, Fractions, Percentage, Squares, Cubes, Square Roots, Cube Roots, etc.). | **3 Hours** |
| **Module-2** | Number system (number tree, factors & factorials, base change,finding last digit & last two digits of indices, LCM & HCF,) , Venn Diagrams (visually organize information, compare two or more choices, solve complex mathematical problems, compare data sets, to reason through the logic). | **4 Hours** |
| **Module-3** | Syllogism (Introduction to syllogisms, Statements of syllogisms, Application of Venn diagrams, Logical deduction), Blood Relationship (Dialogue/ Conversation Based, Based on puzzles, coding-decoding). | **3 Hours** |
| **Module-4** | Age based problems (Ratio and Sum of Ages Given, Ratio &Product of Ages Given under Problems on Ages, Ratio of Present and Future Ages Given, Ratio of Past &Present Ages Given).Ratio Proportion(direct proportion, inverse proportion, continued proportion). | **4 Hours** |
| **Module-5** | Percentage (basic concepts, comparison of percentage, successive percentage), Alligation mixture, Introduction to Data interpretation (analytical methods to review data), Introduction to Data sufficiency(checking and testing a given set of | **3 Hours** |
| **Module-6** | Percentage(Basic, Comparison of two, Successive ,Product constancy ratio), Profit &Loss(Profit, Loss, Cost Price, Selling Price, Marked Price) , Simple Interest & compound interest, Puzzles(Floor, Scheduling, Double line up, Linear, Square, Box) | **3 Hours** |
| | **Total** | **20 Hours** |

| Text Books: | |
|---|---|
| 1 | Quantitative aptitude by R S Aggarwal |
| 2 | Quantitative Aptitude for CAT by Arun Sharma |
| | |
| **Reference Books:** | |
| 1 | Fast Track Objective Arithmetic by Arihant Publications |

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

| | |
|---|---|
| CO1 | To help students explore their values and career choices through individual skill assessments |
| CO2 | To make realistic employment choices and to identify the steps necessary to achieve a goal |
| CO3 | To develop and practice self-management skills for the work site |
| CO4 | To explore and practice basic communication skills |
| CO5 | To learn skills for discussing and resolving problems on the work site |
| CO6 | To assess and improve personal grooming |

| Type | Code | Digital Electronics Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-301 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro operations, identify the addressing modes used in macro instructions, apply algorithms for arithmetic operations and implementation for ALU design. |
| Pre-Requisites | Knowledge of Digital Electronics Circuits |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Expt. No. | Topic |
|---|---|
| 1 | Investigate logic behavior of NOT, AND, OR, NAND, NOR, EX-OR, EXNOR gates. |
| 2 | Gate-level minimization: Two level and multi-level implementation of Boolean functions. |
| 3 | Implementation of Boolean functions using universal gates. |
| 4 | Combinational Circuits: design, assemble and test: adders and subtractors, code converters |
| 5 | Design of multiplexers and de-multiplexer |
| 6 | Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops. |
| 7 | Shift Registers: Design and investigate the operation of all types of shift registers . |
| 8 | Study and design of Asynchronous Counters. |
| 9 | Study and design of synchronous Counters. |
| 10 | VHDL simulation and implementation of adder. |

| Text Books: | |
|---|---|
| **1** | Digital Electronics Circuit Lab Manual, Department of ECE, GIFT, Bhubaneswar |

Course outcomes

| Type | Code | Signals and Systems Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-302 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | To analyse in depth the signals and systems in time, frequency and z-domains |
| Pre-Requisites | Signals and Systems theory |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Expt No | Topic |
|---|---|
| 1 | Introduction to MATLAB & Signals in MATLAB |
| 2 | Understanding the Basic Signals using MATLAB |
| 3 | Properties of Signals & their Transformation |
| 4 | Introduction to system & their classification |
| 5 | Characterization of systems |
| 6 | Convolution of continuous time & discrete time signals |
| 7 | MATLAB implementation of fourier series |
| 8 | MATLAB implementation of continuous time fourier transform |
| 9 | MATLAB implementation of discrete time fourier transform |
| 10 | MATLAB implementation of Z- transform |

| Text Books: | |
|---|---|
| **1** | Signals and Systems Lab Manual, Department of ECE, GIFT, Bhubaneswar |

| | |
|---|---|
| CO1 | Verify the truth table of basic gates, universal gates and exclusive gates |
| CO2 | Realise The Various Boolean Expression Using Universal Gates. |
| CO3 | Design and test various combinational Circuits using Gates |
| CO4 | Justify various Registers using flip-flop. |
| CO5 | Demonstrate various sequential circuits like counters. |
| CO6 | Analyse VHDL code for various combinational and sequential circuit. |

| Type | Code | Object Oriented Programming with JAVA Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTCS-P-PC-305 | | 0-0-3 | 1 | 1 |

| | |
|---|---|
| Objectives | To expose to the field of Problem Solving and Programing |
| Pre-Requisites | Knowledge of Mathematics in Secondary Education |
| Teaching Pedagogy | Regular Lab with use of ICT. Each session is planned to be interactive with focus on real-life problem-solving activities. |

**Detailed Syllabus**

| Lab No: | Name of the experiments | Hours |
|---|---|---|
| 1 | Introduction, compiling and executing java program | 2 Hours |
| 2 | Programs related to different data types, variables, constants, operators | 2 Hours |
| 3 | Conditional statements, control structures (while, do-while, for) Jumping statements | 2 Hours |
| 4 | Array and multidimensional array | 2 Hours |
| 5 | Object, class and Constructors | 2 Hours |
| 6 | Inheritance, Interfaces and multiple inheritance | 2 Hours |
| 7 | Polymorphism (method overloading and method overriding) | 2 Hours |
| 8 | String Manipulations, Wrapper Class | 2 Hours |
| 9 | Java threads (yield (), join (), sleep ()), Concept of Synchronization, Inter Thread Communication) | 2 Hours |
| 10 | Exception handling | 2 Hours |
| 11 | APPLET, Package | 2 Hours |
| 12 | AWT and SWING | 2 Hours |
| 13 | File handling, Event Handling | 2 Hours |

| **Text Books:** |
|---|
| Object Oriented Programming with JAVA Lab Manual, Department of CSE, GIFT, Bhubaneswar |

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

| | |
|---|---|
| **CO1** | Using object-oriented features, such as abstraction, inheritance, polymorphism etc. for writing effective programs. |
| **CO2** | Understand and compile code under java programming environment. (Using different data types, control structure and arrays) |
| **CO3** | Apply polymorphism and string concept to solve a problem in real world. |
| **CO4** | Develop own package and apply thread synchronization using multi-threading concept. |
| **CO5** | Recommend different error handling methods to handle the exception and make the java program more efficient. |
| **CO6** | Create API to design web based as well as stand-alone applications. (Using AWT and Swing) |

| Type | Code | SEMINAR-I | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PS | BTPS-P-PS-301 | | 0-0-3 | 1 | 100 |

| | |
|---|---|
| Objectives | To encourage the students to study advanced engineering developments<br>To prepare and present technical reports.<br>To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models. |
| Pre-Requisites | Knowledge of Speaking with globally accepted language and subject analysis. |
| Teaching Pedagogy | Regular seminar presentation and evaluation with record keeping. |

**METHOD OF EVALUATION:**

1. During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. In a session of one period per week, 5 students are expected to present the seminar.
3. Each student is expected to present at least twice during the semester and the student is evaluated based on that.
4. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
5. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
6. Evaluation is 100% internal.

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

| | |
|---|---|
| CO1 | Outline the topics on modern technology; prepare implementation of the same as the presentation. |
| CO2 | Understanding the technologies used by extracting the new things to be implemented by reviewing the journals/research papers. |
| CO3 | Sketch the application of the technology for the use of the mankind. |
| CO4 | Analyse and correlate the new technology with the subject of interest for further study. |
| CO5 | Evaluate, plan and reframe the technology with the communication skills for a better explanation and presentation. |
| CO6 | Modify and design the concept into the realistic world. |

| Type | Code | Evaluation of Summer Internship-1 | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTSC-P-SC-301 | | 0-0-3 | 1 | 100 |

| | |
|---|---|
| Objectives | To encourage the students to study advanced engineering developments<br>To prepare and present technical reports.<br>To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models. |
| Pre-Requisites | Knowledge of Speaking with globally accepted language, subject analysis, practical implementation. |
| Teaching Pedagogy | Regular contact with interns and evaluation with record keeping. |

**METHOD OF EVALUATION:**

1. During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 8 to 10 minutes.
2. In a session of one period per week, 5 students are expected to present the seminar.
3. Each student is expected to present at least twice during the semester and the student is evaluated based on that.
4. At the end of the semester, he / she
   can submit a report on his / her topic of seminar and marks are given based on the report.
5. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
6. Evaluation is 100% internal.

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

| | |
|---|---|
| CO1 | State the functioning of organization and observe changes for self-improvement. |
| CO2 | Explain how the internship placement site fits into a broader career field. |
| CO3 | Apply appropriate workplace behaviours in a professional setting. |
| CO4 | Solve real life challenges in the workplace by analysing work environment and conditions, and selecting appropriate skill sets acquired from the course |
| CO5 | Evaluate the internship experience in terms of personal, educational and career needs. |
| CO6 | Develop ideas for suitable startups to become successful entrepreneur. |

# Fourth Semester

| Type | Code | Electro Magnetic Theory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-402 | | 4-2-0 | 3 | 100 |

| | |
|---|---|
| **Objectives** | The objective of this course is to study the fundamentals of electromagnetic waves including coordinate systems, vector calculus, electrostatic fields, magneto-static fields, Maxwell's Equations, electromagnetic wave propagation, transmission lines, wave guides, and antennas. |
| **Pre-Requisites** | Basic knowledge of coordinate systems, vector calculus, electric & magnetic fields and related laws is required. |
| **Teaching Scheme** | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Coordinate System & Vector Calculus: Co-ordinate systems & Transformation: Cartesian co-ordinates, circular cylindrical coordinates, spherical coordinates. Vector Calculus: Differential length, Area & Volume, Line, surface and volume Integrals, Del operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Stoke's theorem, Laplacian of a scalar. | **8 Hours** |
| **Module-2** | Static Electric Fields: Electrostatic Fields: Coulomb's Law, Electric Field Intensity, Electric Fields due to a point, line, surface and volume charge, Electric Flux Density, Gauss's Law- Maxwell's Equation, Electric Potential, Relationship between E and V | **6 Hours** |
| **Module-3** | Maxwell's Equation, Energy Density in Electrostatic Fields., Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions. Electrostatic boundary-value problems: Poisson's and Laplace's Equations, Uniqueness Theorem, General procedures for solving Poisson's and Laplace's equations. | **7 Hours** |
| **Module-4** | Static Magnetic Field: Magnetic Field Intensity, Biot-Savart's Law, Ampere's circuit Law-Maxwell Equation, applications of Ampere's law, Magnetic Flux DensityMaxwell's equations. | **6 Hours** |
| **Module-5** | Maxwell's equation for static fields, Magnetic Scalar and Vector potentials. Magnetic Boundary Conditions.Electromagnetic Field and Wave propagation: Faraday's Law, Transformer & Motional Electromagnetic Forces, Displacement Current, Maxwell's Equation in Final forms | **7 Hours** |
| **Module-6** | Time-Harmonic Field. Electromagnetic Wave Propagation: Wave Propagation in lossy Dielectrics, Plane Waves in loss less Dielectrics, Free space, good conductors Power & Poynting vector. | **6 Hours** |
| | **TOTAL** | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | M. N. O. Sadiku and S. V. Kulkarni, Principles of Electromagnetics, 6th Edition, Oxford University Press, 2015. |
| **2** | E. C. Jordan and K. G. Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, Pearson Education, 2009. T3. C. A. Balanis, Antenna Theory: Analysis and Design, 4th Edition, John Wiley & Sons, 2016. |
| **Reference Books:** | |
| **1** | W. H. Hayt and J. Buck, Engineering Electromagnetic, 7th Edition, McGraw Hill Education,2006. |
| **2** | N. N. Rao, Fundamentals of Electromagnetics for Engineering, 1st Edition, Pearson Education, 2009. |
| **3** | S. Ramo, Fields and Waves in Communication Electronics, 3rd Edition, John Wiley & Sons, 2007. |
| **4** | A. R. Hasish and M. Sachidananda, Antennas and Wave Propagation, 1st Edition, Oxford University Press, 2007 |
| **Online Resources** | |
| **1** | https://nptel.ac.in/courses/108104087/: by Prof. P. Kumar, IIT Kharagpur |
| **2** | https://nptel.ac.in/courses/108/106/108106152/: by Prof. U. Khankhoje, IIT Madras |
| **3** | https://nptel.ac.in/courses/108/104/108104130/: by Prof. P. Kumar, IIT Kanpur |
| **4** | https://nptel.ac.in/courses/108/102/108102119/: by Prof. S. Aditya, IIT Delhi |
| **5** | https://nptel.ac.in/courses/108/101/108101090/: by Prof. K. Sankaran, IIT Bombay |
| **6** | https://nptel.ac.in/courses/108/101/108101092/: by Prof. G. Kumar, IIT Bombay |

***Course Outcome: At the end of the course the student will be able to***

| | |
|---|---|
| CO1 | To understand the basic laws of electromagnetism . |
| CO2 | To understand the basic laws of electromagnetism |
| CO3 | To understand the basic laws of electromagnetism |
| CO4 | To understand the basic laws of electromagnetism |
| CO5 | To understand the propagation of EM waves. |

**EXPERIENTIAL LEARNING: -**

| |
|---|
| 1. Find the angle between two vectors using dot product and cross product in MATLAB. |
| 2. For given two vectors A & B find the vector component of A parallel to B using MATLAB. |

| Type | Code | Analog Electronic Circuits | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-401 | | 4-1-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To expose the students semiconductor device, performance characteristics and their application. |
| Pre-Requisites | Basic Electronics and Basic concept Physics and mathematics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Biasing of BJTs: Load L ines (AC and DC), Operating Points, Fixed Bias,Self Bias,voltage divider bias,feedback bias, etc. Bias Stabilization | **6 Hours** |
| **Module-2** | Field-Effect Transistor: Principle and Operation of FETs and MOSFETs; P-Channel and N-Channel MOSFET; Complimentary MOS V-1 Characteristics of E-MOSFET and DMOSFET MOSFET as an Amplifier and as a Switch. | **6 Hours** |
| **Module-3** | Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models, Small Signal Analysis of CE, CC, CB amplifiers Emitter Follower, Effects of RS and RL on CE amplifier,Compound configuration- Cascade,cascode amplifier, Darlington Connection and Current Mirror Circuits | **8 Hours** |
| **Module-4** | Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifier, Effects of RsiG and RL on CS Amplifier, Source Follower and Cascaded System. | **6 Hours** |
| **Module-5** | High Frequency Response of BJTs ,High Frequency Response of FETs, Frequency Response of CE Amplifier., Frequency Response of CS Amplifier.Operational Amplifiers and its applications.<br>Feedback amplifier and Oscillators: Concepts of negative and positive feedback Four Basic Feedback Topologies | **8 Hours** |
| **Module-6** | Practical Feedback Circuits Principle of Sinusoidal Oscillator, Wey-bridge, Phase Shift and Crystal Oscillator Circuits,<br>Power Amplifier (Class A, B, AB, C). | **6 Hours** |
| | **TOTAL** | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | Electronic Devices and Circuit Theory, R. L. Boyelstad and L. Nashelsky, Pearson Education, New Delhi , 9th /10th edition 2013.(Selected portions of chapter 4,5,6,7,8,9,10,11,12 and 14) |
| **2** | Milliman's Electronic Devices and Circuits, J. Milliman, C. Halkias, S. Jit., Tata Mcgraw Hill Education Pvt. Ltd. 2nd Edition 2008. |
| | |
| **Reference Books:** | |
| **1** | Electronic Devices and circuits, Jimmie, J. Cathey adapted by Ajay Kumar Singh Tata Mcgraw Hill publishing company ltd, New Delhi 3rd edition( For Problem Solving. |
| **2** | Electronics Circuit Analysis and Design, Donland A. Naeman, Tata Mcgraw Hill publishing company ltd, New Delhi, 3rd Edition, 2002. |
| **3** | Integrated Electronics: Analog and Digital circuits and systems, J. Milliman, C. Halkias Tata Mcgraw Hill Education Pvt. Ltd, New Delhi , 2nd Edition 2004. |
| **4** | Microelectronic circuits: Analysis and Design, M. H. Rashid, PWS publishing company, a division of Thomson Learning Inc. India Edition. |
| **5** | Electronics devices and circuits, David A. Bell, Oxford Press, 5th Edition 2008. |

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

| | |
|---|---|
| CO1 | Define and understand fundamentals of BJT,FET, MOSFET. |
| CO2 | Explain different types of amplifier and their design. |
| CO3 | Apply various types of BJT and FET amplifiers. |
| CO4 | Analyse the hardware components of amplifier circuits. |
| CO5 | Design different amplifier and oscillator circuits and its applications.. |
| CO6 | Review frequency response of BJT and JFET Amplifiers. |

**EXPERIENTIAL LEARNING:-**

1. Simulate and study Integrator using PSPICE windows.
2. Simulate and study Differentiator using PSPICE windows.
3. Simulate and study Darlington pair amplifier circuit using PSPICE windows.
4. Simulate and study frequency response of a BJT amplifier in common-emitter configuration using PSPICE windows.
5. To verify the characteristics of Wein Bridge Oscillator

.

| Type | Code | PROGRAMMING USING PYTHON | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTCS-T-PC-405 | | 3-0-1 | 3 | 150 |

| | |
|---|---|
| Objectives | Python is next generation multi-purpose programming language, that allows different users to create applications of various domains. Students will be able to learn primary fundamentals of python programming and potential of python is to achieve modern computing requirements. |
| Pre-Requisites | Object oriented concepts, Programming fundamentals |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Introduction**: History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations | **7 Hours** |
| **Module-2** | **ControlFlow-** if, if-else, for, while, break, continue, pass.<br>**Data structure:** Lists - Operations, Slicing, Tuples, Sets, Dictionaries, Sequences. Comprehensions. | **5 Hours** |
| **Module-3** | **Functions** - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. | **6 Hours** |
| **Module-4** | **Object Oriented Programming OOP in Python:** Classes and objects, constructor, 'self-variable', Methods, Constructor Method, Inheritance and types of inheritance, Polymorphism , overloading and Overriding Methods, Data encapsulation, static variables | **8 Hours** |
| **Module-5** | **Python File Handling:** Open files, read from a file and write to a file.<br>Exception handling: Errors and exceptions in Python, Try Except , Built-in exceptions, user defined exceptions | **6 Hours** |
| **Module-6** | **Brief Tour of the Standard Library -** Dates and Times, Matplotlib, Numpy, Pandas. **Modules:** Creating modules, importing modules | **8 Hours** |
| **Total** | | **40 Hours** |

| Text Book | |
|---|---|
| **1.** Python Programming: A Modern Approach, Vamsi Kurama, Pearson | |
| **2.** Learning Python, Mark Lutz, Orielly. | |
| **Reference Books** | |
| **1** | Core Python Programming, W.Chun, Pearson. |
| **2** | Introduction to Python, Kenneth A. Lambert, Cengage |
| **3** | John V Guttag, ―Introduction to Computation and Programming Using Python ‘‘, Revised and expanded Edition, MIT Press, 2013 |
| **4** | Kenneth A. Lambert, ―Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012. |
| **5** | Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-solving Focus, Wiley India Edition, 2013 |

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

| | |
|---|---|
| CO1 | Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements. |
| CO2 | Express proficiency in the handling of strings and functions |
| CO3 | Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets. |
| CO4 | Develop micro code for typical instructions in symbolic form. |
| CO5 | Identify the commonly used operations involving file systems |
| CO6 | Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python. |

| Type | Code | Engineering Economics | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | BTBS-T-HS-302 | | 3-0-0 | 3 | 15 |

**Detailed Syllabus**

| | |
|---|---|
| Objectives | This course will expose students to economic theory through the use of mathematical modeling with a focus on economic decision making for engineers |
| Pre-Requisites | Mathematics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities. |

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics. Demand - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved ), Demand Forecasting – Meaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved). | **10 Hours** |
| **Module-2** | Production - Production function, Laws of returns: Law of variable proportion, Law of returns to scale Cost and Revenue Concepts - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization. | **8 Hours** |
| **Module-3** | Market - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved). | **7 Hours** |
| **Module-4** | Time Value of Money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence. Evaluation of Engineering Projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for | **6 Hours** |
| **Module-5** | Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project. | **4 Hours** |
| **Module-6** | Inflation-Meaning of inflation, types, causes, measures to control inflation. National Income-Definition, Concepts of national income, Method of measuring national income. Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank. | **5 Hours** |
| | **Total** | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | Principles of Economics by Deviga Vengedasalam and Karaunagaran Madhavan, Oxford |
| **2** | Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India |
| | |
| **Reference Books:** | |
| **1** | C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015. |
| **2** | Engineering Economy by William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson |
| **3** | R.Paneer Seelvan, " Engineering Economics", PHI |
| **4** | Ahuja,H.L., "Principles of Micro Economics" , S.Chand & Company Ltd |
| **5** | |

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

| | |
|---|---|
| CO1 | Remembering: Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering economy. |
| CO2 | Understanding: Evaluate numerically the effects of changes in demand and supply on price determination of products and services. |
| CO3 | Analyze: the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise. |
| CO4 | Develop: the ability to account for time value of money using engineering economy factors and formulas. |
| CO5 | Apply: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, |
| CO6 | Remembering: Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering economy. |

| Type | Code | Network Theory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-301 | | 4-1-0 | 4 | 150 |

| | |
|---|---|
| Objectives | To expose to the field of Electrical Circuit and analysis |
| Pre-Requisites | Fundamental Electrical Circuit analysis that includes concepts of Electrical Engineering, Calculation of current, voltage, power. Knowledge of Basic fundamental of electrical circuit. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Basic Concepts:** Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks. | **5 Hours** |
| **Module-2** | **Network Theorems:**<br>Superposition, Millman's theorems, Thevinin's and Norton's theorems, Maximum Power transfer theorem, Reciprocity Theorem, Compensation Theorem<br><br>**Magnet coupling Circuit:** Coupled Circuits: Coefficient of coupling, dot convention, Ideal Transformer, Analysis of multi-winding coupled circuits, Analysis of single tuned and double tuned coupled circuits. | **8 Hours** |
| **Module-3** | **Experiential learning:-**<br>**Design a magnetizing coil to know Self-inductance and Mutual inductance.**<br>**Transient behavior and initial conditions:** Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. | **8 Hours** |
| **Module-4** | **Series Resonance & Parallel Resonance:-**<br>Variation of Current and Voltage with Frequency, Selectivity and Bandwidth, Q-Factor, Circuit Magnification Factor, Selectivity with Variable Capacitance, Selectivity with Variable Inductance | **4 Hours** |
| **Module-5** | **Two port network parameters:**<br>Definition of Z, Y, h and Transmission parameters, modeling with these parameters, relationship between parameters sets. | **6 Hours** |

| | | |
|---|---|---|
| **Module-6** | **Application of Laplace's Transform & Filter:-** Solution of differential equation using Laplace transform, Unit step, Impulse & ramp functions, Laplace transform of singular & shifted function, Convolution integral, Concept of complex frequency, Transform impedance &transform admittance, Series & parallel combination of these transform networks.<br>Filter and its applications.<br>**Experiential learning:-**<br>**Design the Low Pass, High Pass, Band Pass & Band Reject Filter, Active & Passive Filters using MATLAB**. | **9 Hours** |
| **Total** | | **40 Hours** |

| **Text Books:** | |
|---|---|
| **1** | A. Chakrabarthy (2010), Circuit Theory, 5th edition, DhanpatRai& Sons Publications, New Delhi. |
| **2** | A Text Book On Electrical Technology. –B L THERAJA, Vol 1, S.Chand Publications. |
| **Reference Books:** | |
| **1** | Introductory Circuit Analysis, Robert L. Boylestad, Pearson, 12th ed., 2012. |
| **2** | Network Analysis, M. E. Van Valkenburg, Pearson, 3 rd ed., 2006. |

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

| | |
|---|---|
| CO1 | Understand basic concept of AC & DC circuit. |
| CO2 | Illustrate the Design and analysis of circuit theorems and coupling circuit. |
| CO3 | Formulate transient behavior and resonance of DC and AC circuit. |
| CO4 | Apply parameters for different circuit analysis. |
| CO5 | Summarize application of Laplace transformation. |
| CO6 | Explain various Filter and there application. |

**Experiential learning:-**

**Self-inductance and Mutual inductance of magnetic circuit.**
**Resonance circuit.**
**Design the filter circuits using Mat lab.**

| Type | Code | NPTEL | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| OO | BTEC-T-OO-401 | | 2-0-0 | 2 | 150 |

| | |
|---|---|
| Objectives | Digital system design course focuses on design digital system from scratch. The course focuses on designing combinational and sequential building blocks, using these building blocks to design bigger digital systems. During this course we also learn how to use Verilog to design/model a digital system. |
| Pre-Requisites | Basics of Digital Electronics |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| | **Week 1:** Introduction of digital systems. Number system<br>**Week 2**: Number representation: BCD, floating point numbers | |
| | **Week 3:** Boolean algebra, application of Boolean algebra in minimization of Boolean expressions | |
| | **Week 4:** Boolean minimization using K-map and Quine McCluskey method Introduction to Verilog | |
| | **Week 5:** MSI Logic: Multiplexer, encoder, decoder | |
| | **Week 6:** Arthimetic circuits: Adder, subtractor, multiplier, comparator | |
| | **Week 7:** Latches and flipflop (SR, JK, T, D), counters | |
| | **Week 8:** Sequential logic like Registers, introduction to behavior modeling in | |
| | **Week 9:** Finite state machine, state graphs and tables. | |
| | **Week 10:** Reduction of state table and state assignments. Arithmetic circuits using sequential design. | |
| | **Week 11:** Register transfer level (RTL) design, RTL design examples | |
| | **Week 12:** FPGA, VLSI design flow using HDL, introduction to behavior, logic and physical synthesis. | |
| **Total** | | **12 WEEKS** |

| **Text Books:** | |
|---|---|
| **1** | NPTEL |
| **Reference Books:** | |
| **1** | NPTEL |

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

| | |
|---|---|
| CO1 | A strong sense of identity. |
| CO2 | Connection to and contribution with their world. |
| CO3 | A strong sense of wellbeing. |
| CO4 | Confident and involved learners. |
| CO5 | Effective communicators. |

| Type | Code | Embloyability Enhancement Training-C | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTSC-T-SC-302 | | 2-0-0 | 1 | 150 |

| | |
|---|---|
| Objectives | To significantly raise the employability of the students to a level where they are able to clear campus selection process and at the same time develop an attitude of constant self-improvement throughout their career. |
| Pre-Requisites | To help students practiced and understand the various company pattern tests. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Cubes and dices(Problem based on Single Dice, Two or more Dice), Number series(Constant difference series, Addition Series, Subtraction Series, Division Series, Multiplication Series, Odd or Even Number Series, Prime Number Series, Squares or Cubes series, Alternate Pattern Series, Fibonacci Series, Arithmetic Series, Geometric Series, Triangular series, Mixed Pattern Series, Wrong number series) | **4 Hours** |
| **Module-2** | Coding and Decoding(Alphabet Coding, Numerical Coding, Symbol Based Coding, Alphabet-Symbol-Numerical Coding, Values Coding, Substitution Coding, Decipher Coding),Seating Arrangement(Circular ,Linear, Rectangle, Double row Arrangement)<br>Direction(Left & Right Dilemma, Direction of shadows, Direction with reference point), | **4 Hours** |
| **Module-3** | Time &Work, Pipe Cisterns(Inlet, Outlet &Leak), Time, speed & Distance(Average speed, Inverse Proportionality of Speed & Time, Meeting Point Questions), Boat & Streams (Stream, Upstream, Downstream, Still Water),Permutation & combination(Fundamental Principle of Counting, Permutations as an Arrangement, Combinations as Selections, P(n,r) and C(n,r),Application of Permutation and Combination). | **4 Hours** |
| **Module-4** | Data sufficiency(checking and testing a given set of information), Algebra(,Elementary Algebra, Advanced Algebra, Abstract Algebra, Linear Algebra) Mensuration(2D&3D). | **3 Hours** |
| **Module-5** | Height and distance, HCF & LCM, Clocks, Probability<br>Calenders (Counting odd day, counting with reference date, without reference date, Repetition) | **2 Hours** |
| **Module-6** | Simplification and approximation (missing numbers , simplifying equation),Train problems(length, speed, distance, relative speed, direction),Average, Partnership, Progression (Arithematic, Geometric, | **3 Hours** |
| | **Total** | **20Hours** |

| Text Books: | |
|---|---|
| 1 | Quantitative aptitude by R S Aggarwal |
| 2 | Quantitative Aptitude for CAT by Arun Sharma |
| | |

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

| | |
|---|---|
| CO1 | To help students explore their values and career choices through individual skill assessments |
| CO2 | To make realistic employment choices and to identify the steps necessary to achieve a goal |
| CO3 | To develop and practice self-management skills for the work site |
| CO4 | To explore and practice basic communication skills |
| CO5 | To learn skills for discussing and resolving problems on the work site |
| CO6 | To assess and improve personal grooming |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTMC-T-MC-301 | **ENVIRONMENTAL ENGINEERING** | 2-0-0 | 0 | 150 |

| | |
|---|---|
| **Objectives** | To recognize the physical, chemical, and biological components of the earth's systems and show how they function. An environmental studies major will be able to apply lessons from various courses through field experiences. |
| **Pre-Requisites** | Knowledge of Science and technology in Secondary level. |
| **Teaching Pedagogy** | Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module -1** | Components of Earth System: Lithosphere, Cryosphere, Atmosphere, Hydrosphere, Biosphere and Outer space. Ecological concepts and natural Resources: Ecological perspective and value of environment, Environmental auditing, Biotic components.<br>Levels of organizations in environment Ecosystem Process: Energy, Food chain, Environmental gradients, Tolerance levels of environmental factor. | **7 Hours** |
| **Module -2** | Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative). Hydrological cycle, water balance, energy budget, precipitation, infiltration, evaporation and evapotranspiration.<br>Environmental Pollution: Definition, Causes, effects and control measures of: Water pollution, Air pollution, Noise pollution, Soil pollution, Marine pollution, Thermal pollution | **8 Hours** |
| **Module -3** | Nuclear hazards Environmental Issues: Climate change, Global warming, Acid rain, Ozone layer depletion, Sustainable development, Bio gas, Natural gas.<br>Biodiversity, Urban problems related to energy, water scarcity, Water conservation, rain water harvesting, artificial recharge, watershed management, carbon trading, carbon foot print National Ambient Air quality Standards, Noise standards, Vehicle emission standards | **6 Hours** |
| **Module -4** | Drinking water standard (IS 10500), Water Quality Criteria and wastewater effluent standards Water treatment: Water sources and their quality, Lay out of a water treatment plant and working of each unit/ principles of each process i.e. Screening, Aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection. | **6 Hours** |

| | | |
|---|---|---|
| **Module -5** | Miscellaneous treatment: Removal of color, tastes and odour control, removal of iron and manganese, fluoridation and defloridation. Advanced water treatment: Ion exchange, electro-dialysis, RO, desalination Working principles of ready-made water filter/purification system commercially available Lay out of a wastewater treatment plant and working of each unit. | **6 Hours** |
| **Module -6** | Solid waste management: Source, classification and composition of Municipal Solid Waste (MSW), Storage and transport of MSW, MSW management, Waste minimization of MSW, Reuse and recycling, Biological & thermal treatment (principles only), land fill Biomedical Waste management – sources, treatment (principles only) and disposal Hazardous Waste Management- Introduction, Sources, Classification, treatment (principles only) Introduction to e-waste management. Environmental impact Assessment: Project screening for EIA, Scoping studies Environmental policies and acts (Air, Noise, Water, Forest, E-waste, Hazardous waste acts). | **7 Hours** |
| | **Total** | **40 Hours** |

**Text Book:**

1. Environmental Engineering, G. Kiely, TMH, 2007

**Reference Books:**

1. Environmental Engineering, H.S. Peavy, D.R.Rowe and G. Tchobanoglous, McGraw Hill, 1985.
2. Introduction to Environmental Engineering, M. L. Davis and D. A Cornwell, McGraw Hill International, 2005.

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

| | |
|---|---|
| CO1 | Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge. |
| CO2 | Make use of their knowledge to interpret the data by experimental analysis to provide valid conclusions |
| CO3 | Identify, formulate, review research literature and analyze complex Environmental Engineering problems using fundamentals of mathematics, sciences and engineering. |
| CO4 | Develop solutions for Environmental Engineering problems and design system components and processes to meet the specified needs with appropriate consideration for the public health and safety. |
| CO5 | Apply the knowledge of mathematics, Science and Engineering fundamentals for solution of problems of Environmental Engineering. |
| CO6 | Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge. |

| Type | Code | Analog Electronics Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-P-PC-401 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | To design and develop analog circuits which will be useful for amplification, filtering, signal generation, voltage regulation, and data conversion |
| Pre-Requisites | Knowledge of Basic Electronics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| Experiment-1 | Design of BJT bias circuit and compare the results. | 2 Hours |
| Experiment-2 | Design JEET/MOSFET bias circuit and compare the results. | 2 Hours |
| Experiment-3 | Design and simulate BJT common-emitter circuit and compare D.C and A.C performance: | 2 Hours |
| Experiment-4 | Design of voltage divider Biasing for JFET and source follower configuration. | 2 Hours |
| Experiment-5 | Determining the frequency response of a common emitter amplifier: low frequency, high frequency and mid frequency response and compare with simulated results. | 2 Hours |
| Experiment-6 | Study of Darlington connection and current mirror circuits. | 2 Hours |
| Experiment-7 | Gain-Frequency response of OP-AMP | 2 Hours |
| Experiment-8 | Application of Op-Amp as differentiator, integrator, square wave generator. | 2 Hours |
| Experiment-9 | Design of R.C phase shift oscillator | 2 Hours |
| Experiment-10 | Study of Power Amplifier. | 2 Hours |

| Type | Code | Programming using PYTHON Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTCS-P-PC-405 | | 0-0-3 | 1 | 100 |

| | |
|---|---|
| Objectives | The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro-operations, identify the addressing modes used in macro instructions, apply algorithms for arithmetic operations and implementation for ALU design. |
| Pre-Requisites | Knowledge of Digital Electronics Circuits |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Lab No: | Name of the experiments | Hours |
|---|---|---|
| 1 | Python control statement | 2 Hours |
| 2 | Program on data type using Python. | 2 Hours |
| 3 | Program on matrix operation using Python | 2 Hours |
| 4 | Program on Function using Python. | 2 Hours |
| 5 | Program on String operation in python | 2 Hours |
| 6 | Program on object-oriented concept using python. | 2 Hours |
| 7 | File handling in Python. | 2 Hours |
| 8 | Program related to uses of Python modules (NumPy, Pandas) | 2 Hours |
| 9 | Python programming using Matplotlib | 2 Hours |
| 10 | Python programming for linear regression | 2 Hours |

| Text Books: |
|---|
| PYTHON Lab Manual, Department of CSE, GIFT, Bhubaneswar |

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

| | |
|---|---|
| CO1 | Understand the basic concept of Script language. |
| CO2 | Demonstrating the control statement in python |
| CO3 | Experiment on different data types in python. |
| CO4 | Ability to explore python especially the object-oriented concepts, and the built in objects of Python. |
| CO5 | Implementation of Python Modules. |
| CO6 | Ability to Create practical and contemporary applications on Machine learning. |

| Type | Code | Network Theory Laboratory | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEE-P-PC-301 | | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | To expose to the field of Electrical Circuit and analysis. |
| Pre-Requisites | Fundamental Electrical Circuit analysis that includes concepts of Electrical Engineering, Calculation of current, voltage, power. Knowledge of Basic fundamental of electrical circuit. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Expt No | Topic | Hours |
|---|---|---|
| 1 | Verification of Superposition & Reciprocity Theorem | 2 Hours |
| 2 | Verification of Thevenin's and Norton's Theorem | 2 Hours |
| 3 | Verification of Maximum Power Transfer Theorem | 2 Hours |
| 4 | Measure and calculate RL & RC time constant for a given RL & RC circuit | 2 Hours |
| 5 | Frequency response of series resonance circuit with analysis and design | 2 Hours |
| 6 | Frequency response of parallel resonance circuit with analysis and design | 2 Hours |
| 7 | Measure and calculate Z, Y parameters of two-port network. | 2 Hours |
| 8 | Design and frequency response of Low pass and high pass filter | 2 Hours |
| 9 | Design and frequency response of band pass filter | 2 Hours |
| 10 | PSPICE SIMULATION<br>1. Simulation of DC Circuits 2. Mesh Analysis 3. Nodal Analysis 4. DC Transient response | 2 Hours |
| | **Beyond Syllabus** | |
| 1 | Determination of self -inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit. | 2 Hours |
| 2 | Spectral analysis of a non-sinusoidal waveform. | 2 Hours |

| **Text Books:** | |
|---|---|
| **1** | Network Theory Lab Manual, Department of EEE, GIFT, Bhubaneswar |

| Ty | Code | Project-III | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PS | BTPS-P-PS-401 | | 0-0-3 | 2 | 150 |

| | |
|---|---|
| Objectives | The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro operations. |

| | |
|---|---|
| Pre-Requisites | Knowledge of Electrical & Electronics Circuits |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

**Projects**

1. Laser security Alarm
2. Binary code to grey code converter circuit
3. Train accident prevention using Arduino.
4. Smart irrigation system
5. Water tank alarm
6. Voice-controlled home automation system
7. Wireless weather monitoring system
8. Smart irrigation system using IoT
9. Fire alarm system using temperature and smoke sensors
10. Wireless power transmission using electromagnetic induction
11. Digital code lock using microcontrollers
12. Voltage level indicator for batteries
13. Ultrasonic distance measurement device
14. Rainwater detector and automated wiper control
15 Digital stopwatch using a microcontroller
16 Automatic doorbell with visitor counter
17. Real-time air quality monitoring system using IoT
18 Voltage stabilizer using op-amps

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

| | |
|---|---|
| CO1 | Identify Basic Organization of Computers. |
| CO2 | Identify the addressing modes used in macro instructions. |
| CO3 | Apply algorithms for arithmetic operations and implementation for ALU design. |
| CO4 | Develop micro code for typical instructions in symbolic form. |
| CO5 | Develop the pipeline and its performance. |
| CO6 | Identify Characteristics of Memory System. |

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# Syllabus
# for
# B.Tech (3rd Year)
# (2022 Admission Batch)

# Electronics and Communication Engineering

**(Approved by Academic Council and Board of Studies)**

**GIFT Autonomous Bhubaneswar**
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela) Recognized under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, Pincode: 752054

# 3rd Year Course Structure

| Fifth Semester | | | | | |
|---|---|---|---|---|---|
| **Theory** | | | | | |
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **WCH L-T-P** | **Credit** |
| 1 | PC | BTEC-T-PC-501 | Analog Communication | 4-1-0 | 3 |
| 2 | PC | BTEC-T-PC-502 | Digital Signal Processing | 4-1-0 | 3 |
| 3 | PC | BTEC-T-PC-503 | Microprocessor and Microcontroller | 4-1-0 | 3 |
| 4 | PE | BTEC-T-PE-501 | Mobile Communication | 4-1-0 | 3 |
| 5 | PE | BTEC-T-PE-502 | Control System | 4-1-0 | 3 |
| 6 | MC | BTMC-T-MC-501 | Universal Human Values | 2-0-0 | 0 |
| 7 | AEC | BTEC-T-AEC-505 | Employability Enhancement Training-D | 2-0-0 | 1 |
| Total Hours/ Credit **(Theory)** | | | | 29 | 16 |
| **Practical** | | | | | |
| 1 | PC | BTEC-P-PC-501 | Analog Communication Laboratory | 0-0-2 | 1 |
| 2 | PC | BTEC-P-PC-502 | Digital Signal Processing Laboratory | 0-0-2 | 1 |
| 3 | PC | BTEC-P-PC-503 | Microprocessor and Microcontroller Laboratory | 0-0-2 | 1 |
| 4 | PS | BTPS-P-PS-504 | Seminar-2 | 0-0-2 | 1 |
| 5 | PS | BTSC-P-SC-505 | Evaluation o Summer Internship 2 | 0-0-2 | 2 |
| Total Hours/ Credit(Practical) | | | | 10 | 6 |
| Grand Total Hours/ Credit(Practical) | | | | **39** | **22** |

| Sixth Semester | | | | | |
|---|---|---|---|---|---|
| **Theory** | | | | | |
| **Sl. No.** | **Category** | **Course Code** | **Course Title** | **WCH L-T-P** | **Credit** |
| 1 | BS | BTBS-T-BS-601 | Optimization Engineering | 4-1-0 | 3 |
| 2 | PC | BTEC-T-PC-601 | Microwave and Radar Engineering | 4-1-0 | 3 |
| 3 | PC | BTEC-T-PC-602 | Digital VLSI Design | 4-1-0 | 3 |
| 4 | PC | BTEC-T-PC-603 | Digital Communication | 4-1-0 | 3 |
| 5 | HS | BTHS-T-HS-601 | Entrepreneurship Development | 4-0-0 | 3 |
| 6 | OO | BTEC-T-OO-601 | NPTEL | 2-0-0 | 3 |
| 7 | MC | BTMC-T-MC-01 | Essence of Indian Knowledge Tradition -II | 2-0-0 | 0 |
| 8 | AEC | BTEC-T-AEC-605 | Employability Enhancement Training-E | 2-0-0 | 2 |
| Total Hours/ Credit **(Theory)** | | | | 30 | 20 |
| **Practical** | | | | | |
| 1 | PC | BTEC-P-PC-602 | Microwave and Radar Engineering Laboratory | 0-0-2 | 1 |
| 2 | PC | BTEC-P-PC-603 | Digital VLSI Design Laboratory | 0-0-2 | 1 |
| 3 | PC | BTEC-P-PC-603 | Digital Communication Laboratory | 0-0-2 | 1 |
| 4 | PS | BTEC-T-PS-604 | Project-II | 0-0-2 | 2 |
| Total Hours/ Credit(Practical) | | | | 8 | 5 |
| Grand Total Hours/ Credit(Practical) | | | | **38** | **25** |
| **SUMMER INTERNSHIPTRAINING for 30Days** | | | | | |

# Program Outcomes (UG Engineering)

**Program Outcomes** (POs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The Program Outcomes (POs) for UG Engineering programmes defined by NBA are:

PO1. **Engineering Knowledge**:Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problem

PO2. **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the
engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Types & Definitions

| | |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Laboratory / Practical / Sessional |
| WCH | Weekly Contact Hours |
| BS | Basic Sciences |
| HS | Humanities & Social Sciences (including Management) ES |
| | Engineering Sciences |
| PC | Professional Core |
| PE | Professional Elective |
| OE | Open Elective |
| MC | Mandatory Course |
| SC | Skill Course |
| EEC | Employability Enhancement Course |
| SEPD | Skill Enhancement and Personality Development |

# Part 2

# 3rd Year B. Tech.
# (Electronics and Communication Engineering)

# Evaluation Scheme

**Mark Distribution for Internal & External Examinations for all Courses- 2023-24**

| Proposed Internal Examination (B. Tech, Autonomous) | | | | | |
|---|---|---|---|---|---|
| **Sr No** | **Type of Test** | **Mark** | **Frequency** | **Total Mark** | **Reduced Mark** |
| 1 | Modular Test | 25 | 4 | 100 | **50** |
| 2 | Online Quiz Test | 10 | 4 | 40 | **10** |
| 3 | Assignment | 10 | 2 | 20 | **10** |
| 4 | Subject Specific Project | 15 | 1 | 15 | **15** |
| 5 | Attendance | 15 | 1 | 15 | **15** |
| **TOTAL** | | | | 190 | **100** |
| **Pass Mark** | | | | | **45** |

| Proposed External Examination (B. Tech, Autonomous) | | | | |
|---|---|---|---|---|
| **Sl No** | **Type of Test** | **Mark** | **Frequency** | **Total Mark** |
| 1 | End Semester Examination | 100 | 1 | **100** |
| **Pass Mark** | | | | **35** |

**Instructions:**

1. Each student must appear in all of the above internal examinations without fail.
2. No exemption or accommodation of request will be entertained.
3. In case of exigency, or self-illness the student must submit ample evidence to re-appear the test. Since the schedule of the examination is non-negotiable, the request shall be sent to the competent authority.
4. Appearance of modular tests is part of the curriculum; hence each student is urged to appear for each modular test. Due penalty as per the examination rule shall be imposed.
5. For not qualifying or to improve the individual subject score in internal the student must appear on the improvement test after successful registration in CMS.

**Evaluation Process of Practical Subjects:**

| **Components** | **Marks** | **Frequency** | **Assigned To** |
|---|---|---|---|
| Attendance | 10 | Closing of Instruction | To be retrieved from CMS |
| Daily Performance & Viva-voce | 40 | On the day of Experiment | Concerned Faculty (Upload in CMS in weekly basis) |
| Lab Record | 20 | On the day of Experiment | Concerned Faculty |
| End-Semester Lab Test | 30 | 1 | At the end of the semester as per the schedule published by Examination Cell |
| **Total** | **100** | | |

**Evaluation Process of Mandatory Courses:**

| **Components** | **Marks** | **Frequency** | **Assigned To** |
|---|---|---|---|
| In-Semester Evaluation | 100 | 1 | Examination Cell/ Concerned Faculty |
| **Total** | **100** | | |
| | | | |

# Fifth Semester

| Type | Code | Analog Communication | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-501 | | 3-1-0 | 3 | 150 |

| | |
|---|---|
| Objectives | 1-To introduce the concepts of analog communication systems<br>2-To study different Modulation and different techniques.<br>3-To introduce the concept of wave propagation. |
| Pre-Requisites | Basic knowledge of signals and systems, trigonometry, and probability theory is Required. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus :**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Basics 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. | **6 Hours** |
| **Module-2** | 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. | **7 Hours** |
| **Module-3** | 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 | **7 Hours** |
| **Module-4** | Introduction of Radio Receivers and Demodulators, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Super heterodyne receivers, RF amplifier, Local oscillator and mixer, IF amplifier, AM Detectors: Envelop detector and practical diode detector. FM Detectors: Slope detector, phase discriminator and ratio detector | **8 Hours** |
| **Module-5** | Noise Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature. | **6 Hours** |
| **Module-6** | Radiation and Wave Propagation Radiation: Introduction, Basic Antenna system, Antenna parameters, Di – pole antennas, Yagi Uda antenna. Wave propagation: Ground wave, sky wave, space wave, Troposphere scatter, Extraterrestrial propagation. Ionosphere: Structure, properties of layers of Ionosphere. | **6 Hours** |
| **Total** | | **40Hours** |

| Text Books: | |
|---|---|
| **1** | "Electronic Communication System" ,Kennedy & Devis, Tata Mc Graw Hill . |
| **2** | Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008. |
| **3** | Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed. |
| **Reference Books:** | |
| **1** | Analog communications-K.N.Hari Bhat & Ganesh Rao, Pearson Publication, 2 nd Ed |
| **2** | Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004 |
| **3** | Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007. |
| **4** | Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005 |
| **5** | Communication Systems – B.P. Lathi, BS Publication, 2006. |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/117/105/117105143/: by Prof. G. Das, IIT Kharagpur |
| **2** | https://nptel.ac.in/content/storage2/nptel data3/html/mhrd/ict/text/117105143/lec60. |
| **3** | http://www.digimat.in/nptel/courses/video/117105143/L22.html |
| **4** | http://www.nptelvideos.in/2012/11/communication-engineering.html |

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

| | |
|---|---|
| CO1 | Understand the concept of basic communication system. |
| CO2 | Attain the knowledge about Amplitude Modulation Techniques. |
| CO3 | Attain the knowledge about Amplitude Modulation Techniques. |
| CO4 | Understand the operation of Radio receivers and transmitters. |
| CO5 | Analyze the performance of AM and FM systems in presence of noise signals. |
| CO6 | Understand the concept of wave propagation. |

| Type | Code | Digital Signal Processing | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-502 | | 3-1-0 | 3 | 150 |

| | |
|---|---|
| Objectives | 1-To study processing of digital signals using Z-transform,<br>2-To study processing of digital signals discrete Fourier transform.<br>3-To understand concept of IIR & FIR filters |
| Pre-Requisites | Basic knowledge of signals and systems is required. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Basic elements of digital signal Processing: Review of Discrete time signals and Discrete time systems .Review of Z-Transform, properties, inverse z-transform. Analysis of Linear time invariant systems –Z transforms –Convolution and correlation. | **6 Hours** |
| **Module-2** | Introduction to DFT:-Discrete Fourier Transform, DFT as a Linear Transformation, Frequency domain sampling and Reconstruction of Discrete Time Signals, Properties of DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution. | **6 Hours** |
| **Module -3** | Linear filtering methods based on the DFT:- Use of DFT in Linear Filtering,<br>Efficient Computation of DFT: FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT Algorithms, Decimation-In-Time (DIT), Decimation-In-Time (DIF). Use of FFT algorithms in Linear Filtering and correlation. | **8hours** |
| **Module-4** | Structure and Design of FIR : Structure for the Realization of Discrete-Time Systems, Structure of FIR Systems: Direct- Form Structure, Cascade-Form Structure<br>Design of FIR Filters: Design of FIR Filters by using Windows method, Design of FIR Filters by Frequency Sampling Method.. | **7Hours** |
| **Module-5** | Structure and Design of IIR Systems: Direct-Form Structure, Signal Flow Graphs and Transposed Structure, Cascade-Form Structure, Parallel-Form Structure.<br>Design of IIR Filters. Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation. | **7 hours** |
| **Module-6** | Introduction to Multi-rate Signal Processing: Interpolation, Decimation, sampling rate conversion by rational factor | **6Hours** |
| **Total** | | **40Hours** |

| Text Books: | |
|---|---|
| **1** | J. G. Proakis and D. G. Manolakis, Digital Signal Processing : Principles, Algorithms and Applications, 4th Edition, Prentice Hall India, 2007. |
| **2** | A. V. Oppenheim, A. S. Willsky, and S. H. Nawab, Signals and Systems, 2nd Edition, Prentice Hall India, 1992 |
| **3** | . S. K. Mitra, Digital Signal Processing : A Computer Based Approach, 4th Edition, McGraw Hill, 2013. |
| **Reference Books:** | |
| **1** | L. R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, 2nd Edition, Prentice Hall India, 1992. |
| **2** | J. R. Johnson, Introduction to Digital Signal Processing, 2nd Edition, Prentice Hall India, 1992. |
| **3** | A. N. Kani, Digital Signal Processing, 2nd Edition, McGraw Hill Education, 2017. |
| **4** | P. R. Babu, Digital Signal Processing, 4th Edition, Scitech Publication, 2011. |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/117104070/: by Prof. T. K. Basu, IIT Kharagpur |
| **2** | https://nptel.ac.in/courses/108/106/108106151/: by Prof. C. S. Ramalingam, IIT Madras |
| **3** | https://nptel.ac.in/courses/117102060/: by Prof. S. C. Dutta Roy, IIT Delhi |

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

| | |
|---|---|
| CO1 | Explain the stability and causality of the LTI systems using Z-Transform. |
| CO2 | Analyze discrete signals & systems using DFT technique. |
| CO3 | Use DFT techniques for linear filtering. |
| CO4 | Realize different structures of FIR and IIR discrete time systems. |
| CO5 | Design IIR and FIR filters using various techniques. |
| CO6 | Describe the basics of Multi-rate Signal Processing |

| Type | Code | Microprocessors and Microcontrollers | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEC-T-PC-503 | | 3-1-0 | 3 | 150 |

| | |
|---|---|
| Objectives | 1- To be familiar about different microprocessors & microcontrollers,<br>2- To be familiar with applications specific processor.<br>3- To be familiar with interfacing of different microprocessor and microcontroller.. |
| Pre-Requisites | Basic knowledge of Digital Electronic Circuits is required |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on theory and programming activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction: 8085 microprocessor & its organization, General architecture, Bus organization, Memory concepts, Pins and Signals, Instruction execution, Timing diagram, Instruction Set & programming, Addressing modes, Memory interfacing, Interrupts | **6 Hours** |
| **Module-2** | Intel 8086 Microprocessor: Bus Interface unit, Execution Unit, Register Organization, Memory Segmentation, Pin architecture, Minimum and Maximum mode, Physical Memory Organization, Memory Interfacing, Interrupts, Addressing Modes, Instructions; Overview of Co-processor Architectures – Intel 80286,80386,80486, Pentium. | **6 Hours** |
| **Module-3** | Introduction to RISC processors; ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing. | **8 Hours** |
| **Module-4** | Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture. Application of ARM Processor. | **10 Hours** |
| **Module-5** | Interfacing with Peripheral ICs: System level interfacing design with various ICs like 8255 Programmable Peripheral Interface, 8257 DMA Controller, 8259 Programmable Interrupt Controller, 8251 Programmable Communication Interface. | **6 Hours** |
| **Module-6** | Concepts of virtual memory, Cache memory,Microcontrollers: 8051 systems – Introduction to 8051 Microcontrollers, Architecture, Memory Organization ATMEGA 328P microcontroller:-Introduction of ATMEGA 328P,Pin Description,Architecture and Memory Segmentation. | **4 Hours** |
| **Total** | | **40 Hours** |

| Text Books: | |
|---|---|
| 1 | R. S. Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8085,6th Edition, Penram International Publishing, 2013. |
| 2 | D. A. Patterson and J. H. Hennessy, Computer Organization and Design: The Hardware/Software Interface 5th edition, Morgan Kaufman Publishers, 2013. |
| 3 | Microprocessors and Interfacing, Programming & Hardware - Douglas V. Hall,McGraw Hill Education Pvt Ltd., 3rd edition. |
| **Reference Books:** | |
| 1 | Microprocessors & Microcomputer based System Design - Md. Rafiquzzaman, 2nd edition. |
| 2 | Microcontroller Theory & Applications - Deshmukh, McGraw Hill Education Pvt Ltd. |
| **Online Resources:** | |
| 1 | https://www.electronics-tutorials.ws/ |
| 2 | https://nptel.ac.in/courses/108107029/: by Dr. P.Agarwal, IIT Roorkee |
| 3 | https://nptel.ac.in/courses/106108100/: by Prof. Krishna Kumar IISc Bangalore |
| 4 | http://www.electrical4u.com/circuit-analysis.htm |
| 5 | http://www.allaboutcircuits.com |

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

| | |
|---|---|
| **CO1** | To understand the basic concept of 8085 microprocessor,bus organization,memory concept,instruction set, its architecture, Addressing modes etc. |
| **CO2** | To analyze the architecture of a 16-bit Microprocessor 8086 including the concept of instruction queue, |
| **CO3** | To compare the processors like RISC,ARM etc. |
| **CO4** | To analyze the architecture of ARM, CORTEX, OMAP etc processor. |
| **CO5** | To understand the features of the peripherals such as PPI, Programmable interrupt control, USART and their interfacing with a 16-bit processor |
| **CO6** | To realize basic concept of 8051 and ATMEGA328P microcontroller. |

| Type | Code | Mobile Communication | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PE | BTEC-T-PE-501 | | 3-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | 1-To know the evolution of Mobile communication and cell concept to improve capacity of the system.<br>2-To know the fading mechanism and types of fading and effect of fading on Mobile communication.<br>3-To know the role of equalization in Mobile communication and to study different types of Equalizers and Diversity techniques. |
| Pre-Requisites | Basic concepts of communication. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on theory and programming activities. |

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to Cellular Mobile Systems<br>Why cellular mobile communication systems? A basic cellular system, Evolution of mobile radio communications, Performance criteria, Characteristics of mobile radio environment, Operation of cellular systems. Examples for analog and digital cellular systems. | **8 Hours** |
| **Module-2** | Cellular Radio System Design<br>General description of the problem, Concept of frequency reuse channels, Cochannel interference reduction, | **6 Hours** |
| **Module - 3** | Desired C/I ratio, Cell splitting and sectoring. Handoffs Why handoffs and types of handoffs, Initiation of handoff, Delaying a handoff, Forced handoffs, Queuing of handoffs, Power-difference handoffs, Mobile assisted handoff and soft handoff, Cell-site handoff, Intersystem handoff. | **6 Hours** |
| **Module - 4** | Dropped Calls<br>Introduction to dropped call rate.<br>Equalization : Fundamentals of Equalizers, Linear equalizers, Non-linear equalizers, Decision feedback equalizers, MLSE.<br>Introduction to Diversity | **8 Hours** |
| **Module - 5** | Multiple Access Techniques for Wireless Communications<br>Introduction, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple<br>Access and Space Division Multiple Access. | **6 Hours** |
| **Module - 6** | Global System For Mobile (GSM) overview, Examples for 2G, 3G and 4G systems. Introduction to 5G system. | **6 Hours** |
| | **Total** | **40 Hours** |

| | |
|---|---|
| **Text Books:** | |
| **1** | Theodore S. Rappaport - Wireless Communications Principles and Practice, 2nd Edition, Pearson Education, 2003. |
| **2** | Andreas F.MOlisch - Wireless Communications,J ohn Wiley, 2nd Edition, 2006. |
| **Reference Books:** | |
| **1** | Kamilo Feher - Wireless Digital Communications, PHI, 2003 |
| **2** | W.C.Y. Lee - Mobile Cellular Communications, 2nd Edition, MC Graw Hill, 1995. |
| **3** | Yi-Bing Lin - Wireless and Mobile Network Architectures, 2nd Edition, Wiley, 2008. |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/106/105/106105082/: by Prof. A. Pal, IIT Kharagpur |
| **2** | https://nptel.ac.in/courses/106/108/106108098/: by Prof. H.S. Jamadagni, IISc Bangalore |
| **3** | https://nptel.ac.in/courses/106/105/106105081/: by Prof. S. Ghosh, IIT Kharagpur |
| **4** | https://nptel.ac.in/courses/106/105/106105183/: by Prof. S. Chakraborty and Prof. S. K. Ghosh, IIT Kharagpur |

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

| | |
|---|---|
| CO1 | Demonstrate knowledge on : cellular concepts like frequency reuse, fading, equalization, GSM ,CDMA |
| CO2 | Demonstrate knowledge hand-off and infertace and apply the concept to calculate link budget using path loss model |
| CO3 | Analyze fading mechanism and types of fading and effect of fading on Mobile communication |
| CO4 | Understand the concept of equalization and different diversity techniques. |
| CO5 | Apply the concept of GSM in real time applications. |
| CO6 | Compare different multiple access techniques in mobile communication. |

**Detailed Syllabus :**

| Type | Code | Control System Engineering | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| PC | BTEE-T-PC-501 | | 5-1-0 | 4 | 150 |

| | |
|---|---|
| Objectives | 1.Understand the concepts of control systems and importance of feedback in control systems.<br>2.To expose to the field of control system and stability analysis.<br>3.Analyse different types of control systems like linear and non-linear control systems, etc. |
| Pre-Requisites | Fundamental control analysis that includes concepts of Electrical control systems, And stability analysis electrical systems. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities. |

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | **Comprehensive Study of Industrial Control Systems and Feedback Mechanisms:-** Introduction to industrial control system. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Negative Feedback, Signal Flow Graph and Mason's Gain formula. | **6 Hours** |
| **Module-2** | **Standard test Signal and its response:-**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. Concept of Stability, Relative Stability analysis. Root-Locus technique. Construction of Root-loci. | **8 Hours** |
| **Module - 3** | **Exploring Control System Dynamics & PID Design:-**Relationship between time and frequency response, Polar plots, Bode plots. Nyquist-stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response: Constant M Circle, Constant N Circle. Stability, insensitivity and robustness of control systems. | **8 Hours** |
| **Module - 4** | **Exploring the methods of stability and concept of PID Design:**-Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers | **6 Hours** |
| **Module - 5** | **State-Space Mastery: Variables, Stability, and Discrete-Time Systems:-**<br>Lead and Lag compensation in designs, Analysis of transient and steady-state system responses , Stability analysis using Routh-Hurwitz criteria | **6 Hours** |
| **Module - 6** | **Advanced Control Systems and Applications**<br>Types of control systems: linear, non-linear, analog, digital , Different control strategies ,Practical applications and exercises | **6 Hours** |
| **Total** | | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991 |
| **2** | I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009. |
| **Reference Books:** | |
| **1** | M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997. |
| **2** | B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995. |
| | |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/108/102/108102043/ |

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

| | |
|---|---|
| CO1 | Understanding industrial control systems, encompassing mathematical modeling, hardware analysis, transfer functions, feedback control, and signal flow analysis techniques |
| CO2 | Analyze the stability criteria and concept of stability. |
| CO3 | Listing in frequency-domain analysis and stability criteria with practical application of PID controller tuning methods for desired performance and stability margins. |
| CO4 | Acquiring expertise in the relationship between time and frequency responses, including robustness analysis, disturbance rejection, and design specifications in the frequency domain.. |
| CO5 | Apply PLC technique for compensation. |
| CO6 | Developing expertise in state-space models and stability analysis for discrete-time systems. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| | | **UNIVERSAL HUMAN VALUES** | 2-0-0 | 0 | 100 |

| | |
|---|---|
| **Objectives** | 1-To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.<br>2-To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.<br>3-To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature. |
| **Pre-Requisites** | The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection. |
| **Teaching Pedagogy** | Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts. |

## Detailed Syllabus

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | **Foundations of Value Education-A**<br>Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education); Understanding Value Education; Self-exploration as the Process for Value Education. | **3 Hours** |
| **Module-2** | **Foundations of Value Education-B**<br>Continuous Happiness and Prosperity - the Basic Human Aspiration; Happiness and Prosperity-Current Scenario; Method to Fulfill the Basic Human Aspirations. | **3 Hours** |
| **Module-4** | **Harmony in the Human Life, Relationships and Society-B**'Trust'& 'Respect'–as Foundational Values in Relationship; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society & Universal Human Order. | **3 Hours** |
| **Module-5** | **Harmony in the Nature/Existence & Professional Ethics-A** Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature; Realizing Existence as Co-existence at All Levels | **3 Hours** |

| | | |
|---|---|---|
| **Module-6** | **Harmony in the Nature/Existence & Professional Ethics-**B The Holistic Perception of Harmony in Existence; Natural Acceptance of Human Values; Humanistic Education, Humanistic Constitution and Universal Human Order ; Competence in Professional Ethics – Ethical Decision Making&Transition towards Value-based Life and Profession. | **4 Hours** |

| **Text Books:** | |
|---|---|
| **1** | A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1 |
| **2** | Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. |
| **3** | Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009. |
| **4** | Small is Beautiful - E. F Schumacher. |
| **5** | B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008. |

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

| | |
|---|---|
| CO1 | To understand and analyses the foundations of value education, essentials of human values and skills, self-exploration, happiness and prosperity. |
| CO2 | Understand and analyze the foundations of value education, continuous happiness, and prosperity and basic human aspirations. |
| CO3 | Identify and evaluate the role of harmony in human life, relationship and harmony in family and society. |
| CO4 | Understand and associate the holistic perception of harmony at all levels such as existence of trust and respect, justice in human to human relationship. |
| CO5 | Develop appropriate technologies and management patterns to create harmony in professional and personal lives, harmony in the Nature/Existence such as understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfillment. |
| CO6 | Develop appropriate technologies and management patterns to create harmony in professional and personal lives like Natural Acceptance of Human Values. |

| Type | Code | Embloyability Enhancement Training-D | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTSC-T-SC-501 | | 2-0-0 | 1 | 150 |

| | |
|---|---|
| Objectives | 1.To significantly raise the employability of the students<br>2.To a level where they are able to clear campus selection process<br>3.And at the same time develop an attitude of constant self-improvement throughout their career |
| Pre-Requisites | Basic knowledge of core branch subjects. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module-# | Topics | Hours |
|---|---|---|
| **Module-1** | Basics of semiconductors; Diode/Transistor basics and characteristics; Diodes for different uses; Junction & Field Effect Transistors (BJTs, JFETs, MOSFETs); Transistor amplifiers of different types, oscillators and other circuits; Basics of Integrated Circuits (ICs). | **3 Hours** |
| **Module-2** | Basics of MOS and CMOS ICs; Basics of linear ICs, Basics of operational amplifiers and their applications-linear/non-linear.Basics of multiplexers, counters/registers/ memories /microprocessors, design & applications. Digital communication basics: Sampling, quantizing, coding, PCM, DPCM, multiplexing-audio/video. | **4 Hours** |
| **Module-3** | Digital modulation: ASK, FSK, PSK; Multiple access: TDMA, FDMA, CDMA; Basics of multiplexers, counters/registers/ memories /microprocessors, design & applications. | **3 Hours** |
| **Module-4** | Analog versus digital communication & applications: Systems- AM, FM, transmitters/receivers, SNR comparison; Digital communication basics: Sampling, quantizing, coding, PCM, DPCM, multiplexing-audio/video; Digital modulation: ASK, FSK, PSK; Multiple access: TDMA, FDMA, CDMA. | **4 Hours** |
| **Module-5** | Basics of Dbms, Data modelling, Relational Data model, Normalization ,Hashing<br>Basics of Data structure, DS array, DS linked list, DS searching, DS sorting<br>Basics of SQL,SQL database. | **3 Hours** |
| **Module-6** | Number analogy, Seating arrangement(linear,circular),Number system, Percentage, Profit and loss SI & CI, HCF and LCM,Time and Work,Pipe and Cistern | **3 Hours** |
| | **Total** | **20Hours** |

| Text Books: | |
|---|---|
| 1 | Modern Digital and Analog Communications Systems: B.P. Lathi |
| 2 | Semiconductor Physics and Devices: Donald A. Neaman |
| | |
| **Reference Books:** | |
| 1 | Fundamentals of database systems(Ramez Elmsari,Shamkant B.Navathe) |

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

| | |
|---|---|
| CO1 | To help students explore their values and career choices through individual skill assessments |
| CO2 | To make realistic employment choices and to identify the steps necessary to achieve a goal |
| CO3 | To develop and practice self-management skills for the work site |
| CO4 | To explore and practice basic communication skills |
| CO5 | To learn skills for discussing and resolving problems on the work site |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-301 | **Digital Signal Processing Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | To explain the use of MATLAB software in evaluating different signal processing techniques. |
| Pre-Requisites | MATLAB programming language. • Basic operation such as creating file, delete, copy, rename etc should be known. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples |

**Detailed Syllabus**

| Expt. No. | Topic |
|---|---|
| 1 | Verification of Sampling Theorem both in time and frequency domains. |
| 2 | Evaluation of impulse response of a system. |
| 3 | To perform linear convolution of given sequences. |
| 4 | To perform circular convolution of given sequences using (a) the convolution summation formula (b) the matrix method and (c) Linear convolution from circular convolution with zero padding |
| 5 | Computation of N – point DFT and to plot the magnitude and phase spectrum. |
| 6 | Linear and circular convolution by DFT and IDFT method. |
| 7 | Solution of a given difference equation. |
| 8 | Calculation of DFT and IDFT by FFT |
| 9 | Design and implementation of IIR filters to meet given specification (Low pass, high pass, band pass and band reject Filters) |
| 10 | Design and implementation of FIR filters to meet given specification (Low pass, high pass, band pass and band reject filters) using different window functions |

| **Text Books:** | |
|---|---|
| **1** | Digital Signal Processing Lab Manual, Department of ECE, GIFT, Bhubaneswar |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Show the physical interpretation of sampling theorem in time and frequency domains |
| CO2 | Evaluate the impulse response of a system |
| CO3 | Perform convolution of given sequences to evaluate the response of a system |
| CO4 | Compute DFT and IDFT of a given sequence using the basic definition and/or fast methods |
| CO5 | Provide a solution for a given difference equation. |
| CO6 | Design and implement IIR and FIR filters. |

| Type | Code | | L- | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-301 | **Analog Communication Laboratory** | 0- | 1 | 100 |

| | |
|---|---|
| Objectives | The objective of this course is to study electronic communication systems, modulation techniques, digital transmission of analog and digital signal |
| Pre-Requisites | Basic knowledge of signals and systems, trigonometry, and probability theory is required. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Expt. No. | Topic |
|---|---|
| 1 | Amplitude modulation and demodulation |
| 2 | Frequency modulation and demodulation. |
| 3 | Frequency Division Multiplexing & De multiplexing |
| 4 | Pulse Amplitude Modulation & Demodulation, Pulse Width Modulation & Demodulation, Pulse Position Modulation & Demodulation. |
| 5 | Pulse Code Modulation & Demodulation |
| 6 | Time Division Multiplexing & Demultiplexing |
| 7 | Using MATLAB/ LABVIEW generate a carrier and a modulating signal. Modulate the carrier using AM. Show the waveform in time domain and analyze its frequency spectrum |
| 8 | Using MATLAB/ LABVIEW generate a carrier and a modulating signal. Modulate the carrier using FM. Show the waveform in time domain and analyze its frequency spectrum |
| 9 | PPM using MAT LAB. |
| 10 | TDM using MAT LAB. |

| **Text Books:** | |
|---|---|
| **1** | Analog Communication Technique Lab Manual, Department of ECE, GIFT, Bhubaneswar |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Demonstrate the modulation and demodulation techniques. |
| CO2 | Demonstrate frequency multiplexing techniques. |
| CO3 | Analyze various pulse modulation techniques. |
| CO4 | Demonstrate time multiplexing techniques. |
| CO5 | Demonstrate modulation techniques using Labview and MATLAB. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-301 | **Microprocessor and Microcontroller Laboratory** | 0-0-2 | 1 | 1 |

| | |
|---|---|
| Objectives | The objective of the course is to provide hands-on practice on programming of different microprocessors and microcontrollers and their interfacing with external devices |
| Pre-Requisites | Basic analytical & logical understanding including basic knowledge and usage of Digital Electronics is required. |
| Teaching Pedagogy | Regular laboratory experiments to be conducted using hardware and software tools under the supervision of the teacher; the experiments shall consist of programming assignments. |

**Detailed Syllabus**

| Expt. No. | Topic |
|---|---|
| 1 | Programs of addition of two 8 bit number using 8085. |
| 2 | Program of Complement of 16 bit number using 8085. |
| 3 | Programs for 16 bit arithmetic operations using 8086. |
| 4 | Programs for Sorting and Searching (using 8086). |
| 5 | Programs for String manipulation operations (using 8086). |
| 6 | Programs for Digital clock and Stop watch (using 8086). |
| 7 | Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller. |
| 8 | Programming for obstacle detection using ATMEGA 328P microcontroller and IR Sensor. |
| 9 | Programming for Fire detection using ATMEGA 328P microcontroller and Fire Sensor. |
| 10 | Programming for Gas detection using ATMEGA 328P microcontroller and Gas Sensor. |

| **Text Books:** | |
|---|---|
| **1** | Microprocessor and Microcontroller Lab Manual, Department of ECE, GIFT, Bhubaneswar |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Express the fundamentals of evolution, operating concept, and assembly language programming & instruction sets of 8085 Microprocessor. |
| CO2 | Express the fundamentals of evolution, operating concept, and assembly language programming & instruction sets of 8086 Microprocessor. |
| CO3 | Demonstration of application specific operations programming of microprocesoor. |
| CO4 | Analyze the assembly level programming of 8051 microcontroller & its functions for various applications. |
| CO5 | Design application specific programming using ATMEGA328P microcontroller. |

# Sixth Semester

| Type | Code | Optimization Engineering | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| | | | | | 150 |

| | |
|---|---|
| Objectives | 1.Impart knowledge on theory of optimization and conditions for optimality for unconstraint and constraint optimization problems<br>2.Inculcate modeling skills necessary to describe and formulate optimization problems in design and manufacturing<br>3.Familiarize with the working principle of optimization algorithms used to solve linear and non-linear problems |
| Pre-Requisites | Fundamentals of Engineering Mathematics |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detail Syllabus :**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Idea of engineering optimization problems, modeling of problems and principle of modeling,Linear Programming: Formulation of LPP, Graphical | **5 Hours** |
| **Module-2** | Simplex method, Big-M method, Dual simplex method, Duality theory. | **7 Hours** |
| **Module -3** | Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule,Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method,Assignment problems: Hungarian method for solution of Assignment problems. Travel | **10 Hours** |
| **Module -4** | Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method. | **5 Hours** |
| **Module -5** | Non-linear programming problem: Constrained optimization with equality constraint: Lagrange multiplier method. Constrained optimization with inequality constraint: Kuhn-Tucker condition. | **5 Hours** |
| **Module -6** | Inventory Theory: General characteristics, Deterministic Inventory models: EOQ model with constant rate of demand, different rates of demand, EPQ Model. | **8 Hours** |
| **Total** | | **40 Hours** |

| | |
|---|---|
| **Text Books:** | |
| **1** | Operation Research: J K Sharma Macmillan India Ltd. |
| **2** | Operation Research, Prabhakar Pai ,Oxford University Press |
| **Reference Books:** | |
| **1** | Operations Research, H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, Pearson Education, Eighth Edition. |
| **2** | Engineering Optimization, S S Rao, New Age International Pvt Ltd, 2003. |
| **3** | Engineering Optimization, A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Wiley India Pvt. Ltd, Second edition. |
| **4** | Operations Research, F.S.Hiller, G.J.Lieberman, Tata McGraw Hill, Eighth Edition, 2005. |
| **5** | Operations Research, P.K.Gupta, D.S.Hira, S.Chand and Company Ltd, 2014. |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/111/104/111104071/ |

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

| | |
|---|---|
| CO1 | Formulate the engineering problems as an optimization problem. |
| CO2 | Apply necessary and sufficient conditions for a given optimization problem for optimality |
| CO3 | Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms |
| CO4 | Justify and apply the use of modern heuristic algorithms for solving optimization problems |
| CO5 | Solve Engineering Design and Manufacturing related optimization problem using software tools. |

| Type | Code | Microwave and Radar Engineering | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| | | | | | 150 |

| | |
|---|---|
| Objectives | 1.To study the objective of this course is to study microwaves, their frequency bands.<br>2.To study the microwave tubes, amplifiers, components,microwave solid state devices<br>3.To study the principles of radar, and scanning & tracking techniques. |
| Pre-Requisites | Basic knowledge of Circuit Theory, Electromagnetic Theory, and Solid State Physics is required. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to RF and HF Circuits - Overview of RF and HF circuit ,applications, Introduction to passive components in high-frequency environments, RF Amplifiers and Filters. | **6 Hours** |
| **Module-2** | Microwave Tubes- Construction and operation of Microwave Tube ;Types of Microwave Tube, Properties of Klystron Amplifier, reflex Klystron, Magnetron, Travelling Wave Tube (TWT); Backward Wave Oscillator (BWO) | **6 Hours** |
| **Module-3** | Microwave Solid State Devices- Introduction of Microwave Solid State Devices ,Limitation of conventional solid state devices at Microwaves, Diodes (Tunnel, Varactor, PIN), Transferred Electron Devices (Gunn diode); Avalanche transit time effect (IMPATT); Microwave Amplification by Stimulated Emission of Radiation (MASER). | **8 Hours** |
| **Module -4** | Microwave Components- Analysis of Microwave components using s-parameters, Junctions (E, H, Hybrid), Directional coupler; Bends and Corners; Microwave posts, S.S. tuners, Attenuators, Phase shifter, Ferrite devices (Isolator, Circulator, Gyrator); Cavity resonator. | **8 Hours** |
| **Module -5** | Introduction to Radar Systems- Basic Principle ,Block diagram and operation of Radar; Radar range Equation; Pulse Repetition Frequency (PRF) and Range Ambiguities. Doppler Radars- Doppler determination of velocity, Continuous Wave (CW) radar and its limitations, Frequency Modulated Continuous Wave (FMCW) radar | **6 Hours** |
| **Module- 6** | Applications of Radar, Range tracking systems, Doppler (velocity) tracking systems, Basic principle and operation of Moving Target Indicator (MTI) radar, Delay line cancellers, Blind speeds and staggered PRFs. Scanning and Tracking Techniques | **6 Hours** |
| **Total** | | **40 Hours** |

| Text Books: | |
|---|---|
| 1 | Microwave Engineering, David M. Pozer, Fourth Edition, Wiley Publications, 2011. |
| 2 | Microwave Engineering, Sushrut Das, Oxford University Press, 2014. |
| 3 | Introduction to radar systems, Merill I. Skolink, McGraw Hill Publications, Second Edition, 2001 |
| 4 | Microwave and Radar Engineering, G. S. Rao, Pearson India Publisher, 2014 |
| **Reference Books:** | |
| 1 | Microwave devices and Circuits, Samuel Liao, Pearson Education Publisher, Third Edition,1990. |
| 2 | Foundation of Microwave Engg, R.E. Collin, Second Edition,Wiley Publications, 2007 |
| 3 | Microwave devices and Radar Engg, M. Kulkarni; Umesh Publications, Fifth Edition,1998 |
| 4 | Microwave Engineering, Subol Kar, University Press. |
| 5 | |
| **Online Resources:** | |
| 1 | https://nptel.ac.in/courses/108/103/108103141/ |
| 2 | https://nptel.ac.in/courses/108/101/108101112/ |
| 3 | https://nptel.ac.in/courses/117/105/117105130/: by Prof. A. Bhattacharya, IIT Kharagpur. |
| 4 | https://nptel.ac.in/courses/117/105/117105122/: by Prof. A. Bhattacharya, IIT Kharagpur |
| 5 | https://nptel.ac.in/courses/117/101/117101119/: by Prof. J. Mukherjee, IIT Bombay |

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

| | |
|---|---|
| CO1 | Describe conventional vacuum tubes, their limitations, microwaves, and their sources. |
| CO2 | Explain the principle of operation of various microwave amplifiers. |
| CO3 | Identify, describe, and explain different microwave components |
| CO4 | Explain the basic principle of Radar, various scanning and tracking techniques. |
| CO5 | Understand the principle of microwave generation using solid state devices |
| CO6 | Understand the applications of RADAR. |

| Type | Code | Digital VLSI Design | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| | | | | | 150 |

| | |
|---|---|
| Objectives | 1.The objective of this course is to study the design, fabrication.<br>2.To study the testing of devices, circuits & systems using integrated micro fabrication<br>3.To study the technologies providing an in-depth coverage of the state of the art in VLSI technology. |
| Pre-Requisites | Fundamental knowledge of MOSFET and digital electronics is required |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus :**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | **Introduction to VLSI Design :** Overview of VLSI technology,VLSI design flow,Moore's Law and scaling,Fabrication process and technology nodes,Design methodologies: Full-custom, semi-custom, and ASIC design. **Digital Design Fundamentals:**Boolean algebra and logic gates,Combinational and sequential circuits,Finite State Machines (FSM),Data path design and control logic,Timing analysis and clocking strategies | **7 Hours** |
| **Module-2** | **Hardware Description** Languages : Introduction to Verilog and VHDLSyntax and semantics of HDL,RTL design and coding guidelines Testbenches and simulation ,Synthesis concepts | **7 Hours** |
| **Module - 3** | **CMOS Technology :**MOSFET fundamentals,CMOS fabrication and layout,CMOS logic gates design,Transmission gates and pass transistor logic,Design rules and layout techniques,Stick diagram. | **6 Hours** |
| **Module - 4** | **Digital System Design :**Arithmetic circuits (adders, multipliers),Memory design (SRAM, DRAM, ROM),FPGA architecture and programming,Design for testability (DFT),Low-power design techniques. | **6 Hours** |
| **Module - 5** | **Verification and Validation:**Verification methodologies (UVM, OVM),Functional verification Coverage-driven verification Formal verification techniques,Hardware-software co-simulation | **7 Hours** |
| **Module - 6** | **Physical Design :**Floorplanning and partitioning,Placement and routing,Clock tree synthesis (CTS),Power planning and analysis,Signal integrity and parasitics, **Advanced Topics (only concept):**Advanced node technologies (FinFET, FDSOI)3D ICs and TSV technology Emerging memory technologies (MRAM, ReRAM),High-speed interface design (PCIe, USB, Ethernet) ,EDA tools | **7 Hours** |
| | **TOTAL** | **40 Hours** |

| | |
|---|---|
| **Text Books:** | |
| **1** | S. -M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits - Analysis and Design, 3rd Edition, TMH, 2002. |
| **2** | D. A. Hodges, H. G. Jackson, and R. Saleh, Analysis and Design of Digital Integrated Circuits in Deep Submicron Technology, 3rd International Edition, McGraw Hill Education, 2004. |
| **Reference Books:** | |
| **1** | J. P. Rabaey, A. P. Chandrakasan, and B.Nikolic,´ Digital Integrated Circuits: A Design Perspective, 2 nd Edition, Pearson Education, 2016. |
| **2** | N. H. E. Weste, D. Harris, and A. Banerjee, CMOS VLSI Design - A Circuits and Systems Perspective, 4 th Edition, Pearson Education, 2010 |
| **3** | R. J. Baker, CMOS Circuit Design, Layout, and Simulation, 3rd Edition, John Wiley & Sons, 2010. |
| **4** | D. A. Pucknell and K. Eshraghian, Basic VLSI Design, 3rd Edition, PHI Learning, 1995 |
| **5** | J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons, 2006. |
| **6** | W. Wolf, Modern VLSI Design - System on Chip Design, 3rd Edition, Pearson Education, 2004 |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/117/106/117106092/ |
| **2** | https://nptel.ac.in/courses/117/106/117106093/ |
| **3** | https://nptel.ac.in/courses/117101058/ |
| **4** | https://nptel.ac.in/courses/108/107/108107129/ |
| **5** | https://nptel.ac.in/courses/106/105/106105161/ |

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

| | |
|---|---|
| CO1 | Identify suitable method to design circuits and systems using modern tools by following appropriate design flow and fabrication steps. |
| CO2 | Understand the structure and operational analysis of MOSFET under external bias condition before and after scaling |
| CO3 | Design, implement and investigate Inverter, combinational and sequential logic circuits using CMOS technology. |
| CO4 | Investigate switching characteristics of inverter to estimate its delay time and power consumption. |
| CO5 | Design and analyze transmission gates, various memory cells, acquire the knowledge of different testing techniques and their reliability. |

| Type | Code | Digital Communication | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| | | | | | 150 |

| | |
|---|---|
| Objectives | 1-Understand the concept of signal processing of digital data and signal conversion to symbols at the transmitter and receiver.<br>2-Compute performance metrics and parameters for symbol processing and recovery in ideal and corrupted channel conditions.<br>3-Understand the principles of spread spectrum communications |
| Pre-Requisites | Fundamental knowledge of Communication Systems. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities. |

**Detailed Syllabus :**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | **Digital communications**: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER.<br>Digital Modulation Techniques: Phase shift Keying techniques using coherent detection, generation, detection and error probabilities of BPSK and QPSK, M–ary PSK, M–ary QAM. | **6 Hours** |
| **Module-2** | Frequency shift keying techniques using Coherent detection: BFSK generation, detection and error probability. Signalling Communication through Band Limited AWGN Channels: Signalling over AWGN Channels- Introduction, Geometric representation of signals | **6 Hours** |
| **Module - 3** | Principles of Spread Spectrum: Spread Spectrum Communication Systems: Model of a Spread Spectrum Digital Communication System, Direct Sequence Spread Spectrum Systems, Effect of De- spreading on a narrowband Interference, Probability of error (statement only) | **8 Hours** |
| **Module - 4** | Introduction to Information Theory: Measure of information, Average information content of symbols in long independent sequences. Source Coding: Encoding of the Source Output, | **8 Hours** |
| **Module - 5** | Shannon's Encoding Algorithm, Shannon-Fano Encoding Algorithm, Huffman coding. Error Control Coding: Introduction, Examples of Error control coding, Types of Errors, types of Codes. | **6 Hours** |
| **Module - 6** | Linear Block Codes: Matrix description of Linear Block Codes, Error Detection & Correction capabilities of Linear Block Codes, Single error correction Hamming code | **6 Hours** |
| | **TOTAL** | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | Simon Haykin, “Digital Communication Systems”, John Wiley & sons, First Edition, 2014, ISBN 978- 0-471-64735-5. |
| **2** | John G Proakis and Masoud Salehi, “Fundamentals of Communication Systems”, 2014 Edition, Pearson Education, ISBN 978-8-131-70573-5. |
| **3** | K Sam Shanmugam, “Digital and analog communication systems”, John Wiley India Pvt. Ltd, 1996 |
| **4** | Hari Bhat, Ganesh Rao, “Information Theory and Coding”, Cengage, 2017. 5. Todd K Moon, “Error Correction Coding”, Wiley Std. Edition, 2006. |
| **Reference Books:** | |
| **1** | Bernard Sklar, “Digital Communications – Fundamentals and Applications”, Second Edition, Pearson Education, 2016, ISBN: 9780134724058. |
| **2** | K Sam Shanmugam, “Digital and analog communication systems”, John Wiley India Pvt. Ltd, 1996. Web links and Video Lectures (e-Resources |
| **Online Resources:** | |
| **1** | https://nptel.ac.in/courses/108102096 |

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

| | |
|---|---|
| CO1 | Analyze different digital modulation techniques and choose the appropriate modulation technique for the given specifications. |
| CO2 | Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels. |
| CO3 | Differentiate various spread spectrum schemes and compute the performance parameters of communication system. |
| CO4 | Apply the fundamentals of information theory and perform source coding for given message |
| CO5 | Apply different encoding and decoding techniques with error Detection and Correction. |

| Type | Code | Entrepreneurship Development | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| HS | **BTHS-T-OE-601** | | 3-0-0 | 3 | 150 |

| | |
|---|---|
| Objectives | To raise awareness among students about the importance of entrepreneurship as a career and the necessary skills. To provide information on the entrepreneurial environment and related issues. Encourage learners to pursue entrepreneurship as a career and to participate in business incubation. To give them knowledge that will induce in them an entrepreneurial culture and help them to look at the bigger picture. |
| Pre-Requisites | Students should develop an Entrepreneurship bent of mind through motivational speech and attending an Entrepreneurship program. |
| Teaching Pedagogy | Regular classroom lectures with the use of ICT as needed. Each session is planned to be interactive with a focus on real-world problem solving through case lets. |

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | **Introduction:** Concept of Entrepreneur, Entrepreneurship and Enterprise, Definition of Entrepreneurship, Objectives of Entrepreneurship Development, Nature and importance of Entrepreneurship, Entrepreneurial Personality, Types of Entrepreneurs, Role of Entrepreneurship in Economic Development **Case let** | |
| **Module-2** | **Entrepreneurship Environment:** Entrepreneurship Environment in India and Odisha, Phases of Entrepreneurship Development, Identification of Opportunities, Converting Business Opportunities into Reality. Make in India, Atma Nirvar Bharat, Atal Incubation Centre (AIC), MSME, National Small Industries Corporation, MUDRA, and other related programs. **Case let** | |
| **Module -3** | **Entrepreneurial Motivation:** Why to become entrepreneur, Entrepreneurship as a career: Role of family, Entrepreneurship and the role of Odisha government: IPR 2022, Make in-Odisha, Startup policy: Startup ecosystem, Startup Odisha Yatra 2.0. **Case Let.** | |
| **Module–4** | **Startup:** Make in India, Atma Nirvar Bharat, Atal Incubation Centre (AIC), MSME, National Small Industries Corporation, MUDRA, and other related programs. Sickness of Small-Scale Industries, Causes and symptoms of Sickness, cures of Sickness. **Case Let.** | |
| **Module–5** | **Entrepreneurship skills:** Meaning of Entrepreneurship skills, Types of Entrepreneurship Skills (Management skills, leadership skills, financial skills, Analytical skills, Critical thinking skills, Strategic thinking skills, planning skills, technical skills, Time management skills, marketing and networking skills, Entrepreneurial skills in the workplace. **Case Let.** | |
| **Module–6** | **Small-Scale Industries:** Procedure for setting up a small enterprise. Role of Banks and Governments in reviving industries. **Case Let.** | |
| **Total** | | **40 Hours** |

| Text Books: | |
|---|---|
| **1** | Entrepreneurship Development and Management, Vasant Desai, HPH |
| **2** | Entrepreneurship Management, Bholanath Dutta, Excel Books |
| **3** | Entrepreneurial Development, Sangeeta Sharma, PHI |
| **Reference Books:** | |
| **1** | Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi |
| **2** | Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh |
| **Online Resources:** | |
| **1** | https://startupodisha.gov.in/startup-policy |
| **2** | https://www.startupindia.gov.in/content/sih/en/startup-scheme.html |
| **3** | https://www.fundable.com/learn/resources/guides/startup |
| **4** | https://dpiit.gov.in/ |

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

| | |
|---|---|
| CO1 | Acquire a basic understanding of the entrepreneurial skills. |
| CO2 | Develop critical thinking entrepreneurial skills that will enable them to identify and evaluate entrepreneurial opportunities, manage risks and learn from the results. |
| CO3 | Analyze the process that enables entrepreneurs with limited resources to transform a simple idea into a sustainable success. Establish goals, identify resources and determine the steps required to start and manage a business. |
| CO4 | Develop a business plan for starting up a business |
| CO5 | Apply the knowledge to a real-world perspective through cases and examples derived from real entrepreneurial skills and actions hence developing their ability to apply theory to practice. |

| Type | Code | NPTEL | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| OO | BTEC-T-OO-401 | **Microprocessors And Interfacing** | 2-0-0 | 2 | 150 |

| | |
|---|---|
| Objectives | To understand and design microprocessor based systems |
| Pre-Requisites | Basics of Digital Electronics |

**Detailed Syllabus**

| Module-# | Topic | Hours |
|---|---|---|
| | **Week 1**: 8086 Architecture | |
| | **Week 2**: 8086 Pins and Signals | |
| | **Week 3**: 8086 Instruction Set I | |
| | **Week 4**: 8086 Instruction Set II | |
| | **Week 5**: 8086 Instruction Set III | |
| | **Week 6**: 8086 Instruction Set IV | |
| | **Week 7**: 8086 Programming I | |
| | **Week 8**: 8086 Programming II | |
| | **Week 9**: Memory Interfacing | |
| | **Week 10**: 8255 Interfacing Examples | |
| | **Week 11**: Interfacing of DC and Stepper Motors | |
| | **Week 12**: Interfacing of Key board,Display,USART | |
| **Total** | | **12 WEEKS** |

| **Text Books:** | |
|---|---|
| **1** | NPTEL |
| **Reference Books:** | |
| **1** | NPTEL |

| Type | Code | Essence of Indian Knowledge Tradidtion-II | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| MC | BTMC-T-MC-401 | | 2-0-0 | 2 | 150 |

| | |
|---|---|
| Objectives | Defining the concepts of Indian tradition Knowledge<br>Understanding the importance of roots of knowledge system<br>Implementing the traditional knowledge to the day to day life<br>Distinguishing the types of traditional knowledge<br>Evaluating the ideas and teaching s of TK |
| Pre-Requisites | |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on problem solving activities |

**Detailed Syllabus :**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Introduction to Traditional Knowledge (Definition TK its Nature, characteristics and scope) | **3 Hours** |
| **Module-2** | Protection and significance of Traditional knowledge<br>(Significance of TK Protection , Value of TK , role of Govt.to harness TK) | **3 Hours** |
| **Module-3** | Legal Frame work and TK<br>( Forest Dwellers Forest right act 2001, 2002, 2006.) | **3 Hours** |
| **Module-4** | Traditional knowledge and Intellectual property<br>(Systems & Legal concepts for the protection of traditional knowledge) | **3 Hours** |
| **Module-5** | Traditional knowledge and Engineering<br>(Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge) | **4 Hours** |
| **Module-6** | Importance of conservation and sustainable development of environment Management of Biodiversity<br>(Traditional societies dependence on environment , Food security of the country and protection of TK) | **4Hours** |
| | **TOTAL** | **20 Hours** |

**Course Outcome:**

At the end of the Course, Student will be able to:

| | |
|---|---|
| CO1 | Identify the concept of Traditional knowledge and its importance. |
| CO2 | Explain the need and importance of protecting traditional knowledge. |
| CO3 | Illustrate the various enactments related to the protection of traditional knowledge. |
| CO4 | Interpret the concepts of Intellectual property to protect the traditional knowledge. |
| CO5 | Explain the importance of Traditional knowledge in Agriculture and Medicine. |
| | |

| Type | Code | Employability Enhancement Training-E | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| SC | BTSC-T-SC-501 | | 2-0-0 | 1 | 150 |

| | |
|---|---|
| Objectives | 1.To significantly raise the employability of the students<br>2.To a level where they are able to clear campus selection process<br>3.And at the same time develop an attitude of constant self-improvement throughout their career |
| Pre-Requisites | Basic knowledge of core branch subjects. |
| Teaching Pedagogy | Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities. |

**Detailed Syllabus**

| Module | Topics | Hours |
|---|---|---|
| **Module-1** | Maxwell's equations-basic concepts; Gauss', Stokes' theorems; Wave propagation through different media; Transmission Lines-different types, basics, impedance matching/transformation; Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-radiation pattern, monopoles/dipoles, gain, arrays-active/passive, theory, uses. | **4 Hours** |
| **Module-2** | VLSI technology: Processing, lithography, interconnects, packaging, testing; VLSI design: Principles, MUX/ROM/PLA-based design, Moore & Mealy circuit design; Pipeline concepts & functions; Design for testability. | **5 Hours** |
| **Module-3** | DSP: Discrete time signals/systems, uses; Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses; Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; Controllers & uses; Embedded systems. | **3 Hours** |
| **Module-4** | Communication networks:-Principles /practices /technologies /uses /OSI model/security; Basic packet multiplexed streams/scheduling; Cellular networks, types, analysis, protocols(TCP/TCPIP); Microwave & satellite communication: Terrestrial/space type LOS systems,system design; Communication satellites, orbits, characteristics, systems, uses; Fibre-optic communication systems. | **3 Hours** |
| **Module-5** | Javascript basics, Javascript objects, Javascript oop's Exception handling; HTML basics, HTML attributes; PHP basics, PHP control statement, PHP functions. | **2 Hours** |
| **Module-6** | Number analogy, Seating arrangement(linear,circular),Blood Relation<br>Number system, Percentage, Profit and loss SI & CI, HCF &LCM,Time and Work,Pipe and Cistern,Mensuration | **3 Hours** |
| | **Total** | **20 Hours** |

| **Text Books:** | |
|---|---|
| **1** | Signals and Systems: Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab |
| **2** | Principles of Electromagnetics: Matthew N.O. Sadiku |
| **Reference Books:** | |
| **1** | Database System Concepts (Avi Silberschatz · Henry F.Korth · S. Sudarshan) |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-601 | **Microwave and Radar Engineering Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | The objective of this laboratory course is to study the principle of operation of different microwave devices and components and conduct various experiments using these devises to visualize the radiation patterns of different types of antennas. |
| Pre-Requisites | Knowledge of electromagnetic waves and field theory is required. |
| Teaching Pedagogy | Regular laboratory experiments to be conducted using various microwave devices and components under the supervision of the teacher; demonstration will be given for each experiment. |

| Expt. No. | Topic |
|---|---|
| 1 | Study of microwave components and instruments. |
| 2 | Measurement of crystal characteristics and proof of the square law characteristics of the diode. |
| 3 | Measurement of klystron characteristics. |
| 4 | Measurement of VSWR and standing wave ratio. |
| 5 | Measurement of Dielectric constants. |
| 6 | Measurement of Directivity and coupling coefficient of a directional coupler. |
| 7 | Measurement of Q of a cavity. |
| 8 | Calibration of the attenuation constant of an attenuator. |
| 9 | Determination of the radiation characteristics and gain of an antenna. |
| 10 | Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuited stub. |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Familiarize with various microwave devices and components. |
| CO2 | Determine the frequency of the microwave signal, VSWR, and reflection coefficient of rectangular waveguide. |
| CO3 | Understand the principle of operation of different microwave components. |
| CO4 | Characterise Gunn diode and determine dielectric constant of unknown material. |
| CO5 | Visualize the radiation patterns of some test antennas. |

| **Text Books:** | |
|---|---|
| **1** | RF and HF Lab Manual, Department of ECE, GIFT, Bhubaneswar |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-602 | **Digital VLSI Design Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | The objective of this laboratory course is to provide hands-on exposure on preparing schematic, layout & simulation of complex digital systems using HDL (Verilog/VHDL) . |
| Pre-Requisites | Fundamentals of MOSFET and digital electronics is required. The laboratory experiments shall go along with the topics taught in the theory class. |
| Teaching Pedagogy | Regular Laboratory classes with use of ICT as and when required. Practicals are planned to be interactive with focus on problem solving activities and real time applications with the help of software, FPGA and other peripherals |

**Detailed Syllabus**

| Expt. No. | Topic |
|---|---|
| 1 | Design a schematic and simple layout for CMOS Inverter . |
| 2 | Design a schematic and simple layout for CMOS NAND gate, parasitic extraction and simulation. |
| 3 | Design a schematic and simple layout for CMOS NOR gate, parasitic extraction and simulation. |
| 4 | Design a schematic and simple layout for Full adder. |
| 5 | Design a schematic and simple layout for MUX, DeMUX. |
| 6 | Design a schematic and simple layout for D flip-flop. |
| 7 | Design a schematic and simple layout for simple and complex Boolean expressions. |
| 8 | Design a schematic and simple layout for dynamic logic implementation (Domino logic). |
| 9 | Design a schematic and simple layout for dynamic logic implementation (NORA logic). |
| 10 | 10 Design an ALU or a 4-bit Microprocessor . |

| Text Books: | |
|---|---|
| **1** | Digital VLSI Design Lab Manual, Department of ECE, GIFT, Bhubaneswar |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Explain the VLSI Design flow from start to finish. |
| CO2 | Design and implement digital systems using different architectures of VHDL. |
| CO3 | Design, implement, and investigate Inverter, combinational, and sequential logic circuits using CMOS technology. |
| CO4 | Implement digital logic circuits in real time using FPGA. |
| CO5 | Understand the timing diagram of combinational and sequential logic circuits. |

| Type | Code | | L-T-P | Credits | Marks |
|---|---|---|---|---|---|
| P | BTEC-P-PC-603 | **Digital Communication Laboratory** | 0-0-2 | 1 | 100 |

| | |
|---|---|
| Objectives | To learn different digital communication techniques. |
| Pre-Requisites | Fundamentals of Communication system. |
| Teaching Pedagogy | Regular Laboratory classes with use of ICT as and when required. Practicals are planned to be interactive with focus on problem solving activities and real time applications with the help of software, FPGA and other peripherals |

| Expt. No. | Topic |
|---|---|
| 1 | Generation and reception of different types of signals like ASK |
| 2 | Generation and reception of different types of signals like PSK, |
| 3 | Generation and reception of different types of signals like FSK. |
| 4 | Study the functioning of Delta modulator |
| 5 | Experimentally compare different forms of BPSK, analyze their Spectrum with DSO. |
| 6 | Experimentally compare different forms of QPSK, analyze their Spectrum with DSO. |
| 7 | QPSK using MAT LAB |
| 8 | Study the functioning of Adaptive Delta modulator. |
| 9 | To generate and demodulate amplitude shift keyed (ASK) signal using MATLAB |
| 10 | To generate and demodulate frequency shift keyed (FSK) signal using MATLAB |

| Text Books: | |
|---|---|
| 1 | Digital Communication Lab Manual, Department of ECE, GIFT, Bhubaneswar |

**Course Outcomes:**

| | |
|---|---|
| CO1 | Evaluate the performance of PCM, DPCM and Delta modulation schemes. |
| CO2 | Implement different digital modulation schemes like FSK, PSK, and DPSK. |
| CO3 | Analyze source/channel encoding & decoding methods. |
| CO4 | Simulate Pulse Digital Modulation & demodulation using MATLAB. |
| CO5 | Simulate digital communication techniques like ASK, FSK & PSK. |