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 Course Structure

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	4-0-0	2
3	ES	BTBS-T-ES-101/ BTBS-T-ES-102	Basic Electrical and Electronics Engg./ Basic Mechanical and Civil Engineering	4-2-0	3
4	ES	BTBS-T-ES-103	Basic Programming Skills	4-1-0	3
5	HS	BTBS-T-HS-101	Communicative English -I	1-0-0	1
6	SC	BTBS-T-SC-101	SEPD-1 (Skill Enhancement and Personality Development)	2-0-0	1
7	MC	BTBS-T-MC-101/ BTBS-T-MC-102	IT & IS /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	BTBS-P-ES-101/ BTBS-P-ES-102	Basic Electrical and Electronics Engg. Lab/ Basic Mechanical and Civil Engineering Lab	0-0-2	1
3	ES	BTBS-P-ES-103	Basic Programming Skill Lab	0-0-4	2
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Engineering Graphics with AutoCAD / Workshop Practice-I	0-0-3	1.5
5	HS	BTBS-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	4-0-0	2
3	ES	BTBS-T-ES-101/ BTBS-T-ES-102	Basic Electrical and Electronics Engg./ Basic Mechanical and Civil Engineering	4-2-0	3
4	ES	BTBS-T-ES-203	Programming Using Data Structure	4-1-0	3
5	HS	BTBS-T-HS-201	Communicative English -II	1-0-0	1
6	SC	BTBS-T-SC-201	SEPD-2 (Skill Enhancement and Personality Development)	2-0-0	1
7	MC	BTBS-T-MC-101/ BTBS-T-MC-102	IT & IS /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	BTBS-P-ES-101/ BTBS-P-ES-102	Basic Electrical and Electronics Engg. Lab/ Basic Mechanical and Civil Engineering Lab	0-0-2	1
3	ES	BTBS-P-ES-203	Programming Using Data Structure Lab	0-0-4	2
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Engineering Graphics with AutoCAD / Workshop Practice-I	0-0-3	1.5
5	HS	BTBS-P-HS-201	Communicative English Lab-II	0-0-3	1.5
			Total Hours/ Credit (Practical)	14	7
			Grand Total Hours/ Credit (Practical)	**39**	**20**

SUMMER INTERNSHIP TRAINING for 30 Days

✓ Approved by Academic Council in the 1st ACM dated 07.01.2023

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.

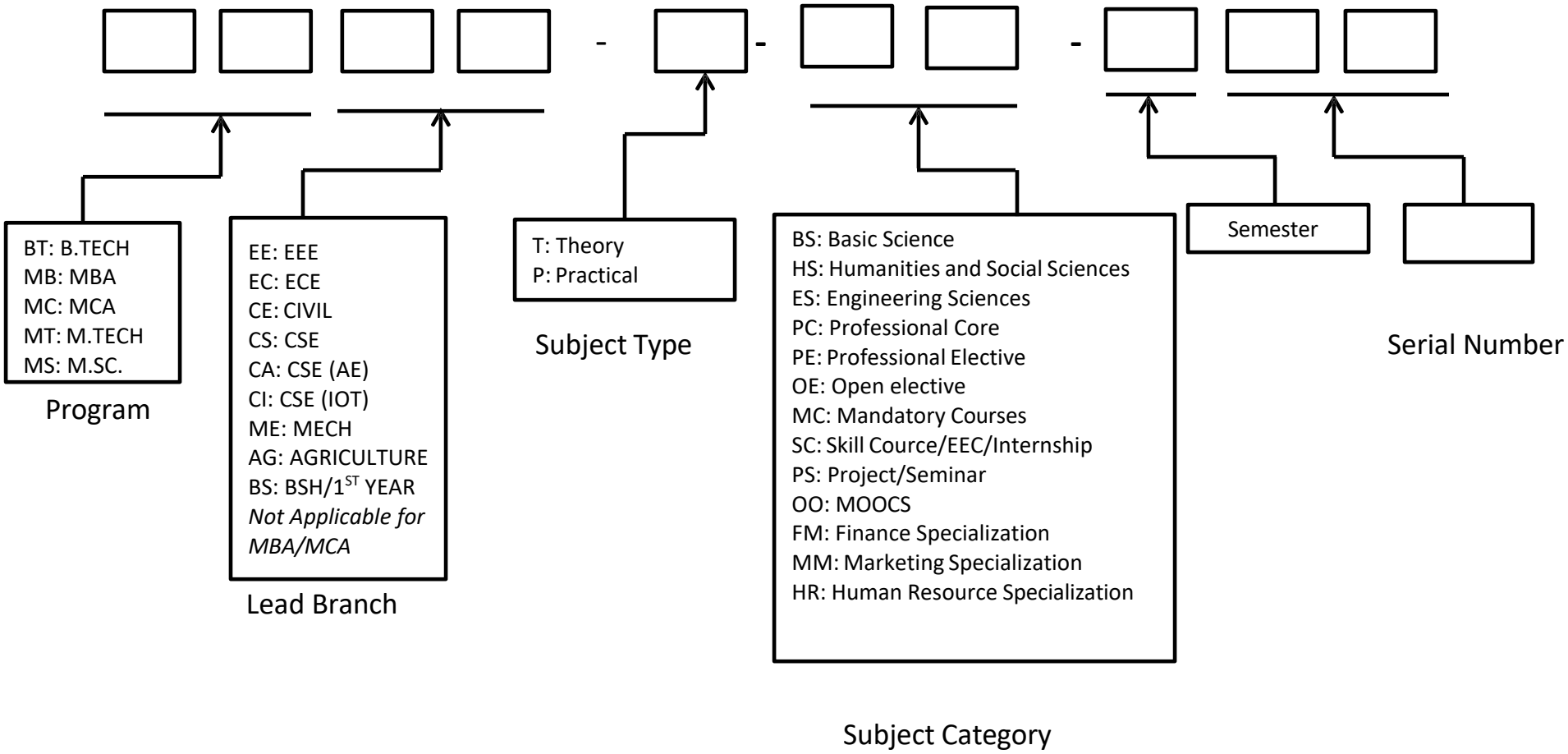
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Subject Code Format



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

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First Year B.Tech

Curriculum Structure

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

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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. 2. To analyze the concepts of mechanics, oscillations, waves and optics to prepare the students for advanced level courses. 3. To demonstrate the ability to identify and apply the appropriate analytic, numerical, and mathematical reasoning, to situations of the physical world. 4. To adaptability to new developments in science and technology.
Pre-Requisites	Class 12th 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** Simple, damped and forced oscillations, resonance, coupled oscillations. Wave and wave equation, Superposition of waves. Interference, Young's double slit experiment, Newton's rings, Diffraction, Fraunhofer diffraction by single slit, Diffraction Grating, Polarization, Malus' Law, Brewster's Law. 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** 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. 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** 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. Dielectric materials, Dielectric Polarization, Dielectric Breakdown, Dielectric constant and loss, Electromagnetic wave in dielectric medium. Superconducting materials: Superconductivity, Critical parameters, Meissner effect, Type I & Type II superconductors, BCS theory, applications of super conducting materials. Nano material: Classifications, Quantum confinement, surface to volume ratio, Graphene and its structure, Application.	**10 Hours**
Module-4	**Quantum Statistics and Optoelectronic devices** Statistical Mechanics: Statistical distributions: Maxwell-Boltzmann, Molecular Energies in an ideal gas, Bose-Einstein and Fermi-Dirac statistics. Laser: Spontaneous and stimulated emission, Einstein's coefficients, Population inversion, Light amplification, Basic laser action, Types of laser, Ruby and He-Ne lasers, applications. 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. **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 **Fuel Cells:** Definition, Different types of fuel cell, Hydrogen blue fuel cell, FCEVs **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 **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. 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). 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 . 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 : 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 . Introduction to Microprocessors and Microcontrollers: Basic block diagram: input, output, ALU, CU, Registers, Difference between microprocessor and microcontroller. 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. 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. 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.	
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:** Importance of communication in English Language for Technocrats Process and Factors of Communication Applied Grammar (Parts of Speech, Modals, Subject – Verb Agreement, Vocabulary and usage)	**10 hours**
Module-2	**Reading and Writing** Process of Reading, Skimming, Scanning, inferential Reading Process of Writing ,Summarizing and Paraphrasing, Note Making, Notice Writing Minutes & Preparing Agenda	**05 Hours**
Module-3	**Oral Communication** Sounds of English: Vowels and Consonants Sounds, Syllable and its Structure, Word Stress, Indian English and Standard English. 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:** 1. Exploring habits, attitudes, preferences and experience 2. becoming aware of strengths and weaknesses, talents and problems, emotions and ideas 3. Identifying the optimum means of improving personal performance 4. Identifying areas of expertise and use these to solve problems in new contexts 5. Knowing your ambitions, goals, and values 6. Understanding feelings and emotions: primary feelings and secondary feelings, Self-regulating emotions	**10 Hours**
Module-2	**Self-management** 1. IQ, EQ, SQ, MI 2. Understanding of life story 3. Focusing on Internal narratives 4. Managing change, confusion and uncertainty 5. Sharpening the Intellect 6. Schooling the mind 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 (2nd and 4th 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. **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** 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** Formal Letters- Letter for placing an order, Letter of Complaint, Job Application Letter Resume Building-Chronological, Functional& Combinational Reports-Format and Components of Long Report ,Format and Components of Short Report, Proposals-Format and Components of Proposal	**8Hours**
Module-3	**Soft Skills** 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):** 1. Mock GD 1 2. Mock GD 2. **Interview skills:** 1. Preparing for interviews through mock interview session. 2. Writing a good and effective C.V. and SWOC presentation	**10 Hours**
Module-2	**Assertiveness and EI:** 1. Theory inputs and activities. 2. Conducting Mock Interviews **Team work activity:** 1. Building blocks of a team - discussion & activity. 2. Panel Discussion. **Summarizing and note making**: 1. Techniques and important tips. **Personality assessment:** 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
TeachingPedagogy	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. The students will get knowledge on the synthesis of different medicines, preparation of soap & detergents etc. The students will get knowledge on the operation of different equipment's.
Pre-Requisites	Knowledge of chemistry in Secondary Education.
TeachingPedagogy	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.	
Experiment-9	Determination of available chlorine in a sample of bleaching powder	**2 Hours**
Experiment-10		**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. To gain practical experience in characterizing electronic devices. 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, 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. To gain practical experience in characterizing soil and handling hydraulic machines. 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	

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.
TeachingScheme	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 (i) push operation (ii) pop operation	**2Hours**
Experiment-3	Write a C program to create a queue and perform (i) Push (ii) Pop (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: (i) Creation (ii) Insertion (iii) Deletion (iv) Traversal	**2Hours**
Experiment-7	Write a C program that uses functions to perform the following operations on Double linked list: (i) Creation (ii) Insertion (iii) Deletion (iv) Traversal in both ways	**2Hours**
Experiment-8	Write a C program that uses functions to perform the following operations on Binary Search Tree: (i) Creation (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)

Electrical and Electronics Engineering

(Approved by Academic Council and Board of Studies)

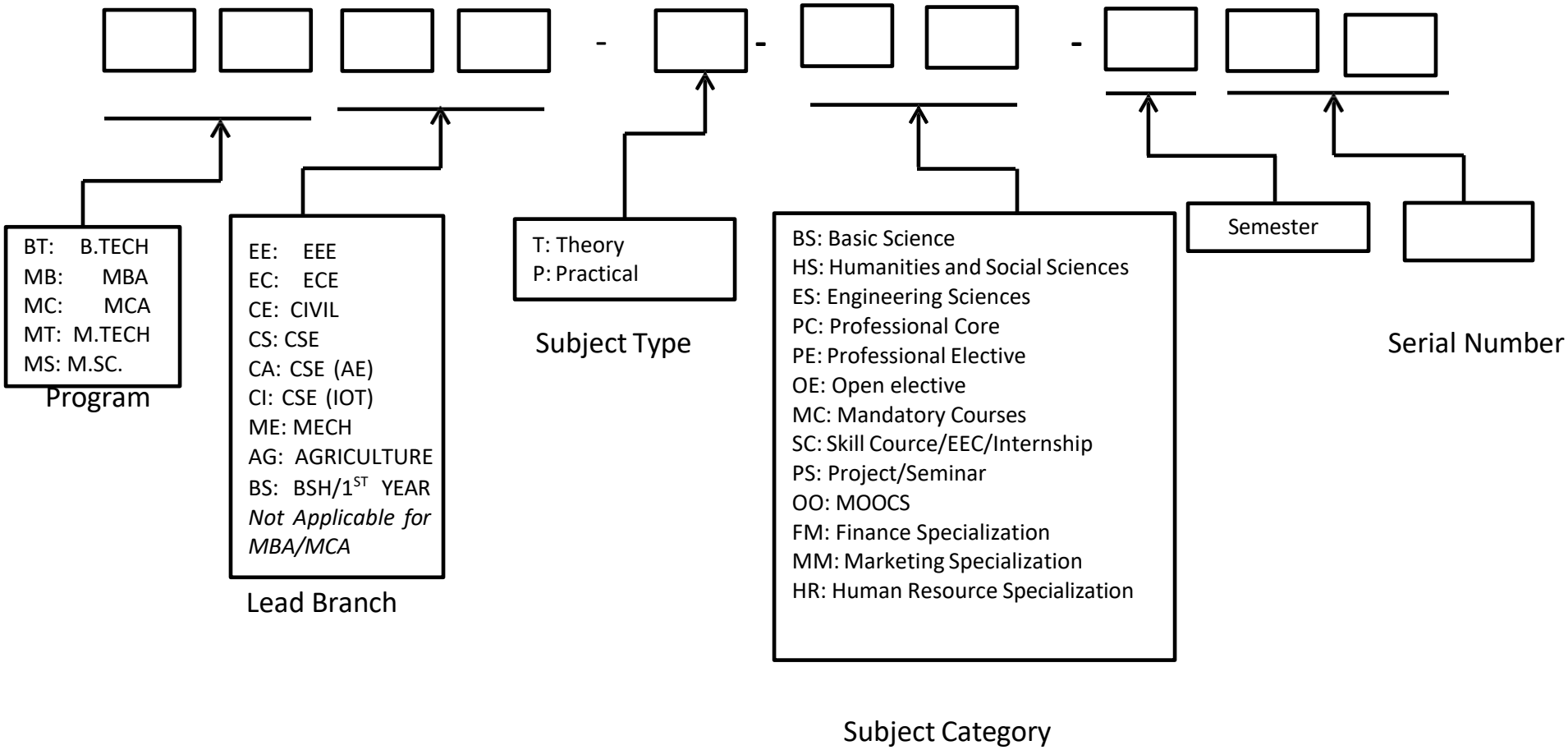
GIFT Autonomous College
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)
Recognised under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, Pincode: 752054

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	Math-III	4-0-0	3
2	PC	BTEE-T-PC-301	Network Theory	5-0-0	3
3	PC	BTEC-T-PC-301	Digital Electronics	3-1-0	3
4	HS	BTBS-T-HS-301/ BTBS-T-HS-302	Organizational Behavior Engineering Economics	3-0-0	3
5	PE	BTEE-T-PE-301	Electrical and Electronics Measurement	3-1-0	3
6	MC	BTMC-T-MC-301/BTMC-T-MC-302	Environmental Engineering/ Essence o Indian Knowledge Tradition -I	2-0-0	0
7	ES	BTCS-T-ES-301	OOPS JAVA	3-1-0	3
8	SC	BTSC-T-SC-301	Employability Enhancement Training-I	2-0-0	1
			Total Hours/ Credit(Theory)	28	19
Practical					
1	PC	BTEE-P-PC-301	NT Lab	0-0-2	1
2	PC	BTEE-P-PC-301	DE LAB	0-0-2	1
3	ES	BTCS-P-ES-301	OOPS LAB	0-0-2	1
4	PS	BTPS-P-PS-301	Seminar-1	0-0-3	1
5	SC	BTSC-P-SC-301	Evaluation of Summe Internship-1 (2)	0-0-2	2
Total Hours/ Credit(Practical)				11	6
Grand Total Hours/ Credit(Practical)				39	25

Fourth Semester					
Theory					
Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	PC	BTEE-T-PC-401	Power Electronics	4-1-0	3
2	PE	BTEE-T-PE-401	Renewable Powe Generating System	4-1-0	3
3	PC	BTEE-T-PC-401	Analog Electronics Circuit	3-1-0	3
4	PC	BTEE-T-PC-403	Electrical Machine-I	4-1-0	3
5	HS	BTBS-T-HS-301/ BTBS-T-HS-302	Organizational Behavior Engineering Economics	3-1-0	3
6	MC	BTMC-T-MC-301/ BTMC-T-MC-302	Environmental Engineering/ Essence of Indian Knowledge Tradition I	2-0-0	0
7	SC	BTSC-T-SC-401	Employability Enhancement Training-II	2-0-0	1
Total Hours/ Credit(Theory)				30	20
Practical					
1	PC	BTEE-P-PC-401	PE LAB	0-0-2	1
2	PC	BTEC-P-PC-401	AEC LAB	0-0-2	1
3	PC	BTEE-P-PC-403	EM-I Lab	0-0-2	1
4	PS	BTPS-P-PS-401	Project 3 (2)	0-0-3	2
Total Hours/ Credit(Practical)				9	5
Grand Total Hours/ Credit(Practical)				39	25
SUMMERINTERNSHIPTRAININGfor30Days					

Subject Code Format



Part 2
2nd Year B. Tech.
(Electrical and Electronics Engineering)

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Second Year

Curriculum Structure

B.Tech (3rd Semester & 4th Semester)

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Type	Code		L-T-P	Credits	Marks
BS	BTBS-T-BS-301	**Mathematics - III**	4-1-0	3	150

Objectives	The objective of this course is to provide the knowledge of Laplace & Fourier Transforms, complex analysis, and probability.
Pre-Requisites	Knowledge of calculus of single variable, coordinate geometry of two and three dimensions, matrix algebra, and ordinary differential equations is required.
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.

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.

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 Riemann 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:
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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.83	2.83	2.67	2.83	2.50	0.00	2.83	3.00	2.83	2.50

Type	Code	Network Theory	L-T-P	Credits	Marks
PC	BTEE-T-PC-301		4-0-0	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.

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

CO1	Understand basic concept of AC & DC circuit.
CO2	Evaluate the electrical circuit using theorems and coupling circuit.
CO3	Analyze transient behavior and resonance of DC and AC circuit.
CO4	Summarize application of Laplace transformation.
CO5	Apply parameters for different circuit analysis.
CO6	Explain various Filter and there application.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Basic Concepts:** Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and nodal analysis with linearly dependent and independent sources for DC and AC networks. **Network Theorems: (7hrs)** Superposition, Millman‘s theorems, Thevinin‘s and Norton‘s theorems, Maximum Power transfer theorem, Reciprocity Theorem, Compensation Theorem	**9 Hours**
Module-2	**Magnet coupling Circuit:** Coupled Circuits: Coefficient of coupling, dot convention Analysis of multi-winding coupled circuits, Analysis of single tuned and double tuned coupled circuits. **Series Resonance & Parallel Resonance:-** Variation of Current and Voltage with Frequency, Selectivity and Bandwidth, Q-Factor, Circuit Magnification Factor, Selectivity with Variable Capacitance, Selectivity with Variable Inductance.	**8 Hours**
Module - 3	**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	**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.	**5 Hours**
Module - 5	**Two port network parameters:** Definition of Z, Y, h and Transmission-line parameters, modeling with these parameters, relationship between parameters sets, Inter connection of Two-port networks.	**5 Hours**
Module - 6	**Network functions & Filter:-** Introduction to Transfer function, Location of poles and zeros. Passive Filters (Low Pass, High Pass, Band Pass & Band Reject Filter) and its applications.	**5 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.

PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO	**2.83**	**2.83**	**2.50**	**2.33**	**2.67**	**1.25**	**1.00**	**0.00**	**0.00**	**2.83**	**2.25**	**2.67**

Type	Code	Digital Electronics Circuit	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.

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	Analyze various Combinational circuits.
CO4	Design various Sequentially circuits.
CO5	Apply the HDL for digital circuits.
CO6	Validate combinational logic circuits using programmable logic devices.

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 : 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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	1.33	2.33	1.50	2.83	2.00	2.83	2.67	2.67	2.83	2.00	2.83

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Type	Code		L-T-P	Credits	Marks
HS	BTBS-T-HS-401	**Engineering Economics**	3-1-0	3	150

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.

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
CO2	Understanding: Evaluate numerically the effects of changes in demand and supply on price determination of products and
CO3	Analyze: the macroeconomic environment and financial systems of the country and its impact on business, society and
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
CO6	Remembering: Define the basic concept of micro and macroeconomics, engineering economics and their application in

Detailed Syllabus

Module-#	Topics	Ho
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 interes diagrams, Principles of economic equivalence. Evaluation of Engineering Projects-Present w Future worth method, Annual worth method, Internal rate of return method, Cost benefit analy projects.	**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**

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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	1.50	1.50	1.00	1.80	1.5	1.80	2.83	2.67	1.5	2.25	2.5	2.80

Type	Code	Electrical and Electronics Measurement	L-T-P	Credits	Marks
PE	BTEE-T-PE-301		3-1-0	3	150

Objectives	To introduce the students to the electrical & electronics measurement system & its applications.
Pre-Requisites	Electrical measurement
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.

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

CO1	Understand the measurement systems and different type of measuring instruments
CO2	Analyze the problems using bridge circuits.
CO3	Evaluate insulation and ground resistance.
CO4	Create knowledge on instruments transformer.
CO5	Identify different electronics instruments..
CO6	Develop the knowledge on different sensors and Transducers.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Measurements:** Methods of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.	**9 Hours**
Module-2	**Electromechanical Power and Measurement:** PMMC, Electro dynamo meter, Moving iron meter, Rectifier and thermo-instruments Comparison of various types of indicating instruments, Megger construction and working Extension range of Ammeter and Voltmeter.	**8 Hours**
Module - 3	**Bridge Measurements:** AC bridges: Applications and conditions for balance, Maxwell's bridge, Hay's bridge Schering bridge, Wien's bridge, De Sauty's bridge.	**5 Hours**
Module - 4	**Testing:-** Insulation testing, Ground resistance measurement, Varley and Murray loop test. **Instrument Transformers:** Current and Voltage transformers, Constructional features, Ratio and Phase angle errors	**7 Hours**
Module - 5	**Electronics Instruments:-** Thermocouple, laws, characteristics, installation problem, cold junction compensation.	**5 Hours**
Module - 6	**Sensors & Transducers:** Introduction to sensors & Transducers, Strain gauge, LVDT, Temperature transducers Flow measurement using magnetic flow measurement.	**6 Hours**
Total		**40 Hours**

Text Books:	
1	Golding, E.W., and Widdis, F.C., Electrical Measurements and Measuring Instruments, Pitman (2003).
2	Helfrick, A.D., and Cooper, W.D., Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India (2007).
Reference Books:	
1	Kalsi, H.S., Electronic Instrumentation, Tata McGraw Hill (2007).
2	Nakra, B.C., Chaudhry, K.K., Instrumentation Measurement and Analysis, Tata McGraw Hill (2003).
3	A Course In Electronic Measurements And Instrumentation, Dhanpat rai & sons (2015)

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	2.33	2.83	1.83	2.33	1.00	2.83	2.83	3.00	1.50	2.50

Type	Code	Object Oriented Programming using JAVA	L-T-P	Credits	Marks
ES	BTBS-T-ES-301		3-1-0	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.

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

CO1	To understand the Object-oriented programming concepts and every term of the program.
CO2	To test and execute the programmes by Object and Classes and implement inheritance property.
CO3	To implement polymorphism and string manipulation.
CO4	To determine data abstraction and wrapper classes to achieve code reusability.
CO5	To understand the hierarchy of file stream classes and the concept of exception handling.

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. **Object and Classes:** class and object, functions and data members, static members. **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. **Data Abstraction:** Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple InheritanceUsing Interfaces.	**6 Hours**
Module-4	**Polymorphism:** Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. **String Manipulations:** Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer. **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. **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). **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 Books:
1. Programming in Java. Second Edition. Oxford Higher Education. (Sachin Malhotra/Saurav Choudhary)
2. CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication
Reference Books:
1 JAVA Complete Reference (9th Edition) Herbalt Schelidt
2 Effective Java 3rd Edition by Joshua Bloch (Author)
3 Java For Dummies 6th Edition
by Barry A. Burd (Author)

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.67	2.83	2.83	2.83	1.60	0.00	2.50	2.83	2.67	2.00	2.00

Type	Code	Environmental Engineering	L-T-P	Credits	Marks
MC	BTMC-T-MC-301		3-1-0	0	150

Objectives	1. To Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge. 2. To Make use of their knowledge to interpret the data by experimental analysis to provide valid conclusions 3. To Identify, formulate, review research literature and analyze complex Environmental Engineering problems using fundamentals of mathematics, sciences and engineering. 4. To 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. 5. To Apply the knowledge of mathematics, Science and Engineering fundamentals for solution of problems of Environmental Engineering.
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.

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 o Environmental Engineering.
CO6	Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge.

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. 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. 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. 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 odor control, removal of iron and manganese, fluoridation and defloration. 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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.00	2.80	1.0	2.5	2.5	1.00	2.83	1.00	2.5	2.80	0.50	0.50

Typ	Code	Employability Enhancement Training-B	L-T-P	Credits	Marks
EC	BTSC-T-SC-301		1-0-1	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 l i fe problem solving activities.

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

CO1	Help students explore their values and career choices through individual skill assessments
CO2	Make realistic employment choices and to identify the steps necessary to achieve a goal
CO3	Develop and practice self-management skills for the work site
CO4	Explore and practice basic communication skills
CO5	Learn skills for discussing and resolving problems on the work site
CO6	Assess and improve personal grooming

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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.8	2.67	1.8	2.5	2.00	1.00	1.5	1.67	1.5	2.67	1.83	2.00

Type	Code	Network Theory Lab	L-T-P	Credits	Marks
PC	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.

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

CO1	Explain the different theorems.
CO2	Analyse the transient circuit and calculate the time constants.
CO3	Identify the resonant behaviour of a R-L-C circuit.
CO4	Evaluate the different parameters of two-port network.
CO5	Design the passive filter circuits.
CO6	Demonstrate the PSPIECE for different circuits.

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 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	Measure and calculate hybrid & Transmission line parameters of two-port network.	2 Hours
9	Design and frequency response of Low pass and high pass filter	2 Hours
10	PSPICE SIMULATION 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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	1.83	2.67	2.33	0.00	0.00	0.00	1.67	2.83	2.00	2.25

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

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.

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.
	Beyond Syllabus
1	Clock-pulse generator: design, implement and test
2	Design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bit product

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

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PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	1.83	2.67	2.33	0.00	0.00	0.00	1.67	2.83	2.00	2.25

Object Oriented Programming using JAVA Lab

Type	Code		L-T-P	Credits	Marks
CS	BTBS-P-ES-301	**Object Oriented Programming using JAVA Lab**	0-0-3	1	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

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Introduction, compiling and executing java program	2 Hours
Experiment -2	Data types, variables and design control structures	2 Hours
Experiment- 3	Loop control structures	2 Hours
Experiment- 4	Introduction to object and class	2 Hours
Experiment- 5	Inheritance, poly morphism and abstract class	2 Hours
Experiment- 6	package	2 Hours
Experiment- 7	Interfaces, Inner classes	2 Hours
Experiment- 8	Exception handling and java threads	2 Hours
Experiment- 9	Java applets	2 Hours
Experiment- 10	AWT and swings	2 Hours
Total		**20Hours**

Text Books:	
1	Database Management Systems Lab Manual, Department of CSE, GIFT, Bhubaneswar

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	1.33	2.67	3.00	2.67	0.00	1.80	2.60	1.80	2.60	0.00	2.60

Type	Code	Seminar-I	L-T-P	Credits	Marks
PS	BTEE-P-PS-301		0-0-3	1	100

Objectives	To encourage the students to study advanced engineering developments To prepare and present technical reports. 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.

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
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.

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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.50	2.83	2.83	2.33	2.83	1.60	0.00	2.83	2.67	1.67	2.83

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

Objectives	To encourage the students to study advanced engineering developments To prepare and present technical reports. 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.

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 start-ups to become successful entrepreneur.

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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	1.50	2.17	2.00	2.83	2.50	2.83	2.67	2.67	2.83	2.17	2.83

Fourth Semester

Type	Code	Power Electronics	L-T-P	Credits	Marks
PC	BTEE-T-PC-401		3-0-0	3	150

Objectives	To expose to the field of Problem Solving, Design on converter circuit
Pre-Requisites	Knowledge of semiconductor device, rectifier 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.

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

CO1	Understanding the semiconductors devices and its performance.
CO2	Analyze the controlled and uncontrolled converter.
CO3	Creating the knowledge on DC-DC converter.
CO4	Applying the idea on AC-AC converter.
CO5	Design the DC-AC converters.
CO6	Define the PWM techniques and its different applications.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Power Semiconductor Devices**: power diodes, power transistors, SCRs, TRIAC, GTO power MOSFETs, IGBTs-Principles of operation, V-I characteristics, protection and gate drive circuits, dv / dt and di / dt protection, Series and parallel operation of Thyristor.	8 Hours
Module-2	**AC-DC Converters**: **Uncontrolled Converters:-** Single phase half wave and full wave rectifiers with R-L and R-L-E load, 3 phase bridge rectifier with R-L and R-L-E load. **Controlled Converters**: single phase half wave and full converter with R and R-L load. Single phase half wave rectifiers with R-L and freewheeling Diode, 3 phase half wave & full wave converter with R and R-L load, Effect of Source Inductance, Power facto improvement, Dual converter.	12 Hours
Module-3	**DC-DC converter**: Power circuit of buck, boost converter& buck-boost converter with circuit configuration and analysis, Fly-Back and SMPS converter.	6 Hours
Module-4	**AC-AC Converters**: Single-phase mid-point and bridge types of step-up and step-down Cyclo-converter. Single-phase AC Voltage regulators and its basic analysis.	6 Hours
Module-5	**DC-AC converters**: Single phase half bridge and full bridge VSI, Three phase Voltage Source (VSI) (120 and 180 Degree mode of conduction),	4 Hours
Module-6	Pulse Width Modulation Techniques (PWM) and its application on Voltage and frequency control of inverter. Introduction to Multi level Inverter.	4 Hours
	Total	40 Hours

Text Book
1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India.
2. P.S. Bimbhra, Power Electronics, Khanna Publishers, New Delhi

Reference Books	
1	L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India.
2	N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons
3	Fundamentals of Power Electronics, Erickson, Robert W, and Maksimovic, Dragan.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.50	2.83	1.33	2.33	2.50	3.00	2.00	3.00	2.50	3.00

Type	Code		L-T-P	Credits	Marks
PE	BTEE-T-PE-401	Renewable Power Generating System	3-0-0	3	150

Objectives	To get exposure on solar radiation and its environmental impact to power and different power plants
Pre-Requisites	Knowledge on power plant and its applications
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.

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

CO1	Understanding the physics of solar radiation.
CO2	Analyze the performance of solar energy collectors, methodologies and application of solar energy.
CO3	Apply solar energy in a useful way.
CO4	Remember the power of wind energy and gain knowledge on DFIG.
CO5	Executing the idea of biogas and its applications.
CO6	Adopting knowledge on Hybrid systems.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.	**10 Hours**
Module-2	Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Types and performance characteristics, Applications- Solar water heating systems (active & passive) , Solar space heating & cooling systems , Solar desalination systems, Solar cooker. Solar photovoltaic system-Operating principle, Photovoltaic cell concepts, Cell, module, array, Losses in Solar Cell, Effects of Shadowing Partial and Complete Shadowing, Series and parallel connections, Cell mismatching, Maximum power point tracking, Applications-Battery charging, Pumping, Lighting, Peltier cooling. Modeling of PV cell.	**6 Hours**
Module-3	Solar photovoltaic system-Operating principle, Photovoltaic cell concepts, Cell, module, array, Losses in Solar Cell, Effects of Shadowing Partial and Complete Shadowing, Series and parallel connections, Cell mismatching, Maximum power point tracking, Applications-Battery charging, Pumping, Lighting, Peltier cooling. Modeling of PV cell.	**6 Hours**
Module - 4	Wind Energy: Wind energy, Wind energy conversion; Wind power density, efficiency limit for wind energy conversion, types of converters, aerodynamics of wind rotors, power ~ speed and torque ~ speed characteristics of wind turbines, wind turbine control systems; Different control methods Grid integration of large-scale wind resources: Grid support features of utility-scale PV with storage, Microgrids, and frequency/voltage control in islanded mode of operation, Demand response, distributed storage and smart grid concepts. Concept of DFIG.	**10 Hours**
Module - 5	Biomass Power: Principles of biomass conversion, Combustion and fermentation, Anaerobic digestion, Types of biogas digester, Wood gassifier, Pyrolysis, Applications. Bio gas, Wood stoves, Bio diesel, Combustion engine, Applications.	**4 Hours**
Module - 6	Hybrid Systems: Need for Hybrid Systems, Range and type of Hybrid systems, Case studies of Diesel-PV, Wind-PV, Micro hydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles	**4 Hours**
Total		**40 Hours**

Text Books:	
1	Rai G.D. , “Non-Conventional Energy Sources”, Khanna Publishers, 2011
2	Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis), 2011
Reference Books:	
1	Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007
2	Ramesh R & Kumar K.U , “Renewable Energy Technologies”,Narosa Publishing House,2004
3	Mittal K M, “Non-Conventional Energy Systems”, Wheeler Publishing Co. Ltd, New Delhi,2003
4	Kothari D.P, Singhal ., K.C., “Renewable energy sources and emerging technologies”,P.H.I, New Delhi, 2010

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7		PO9	PO10	PO11	PO12
CO	2.83	2.50	2.67	2.33	2.50	2.83	1.83	2.50	2.83	2.17	2.33	2.17

	Code	Analog Electronic Circuits	L-T-P	Credits	Marks
PC	BTEC-T-PC-401		3-0-0	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.

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.

Detailed Syllabus

Module	Topics	Hours
Module-1	Biasing of BJTs: Load Lines (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. 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, 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.

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PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	2.83	3.00	2.67	0.00	2.00	1.00	1.83	2.67	2.17	2.67

Type	Code	Electrical Machine-I	L-T-P	Credits	Marks
PC	BTEE-T-PC-403		3-1-0	3	150

Objectives	To present a problem oriented introductory knowledge of Machines, electro mechanical energy conversion & different parts of electrical machine.
Pre-Requisites	Basic Electrical and Concept of Mathematics and Physics
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.

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

CO1	Understand the concepts of magnetic circuits.
CO2	Understand the operation of dc machines.
CO3	Design and performance of testing of DC Machine
CO4	Analyze the differences in operation of different dc machine configurations.
CO5	Analyze single phase and three phase transformers circuits.
CO6	Understand the 3-phase Transformer.

Detailed Syllabus

Module	Topics	Ho
Module-1	**Introduction:-** Over view of magnetic circuits and its application to electrical machines, **D. C Machines:-** Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, Armature winding, lap & wave winding, single & double layer winding, ,commutator, visualization of magnetic field produced by the field winding excitation with armature winding open, methods of excitation, air gap flux density distribution.	**06 Hours**
Module-2	Working of DC Generator, EMF equation,, Types of DC generators - separately excited, shunt , series and compound. Open circuit characteristic of separately excited DC generator, voltage build-up in a shunt generator, critical field resistance and critical speed. Armature reaction in DC Machines, Brush position, Effects of armature reaction, commutation process, methods of decreasing armature reaction, voltage commutation & Inter poles, compensating winding, Losses and efficiency of D C Machines.	**07 Hours**
Module-3	**Different Characteristics of different DC generators**- OCC, Load Ch. external Ch. Internal Ch Parallel operation of D C generators, counter torque, applications of DC generators. Testing of D C machines:- Brake test, Swinburne's test, Hopkinson's test.	**6 Hours**
Module-4	Working of DC motor, classification, back emf, Armature torque equation, Shaft torque. Speed of D C motor & speed regulation, different characteristics of different types motor, speed-torque characteristics. DC motor starter, 3 point & 4 point starter, Armature resistance control, flux control & supply voltage control method of speed control of different types DC motor, Applications of D C motors.	**08 Hours**

Module-5	Construction, EMF equation & working of single phase transformer. Actual transformer at No Load & On load , No load phasor diagram, On load phasor diagram at lagging-leading-resistive load, rating of transformer. Equivalent circuit of transformer, approximate equivalent circuit, testing of transformer-polarity test, OC test, SC test , , voltage regulation , condition for zero voltage regulation & maximum regulation, Losses & efficiency, condition for maximum efficiency. All day efficiency. Back to back test. Parallel operation of single phase transformers. Auto transformer, copper saving, connection of 2 winding transformer as an auto transformer.	**10 Hours**
Module-6	**Three phase transformer:-** Construction, Cooling methods. Different connections of 3 phase transformer (Yy0, Yy6, Dd0, Dd6, Yz1,Yz11, Dz0,Dz6) . KVA capacity in Open delta & scott connection , Three phase to six phase conversion, Parallel operation of three phase transformers, three winding transformer, harmonics in 3 phase transformer (causes , effects and its suppression), Switching in transients in transformer.	**08 Hours**
	Total	**45 Hours**

Text Book	
• M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.	
• P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.	
Reference Books	
1	Electrical Machines. by Nagarath & Kothari, TMH Publications
2	Electrical Technology Vol II. B. L. Theraja,S .Chand Publications
3	Performance and Design of A.C. machines by M. G. Say
4	Electrical Machines by P S Bhimbra
5	Electrical Machine Design by A.K.Shawhney, Dhanpatrai & Sons

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.67	2.83	2.83	2.50	1.00	1.00	1.00	1.20	2.83	2.50	2.83

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-301	**Organizational Behavior**	3-1-0	3	150

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.

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 macro approaches.
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.

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. 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 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 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).

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.33	1.00	2.83	2.33	2.50	1.83	3.00	2.50	2.83	2.83	2.33	2.67

Type	Code		L-T-P	Credits	Marks
MC	BTBS-P-MC-302	**Essence of INDIAN Knowledge Tradition -I**	3-0-0	0	100

Objectives	The course aims at imparting basic principles of thought process, reasoning and inference. 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	Knowledge of Indian history.
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.

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

CO1	Ability to understand, connect up and explain basics of Indian Traditional knowledge Modern scientific perspective.

- 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)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Books:

S.N.	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 Fritzof Capra, Tao of Physics Fritzof Capra, The wave of Life
3	V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
4	GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya,VidyanidhiPrakasham, Delhi, 2016 and maintain attendance also Evaluation is 100% internal.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	0.50	2.00	0.50	1.00	0.50	2.67	1.00	2.83	2.83	2.00	0.50	2.67

Type	Code	NPTEL	L-T-P	Credits	Marks
OO	BTEE-T-OO-406		3-0-1	3	150

Objectives	One should be able to analyze memory less linear circuits
Pre-Requisites	XII std. level algebra and calculus, electrostatics
Teaching Pedagogy	NPTL VEDIOS & NPTL SITE
Level :	Undergraduate
Start Date :	25 Jul 2022
End Date :	14 Oct 2022
Enrollment Ends	08 Aug 2022
Exam Date :	29 Oct 2022 IST

Detailed Syllabus

Module-#	Topics	Hours
Total		**12 WEEKS**

Text Books:	
1	NPTL
Reference Books:	
1	NPTL

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	Employability Enhancement Training-C	L-T-P	Credits	Marks
SC	BTSC-T-SC-401		3-0-1	1	150

Objectives	To significantly raise the employability of the students to a level where they are able to clea campus selection process and at the same time develop an attitude of constant self-improvemer 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.

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

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) 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 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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	1.83	2.67	2.33	1.60	1.80	1.83	1.67	2.83	2.00	2.25

Type	Code	Power Electronics Lab	L-T-P	Credits	Marks
PC	BTEE-P-PC-401		1	1	150

Objectives	To expose to the field of Problem Solving, Design on converter circuit
Pre-Requisites	Knowledge of semiconductor device, rectifier 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.

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

CO1	Understand the V-I characteristics of semiconductors device and calculate the parameters.
CO2	Analyze the controlled converter.
CO3	Creating the knowledge on DC-DC converter.
CO4	Determine BUCK and BOOST converter.
CO5	Design the Voltage source invertor.
CO6	Remember about cycloconverter.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Study of the V-I characteristics of SCR, TRIAC, IGBT and MOSFET.	2 Hours
Experiment-2	To measure the latching and holding current of a SCR	2 Hours
Experiment-3	Study of the single phase half wave controlled rectifier with R and R-L Load	2 Hours
Experiment-4	Study of single phase full wave controlled rectifier circuits with R and R-L Load	2 Hours
Experiment-5	Study of the three phase half wave controlled rectifier with R and R-L Load	2 Hours
Experiment-6	Study of three phase full wave controlled rectifier circuits with R and R-L Load	2 Hours
Experiment-7	Study of Buck converter.	2 Hours
Experiment-8	Study of Boost converter.	2 Hours
Experiment-9	Study of the single phase pwm voltage source inverter.	2 Hours
Experiment-10	Study of cycloconverter	2 Hours

Text Books:	
1	Power Electronics Lab Manual, Department of EEE, GIFT, Bhubaneswar

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	3.00	3.00	2.83	1.80	1.80	2.60	3.00	2.80	2.40	2.80

Type	Code	Electrical Machine-I Lab	L-T-P	Credits	Marks
PC	BTEE-P-PC-403		0-0-3	1	100

Objectives	To present a problem oriented introductory knowledge of Machines, electro mechanical energy conversion & different parts of electrical machine.
Pre-Requisites	Basic Electrical and Concept of Mathematics and Physics
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-#		Hours
Experiment-1	Determination of critical resistance and critical speed from No load test of a DC shunt generator.	2 Hours
Experiment-2	Speed control of D.C shunt motor by armature resistance and field flux control method.	2 Hours
Experiment-3	To draw the Internal & External characteristics of a D C shunt generator.	2 Hours
Experiment-4	Calculation of efficiency of a DC machine by Brake test / Swinburne's test.	2 Hours
Experiment-5	Determination of Efficiency and Voltage Regulation by Open Circuitand Short Circuit test on single phase transformer.	2 Hours
Experiment-6	Parallel operation of two single phase transformers.	2 Hours
Experiment-7	Back-to Back test on two single phase transformers.	2 Hours
Experiment-8	Study of open delta and Scott connection of two single phase transformers.	2 Hours
Experiment-9	Speed control of a D C compound motor (starting by 4 point starter).	2 Hours
Experiment-10	Yy,Dd,Yd,Dy connection of a three phase transformer.	2 Hours

Text Books:	
1	Electrical Machine- I Lab Manual, Department of EEE, GIFT, Bhubaneswar

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	3.00	2.83	2.83	2.33	1.40	2.40	2.60	2.60	2.80	1.80	2.60

Type	Code	Analog Electronics Lab	L-T-P	Credits	Marks
PC	BTEC-P-PC-401		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 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	Investigate logic behavior of NOT,AND, OR, NAND, NOR, EX-OR, EXNOR gates.	2 Hours
Experiment-2	Gate-level minimization: Two level and multi level implementation of Boolean functions.	2 Hours
Experiment-3	Implementation using universal gates.	2 Hours
Experiment-4	Combinational Circuits: design, assemble and test: adders and subtractors, code converters	2 Hours
Experiment-5	Design of multiplexers andde-multiplexer	2 Hours
Experiment-6	Flip-Flop: assemble, test and investigate operation of SR, D & J-Kflip-flops.	2 Hours
Experiment-7	Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.	2 Hours
Experiment-8	Study and design of Asynchronous Counters.	2 Hours
Experiment-9	Study and design of synchronous Counters.	2 Hours
Experiment-10	Clock-pulse generator: design, implement and test.	2 Hours
	Beyond Syllabus	
Experiment-1	Design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bitproduct.	2 Hours
Experiment-2	VHDL simulation and implementation of adder.	2 Hours

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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	2.83	2.00	2.67	0.00	0.00	0.00	1.80	2.80	2.00	2.60

Type	Code	Project-III	L-T-P	Credits	Marks
PS	BTPS-P-PS-401		3-0-1	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

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

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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO3	2.83	2.83	2.83	2.67	2.8	2.83	2.8	1.00	2.8	2.8	2.83	2.83

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

Electrical and Electronics 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

3rd Year Course Structure

Fifth Semester					
Theory					
Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	PC	BTEE-T-PC-504	Digital Signal Processing	3-1-0	3
2	PC	BTEE-T-PC-501	Control System Engineering	4-1-0	4
3	PC	BTEE-T-PC-503	Electrical Power Transmission & Distribution	4-1-0	4
4	PC	BTEE-T-PC-502	Electrical Machine-II	4-1-0	4
5	PE	BTEE-T-PE-501	Electric Vehicle and Renewable Energy System	2-1-0	2
6	MC	BTMC-T-MC-501	Universal Human Values	2-0-0	0
7	AEC	BTEE-T-AE-501	Employability Enhancement Training-III	2-0-0	1
			Total Hours/ Credit(Theory)	26	18
Practical					
1	PC	BTEE-P-PC-502	Control System & Instrumentation Lab	0-0-2	1
2	PC	BTEE-P-PC-503	Electrical Power Transmission & Distribution LAB	0-0-2	1
3	ES	BTEE-P-PC-501	Electrical Machine-II LAB	0-0-2	1
4	PS	BTPS-P-PS-501	Seminar-1 I	0-0-3	1
5	PS	BTSC-P-SC-501	Evaluation of Summer Internship-II	0-0-2	2
			Total Hours/ Credit(Practical)	11	6
			Grand Total Hours/ Credit(Practical)	37	24

sixth Semester					
Theory					
Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	PE	BTEE-T-PE-601	Electrical Power System Protection	3-1-0	3
2	PC	BTEE-T-PC-603	Power System Operation and Control	4-1-0	4
3	PC	BTEE-T-PC-601	Microprocessor & Microcontroller	4-1-0	4
4	BS	BTBS-T-BS-601	Optimization Engineering	3-1-0	3
5	MC	BTMC-T-MC-601	Essence of Indian Knowledge Tradition -II	2-0-0	0
6	HS	BTHS-T-OE-601	Entrepreneurship and Development	3-1-0	3
7	OO	BTBS-T-OO-601	NPTEL	2-0-0	2
8	AEC	BTEE-T-AE-601	Employability Enhancement Training-IV	2-0-0	1
			Total Hours/ Credit(Theory)	28	20
Practical					
1	PC	BTEE-P-PC-601	Microprocessor & Microcontroller LAB	0-0-2	1
2	PC	BTEEP-PC-603	Power System Operation and Control LAB	0-0-2	1
3	PS	BTEE-P-PC-602	Project 4	0-0-2	2
			Total Hours/ Credit(Practical)	6	3
			Grand Total Hours/ Credit(Practical)	34	23
SUMMERINTERNSHIPTRAININGfor30Days					

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, engineeringfundamentals, 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 andrese arch 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.

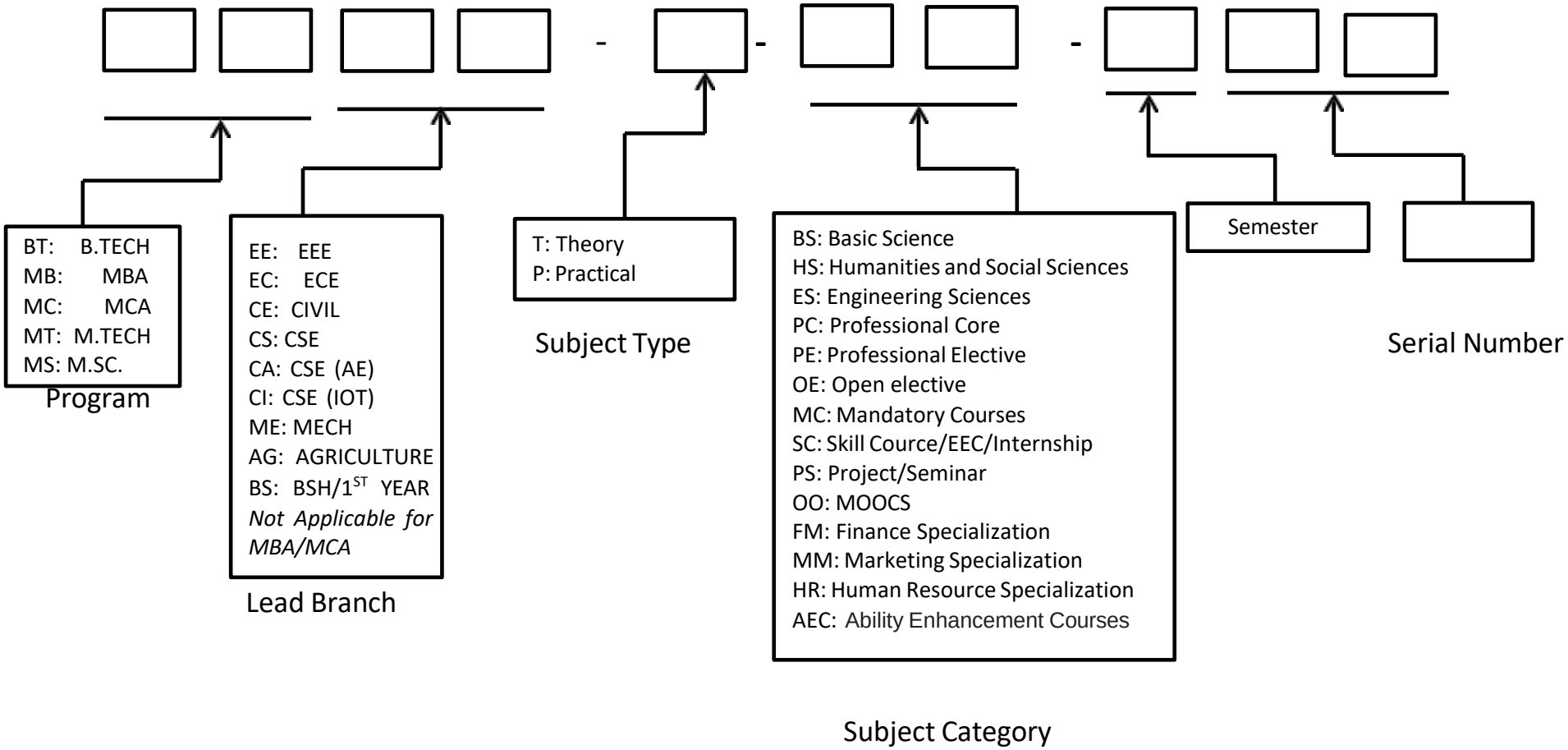
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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 /
SessionalWCH	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

Subject Code Format



Part 3

3rd Year B. Tech.

(Electrical and Electronics Engineering)

5TH SEMESTER

Type	Code		L-T-P	Credits	Marks
PC	BTEE-T-PC-503	Electrical Power Transmission & Distribution	4-1-0	4	200

Objectives	To delve into the field of Electrical Power Transmission and Distribution.
Pre-Requisites	Fundamental Power System Analysis, incorporating Electrical Engineering concepts and power system calculations
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned tobe interactive with focus on problem solving activities.

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

CO1	Analyzing the Sustainability of Conventional Energy Sources.
CO2	Understanding Inductance and Capacitance in Power Transmission Lines.
CO3	Assessing the Impact of Skin Effect and Proximity Effect on Power Transmission.
CO4	Understanding about over line Insulator.
CO5	Applying the Role and Function of Compensation Techniques in Power Systems.
CO6	Identifying Distribution Network Analysis and Voltage Regulation Techniques.

Module	Topics	Hours
Speed Math		
Module-1	**Tracing the Evolution and Current State of Power Systems with practical applications:** Evolution of Power Systems and the Present-Day Scenario. Structure of the Power System. Conventional Sources of Electrical Energy: Hydroelectric Power Generation, Thermal Power Generation, and Nuclear Power Generation, introduction to RES.	**6 Hours**
Module-2	**Comprehensive Analysis with practical applications of Electrical Elements in Power Transmission Lines:** Inductance Concepts: Internal Flux, External Flux Linkages, Single Phase Two Wire Line, Different three Phase Lines, Grouped Conductor Flux Linkages, Bundled Conductor Inductance Calculations , Composite Conductors, GMD, GMR, Line Transposition, Symmetrical/Unsymmetrical for three Phase Lines, Skin Effect, and Proximity Effect. Capacitance Overview: Two Wire Line, Symmetrical/Unsymmetrical Three Phase Lines, Earth Effects, Bundled Conductor Calculations, Parallel-Circuit Three Phase Lines, Corona Phenomenon.	**9 Hours**
Module-3	**Exploring Transmission Line Dynamics, Underground Cables, Insulators, and Power Flow Analysis practical Implementations:** Transmission Line Representation, Equivalence Circuit Analysis, Performance Evaluation, including Voltage Profile Assessment, Consideration of Ferranti Effect, Power Flow Analysis, Surge Impedance Loading Capacity, Underground Cable Overview: Types, Construction, Classification, Single-Core Cable Parameters, Grading, Capacitance in Three-Core Cable, Overhead vs. Underground Comparison, XLPE and PVC Cable Considerations.	**6 Hours**

Module-4	**Overhead Line Insulators with practical effects:** Insulating materials and types of insulation: (a) composite insulation; (b) polymer insulation; (c) glass insulation; (d) silicone rubber insulation; and (e) hybrid insulation. Voltage distribution over insulation strings and methods of equalizing the potential. **Introduction to Overhead Transmission Lines & Accessories with practical studies**: The catenary curve, sag tension calculation, supports at different levels, stringing chart, sag template, equivalent span, stringing of conductors, vibration, and vibration dampers.	**8 Hours**
Module-5	**Introduction to Power system improvement technique and its practical effects:** Static VAR compensators (SVC), static synchronous compensators (STATCOM), synchronous condensers, unified power flow controllers (UPFC), dynamic voltage restorers (DVR), distributed energy resources (DER) integration.	**6 Hours**
Module-6	**Distribution Systems and relevant field analysis:-** Primary and secondary distribution network, Voltage Drop in DC and AC Distributors, Kelvin's Law, its Limitations, and the Application of Capacitors in Distribution Systems. **Power System Earthing**: Soil Resistivity, Earth Resistance, Tolerable Step and Touch Voltage. Single-wire Earth Return Concept in distribution system.	**7 Hours**
Total		**42 Hours**

Text Books:
T1:- J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education 1994.
T2:- C.L.Wadhwa,"Electrical Power Systems", New Age International Publishers, 6th Edition
Reference Books:
R1:- I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
R2:- D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 4th Edition, 2011.
R3:- B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 5th Edition, 2012.
R4:- A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc, 1999.

Online Resources:

Course Name: Power System Generation Transmission and Distribution
Course Link: https://nptel.ac.in/courses/108/102/108102047/

Course Instructor: Prof. D P Kothari, IIT Delhi

Course Name: Power System Engineering
Course Link: https://nptel.ac.in/courses/108/105/108105104/
Course Instructor: Prof. D Das, IIT Kharagpur

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.83	2.83	2.33	1.67	2.50	2.50	2.83	2.17	2.33	2.17

Type	Code	Control System Engineering	L-T-P	Credits	Marks
PC	**BTEE-T-PC-501**		4-1-0	4	200

Objectives	To expose to the field of control system and stability analysis.
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 real-life problem-solving activities.

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

CO1	Understanding industrial control systems and mathematical modeling.
CO2	Remembering the different types of signal and its response.
CO3	Analyze the stability criteria and concept of stability.
CO4	Applying different techniques for stability criteria with practical application of PID controller tuning.
CO5	Summarize the relationship between time and frequency responses, including robustness analysis with PLC technique for compensation.
CO6	Outline in state-space models and stability analysis for discrete-time systems.

Detailed Syllabus

Module	Topics	Hours
Module-1	**A Comprehensive Study of Industrial Control Systems and Feedback Mechanisms with practical examples:** Introduction to industrial control systems 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. Block diagram algebra. Signal Flow Graph and Mason's Gain Formula.	**06 Hours**
Module-2	**Standard test signal and its response with field applications:** Time response of first- and second-order systems for standard test inputs. Application of the initial and final value theorem. Design specifications for second-order systems based on the time response. Concept of stability. Routh-Hurwitz Criteria. Relative stability analysis. Root-Locus technique. Construction of root loci.	**8 Hours**
Module - 3	**Exploring Control System Dynamics and PID Design with practical implementation:** Relationship between time and frequency response Polar plots and Bode plots. Nyquist-stability criterion. Relative stability using the Nyquist criterion (gain and phase margin) Closed-loop frequency response: constant M circle, constant N circle. Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity, and robustness of control systems.	**8 Hours**
Module - 4	**Exploring the methods of stability and concept of PID design with practical applications:** Root-loci method of feedback controller design. Design specifications in the frequency domain. Frequency-domain methods of design. Application of proportional, integral, and derivative controllers; tuning of PID controllers such as Ziegler-Nichols, Cohen-Coon, or trial-and-error methods to achieve desired performance specifications and stability margins.	**6 Hours**

Module-5	**State-Space Mastery: Variables, Stability, and Discrete-Time Systems with real time examples:-** Lead and lag compensation in designs. Integrating control algorithms with hardware interfaces, sensors, actuators, and communication networks for closed-loop control and system monitoring. Implementing control algorithms and strategies in real-world systems using programmable logic controllers (PLCs).	**8 Hours**
Module - 6	**Concepts of state variables with field applications:** State space model. Diagonalization of the State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.	**6 Hours**
Total		**42 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.

Course Name: Control System Engineering

Course Link: https://nptel.ac.in/courses/108/10

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.60	2.83	2.50	2.50	2.33	0.00	1.00	0.00	2.50	1.83	0.00	2.33

Type	Code	Electric Vehicle and Renewable Energy System	L-T-P	Credits	Marks
PE	**BTEE-T-PE-501**		2-1-0	2	200

Objectives	To expose in the field of Electric vehicle and renewable energy.
Pre-Requisites	Fundamental PV cell & Renewable energy that includes concepts of Electrical energy.
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.

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

CO1	Analyzing the Evolution, Environmental Footprint, Transition Hurdles, and Technical Needs in Electric Vehicle Advancement.
CO2	Recognize diverse electric vehicle types and their associated challenges, enhancing knowledge recall.
CO3	Understand the components and subsystems of Electric Vehicles, including all parameters.
CO4	Applying the management system for battery.
CO5	Summarizing Zero-Emission Power Generation through Diverse Sustainable Energy Sources.
CO6	Assessing Battery Storage Diversity, Charging Dynamics, and Testing Proficiency for Electric Vehicle Batteries.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Introduction to Electric Vehicles:** Need for Electric Vehicles, History of Electric Vehicles, Electric Vehicles and Environment, Challenges faced by electric vehicles to replace ICE: major requirements of electric vehicles. **Types of electric vehicles and their challenges:** battery electric vehicles, IC engines and electric hybrid vehicles, fuelled EVs, EVs using supply lines, EVs that use flywheels or super capacitors, solar-powered vehicles, and vehicles using linear motors.	**8 Hours**
Module-2	**Battery Electrical Vehicle:** Battery parameters, Power Converter, Driving Wheels, Suspension System, Driveshaft, Mechanical Transmission, Electric Motor, Power Electronics Converters (DC-AC/DC-DC), and Electronic Control Unit (ECU).	**8 Hours**
Module - 3	**Different systems of management for battery safety include:** The energy source subsystem is a battery pack with a battery management system. On-board charger, The auxiliary subsystem, power steering unit, Common parts between an ICE drive train and an EV drive train, Differences (modifications or parts to be removed or added) between the ICE and EV drive trains.	**6 Hours**
Module - 4	**Power generation with zero emissions:** Impact of fossil fuels and journey to-wards RES for zero emissions, carbon credit, net zero concepts. **Alternative and Sustainable Energy:** Solar Energy, Wind Energy, Hydroelectricity, Tidal Energy, Marine Currents, Wave Energy, Biomass Energy, Obtaining Energy from Waste, and Geothermal Energy.	**8 Hours**

Module - 5	**Storage management System:** Battery energy storage systems (BESS), Battery management system, Super Capacitors, Flywheels, Pumped storage plant (PSP).	**5 Hours**
Module - 6	Electric vehicle battery charging (normal and fast charging) and discharging, battery modeling and testing.	**5 Hours**
Total		**40 Hours**

Text Books:	
1	Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
Reference Books:	
1	James Larminie, John Lowry, Electric Vehicle Technology Explained, Wi- ley, 2003.
2	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Course Name: Introduction to Hybrid and Electric Vehicles
Course Link: https://nptel.ac.in/courses/108/103/108103009
Course Instructor: Dr. Praveen Kumar and Prof. S. Majhi, IIT Guwahati

Course Name: Electric Vehicles - Part 1
Course Link: https://nptel.ac.in/courses/108/102/108102121/
Course Instructor: Prof. Amit Jain, IIT Delhi
Course Name: Fundamentals of Electric vehicles: Technology & Economics
Course Link: https://nptel.ac.in/courses/108/106/108106170/
Course Instructor: Prof. Ashok Jhunjhunwala et al, IIT Madras

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.50	2.33	2.50	2.83	2.83	2.33	1.83	2.67	2.83	2.33	2.33

Type	Code	Digital Signal Processing	L-T-P	Credits	Marks
PC	BTEE-T-PC-504		3-1-0	3	200

Objectives	The objective of this course is to study processing of digital signals using Ztransform, discrete Fourier transform, design of IIR & FIR filters, and the concepts of multi-rate signal processing.
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

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

CO1	Explain the stability and causality of the LSI systems using Z-Transform.
CO2	Analyze discrete signals & systems using DFT technique.
CO3	
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

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.	**5 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, Filtering of Long Data Sequences. **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 **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. **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; Implementation of sampling rate conversion by poly-phase filter structure. Application of DSP – Model of Speech Wave Form – Vocoder.	**7Hours**
	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
4	
5	

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.33	2.33	2.50	2.83	1.83	1.50	1.80	0.00	2.80	2.80	0.00	2.80

Type	Code		L-T-P	Credits	Marks
PC	BTEE-T-PC-502	**Electrical Machine -II**	4-1-0	4	200

Objectives	The objective of this course is to provide the knowledge of electrical machineries.
Pre-Requisites	Knowledge of physics and mathematics.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned tobe interactive with focus on problem solving activities.

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

CO1	Understand the construction and working of different AC machines three phase & single phase.
CO2	Organizing different characteristics of 3-phase AC machines.
CO3	Evaluate the equivalent circuit parameters of different synchronous & asynchronous machines.
CO4	Applying different methods for operation of different AC machines.
CO5	Identify the problems and solution occurred during operation of synchronous generators.
CO6	Summarizing the details of Synchronous Motors.

Detailed Syllabus

Module	Topics	Hours
Speed Math		
Module-1	**A C machine winding with practical applications :-** Idea of concentrated & distributed winding, single layer & double layer armature winding, Different factors of armature winding. **Three phase Induction Motor with practical applications:-** Construction of squirell cage & slip ring type, rotating magnetic field, pulsating magnetic field, working principle, slip, slip speed.	**10 Hours**
Module-2	**Calculation of torque and efficiency of Induction Motor :-** Frequency of rotor emf and current, phasor diagram, equivalent circuit. Torque- Slip characteristics, starting & maximum torque, losses & efficiency .	**5 Hours**
Module-3	**Finding the circuit parameters of Induction Motor :-**Determination of equivalent circuit parameters from no load & blocked rotor test, starting, different types of starter & comparison between them. Different methods of speed control, effect of torque-slip characteristics on variation of different parameters of induction motor. Introduction to induction generator and doubly feed induction machines	**7 Hours**
Module-4	**Single phase induction motor (Capacitor start capacitor run & Permanent capacitor):-** Construction, double field revolving theory. Equivalent circuit, determination of equivalent circuit parameters from no load & blocked rotor test., methods of starting, applications. **Three phase synchronous generator :-** construction, salient pole type & cylindrical	**10 Hours**

	rotor type, speed, frequency & emf equation	
Module-5	**Three phase synchronous generator with real applications:-** equivalent circuit, occ, scc, phasor diagram at different load, load angle, synchronous reactance. Voltage regulation by synchronous impedance method and ZPF method, potier triangle , Two reaction theory, Analysis of salient pole machine phasor diagram .	**7 Hours**
Module-6	**Three phase synchronous generator with practical applications**:-, power angle characteristics, slip test, synchronization, parallel operation at no load & at on load, operation of 3 phase synchronous generator when connected to infinite bus bar. **Three phase synchronous motor:-** Construction, working principle, phasor diagram, V & inverted V curve, different methods of starting.	**6 Hours**
Total		**45 Hours**

Text Books:
P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
Reference Books:
R1:- Stephen J. Chapman-'Electric Machinery and Fundamentals'- Mc Graw Hill International Edition, (Fourth Edition), 2015.
R2:- A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
R3:- A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.

Online Resources:

Course Name: Electrical Machine-II
Course Link: https://nptel.ac.in/courses/108/105/108105131/

Course Instructor: Prof. T K Bhattacharya, IIT Kharagpur

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3.00	2.83	3.00	2.50	2.33	2.50	1.00	1.00	1.50	2.83	2.33	2.80

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-501	**Universal Human Values**	2-0-0	0	200

Objectives	➢ 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. ➢ 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. ➢ To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
Pre-Requisites	The methodology of this course is exploration 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 Scheme	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.

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

CO1	Understand and appreciate the significance of universal human values in personal and professional life.
CO2	Develop critical thinking and ethical reasoning skills to address real-life dilemmas.
CO3	Cultivate empathy and compassion towards others, promoting social harmony and well-being.
CO4	Enhance self-awareness and personal growth through reflection on one's values and actions.
CO5	Foster a sense of responsibility and commitment to societal and environmental sustainability.
CO6	Apply principles of universal human values in decision-making processes to create a positive impact.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Foundations of Value Education-A** 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** Continuous Happiness and Prosperity - the Basic Human Aspiration; Happiness and Prosperity-Current Scenario; Method to Fulfill the Basic Human Aspirations.	**3 Hours**
Module-3	**Harmony in the Human Life, Relationships and Society-A** Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; Achieving Harmony: Integrating Self and the Body; Harmony in the Family and Society.	**4 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 Fulfillment 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**
	TOTAL	**20 Hours**

Text Books:
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
Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
Reference Books:
Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
Small is Beautiful - E. F Schumacher.
B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.50	2.50	2.33	1.83	1.00	3.00	3.00	2.83	3.00	2.83	0.00	2.50

Type	Code		L-T-P	Credits	Marks
AEC	BTEE-T-AE-501	**Employability Enhancement Training-D**	2-0-0	1	200

Objectives	Equip individuals with the necessary skills, knowledge, and abilities to improve their employability and succeed in the job market.
Pre-Requisites	Fundamentals of electrical, electronics and soft skill.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned tobe interactive with focus on problem solving activities.

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

CO1	Understand the fundamentals basic electrical and electronics elements and circuits.
CO2	Analyze the application of network theory and analogue circuits.
CO3	Apply the concept of magnetism on electrical circuit.
CO4	Remember power electronics and its application in recent trends.
CO5	Develop knowledge on basic java and its applications.

Detailed Syllabus

Module	Topics	Hours
Speed Math		
Module-1	**Essential Principles in Electrical Circuits: AC/DC Fundamentals, Resonance, Semiconductors, and Inductance**:- Interview question on fundamentals of Elements of Electrical circuits. Concept of Alternating current and direct current, Average value, RMS value, Form factor and Crest factor. Fundamentals of alternating supply to R,R-L,R-C and R-L-C series and parallel circuit. Concept of resonance and its applications. Concept semiconductors and its complex power and power factor in ac circuits Inductance, Magneto motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations. **Exploring Semiconductor Physics and Devices: Energy Bands, Carrier Dynamics, and Semiconductor Components**:- Interview question on energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors. Diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations .P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.	**3 hrs**
Module-2	**Advanced Topics in Electrical Networks: Ideal Sources, Transient Response, Steady-State Analysis, and Three-Phase Circuits**:- Interview question on ideal voltage and current sources, dependent sources, Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, two port networks, balanced three phase circuits, star-delta transformation.	**3 hrs**
Module-3	**Exploring Diode Circuits, Amplifiers, Logic Circuits, and Signal Processing: A Comprehensive Overview**:- Interview question on simple diode circuits: clipping, clamping, rectifiers; Amplifiers: biasing, equivalent circuit and frequency response. Concepts of combinatorial and sequential logic circuits, multiplexers, de-multiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters. Binary, integer and floating-point- numbers. Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders. Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.	**3 hrs**

Module-4	**Fundamentals of Electrical Engineering: Magnetic Circuits, Electromagnetism Laws, and Transformer Principles in Single and Three-Phase Systems**:- Interview question on concept of magnetic circuit and laws of electromagnetism. Basic of Single phase transformer, open circuit and short circuit tests, regulation and efficiency; Basic of Three-phase transformers: connections, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors, applications of transformer and DC Machines. **Instruments and Power Electronics Applications**:- Interview question on fundamentals of Different types of measuring instruments and its applications. Measurement of voltage, current, power, energy and power factor. Applications of power electronics equipment on different fields of electrical and electronics engineering.	**4 hrs**
Module-5	**Exploring Static V-I Characteristics and Control Circuits: Thyristor, MOSFETs, IGBTs, and DC-DC Converters**:- Interview question on basic of static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT, Buck, Boost and Buck-Boost Converters, Concept of controlled and uncontrolled rectifier circuits.	**3 hrs**
Module-6	**Introduction to Java Basics**:- Data types, variables, and operators, Control flow, statements (if-else, switch, loops), Object-Oriented Programming (OOP) Concepts: Classes, objects, and methods, Inheritance and polymorphism (basic understanding), Encapsulation and abstraction **Exception Handling**:- Basics of try-catch block, Handling checked and, unchecked exceptions **Collections Framework**:- Array List and Hash Map (basic understanding), Iteration over collections **Basic Multithreading**: - Basics of threads, Creating and running threads, String **Handling**: - Basic understanding of the String class and its methods, Resume Review and Soft Skills: Brief overview of resume building, Tips for effective communication in interviews.	**4 hrs**
Total		**20hrs**

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	1.83	2.67	2.33	1.60	1.80	1.83	1.67	2.83	2.00	2.25

Type	Code	Electrical Power Transmission & Distribution Lab	L-T-P	Credits	Marks
PC	BTEE-P-PC-502		0-0-2	1	100
Objectives		To delve into the field of Electrical Power Transmission and Distribution.			
Pre-Requisites		Fundamental Power System Analysis, incorporating Electrical Engineering concepts and power system calculations			
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.			

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

CO1	Understanding and proficiency in analyzing Ferranti effect, ABCD parameters.
CO2	Evaluating string efficiency and conducting earth resistance measurements in electrical systems
CO3	Analyzing competence in performing transformer oil tests and comprehending the operation of diverse lightning arresters.
CO4	Understanding of power factor improvement in distribution systems through switched capacitor utilization, and explores the phenomena and effects of corona discharge.
CO5	Acquire proficiency in Simulink for studying power system blocks, MATLAB for designing short and long transmission lines, and conducting load flow analysis on simple power system networks.
CO6	Utilize MATLAB for simulating power system faults and modeling distribution feeders with varied scenarios.

Detailed Syllabus (Perform any 10 Experiments)

HARDWARE BASED EXPERIMENTS

Experiment No	Topic	Hours
1	Determination of Ferranti Effect	2 Hours
2	Determination of ABCD Parameter.	2 Hours
3	Determination of string efficiency	2 Hours
4	Earth resistance measurement.	2 Hours
5	Transformer oil test.	2 Hours
6	Study of various lightning arresters.	2 Hours
7	Distribution system power factor improvement using switched capacitor.	2 Hours
8	Study of corona discharge	2 Hours

SOFTWARE OR SIMULATION BASED EXPERIMENTS

Experiment No	Topic	Hours
1	To study the power system blocks in Simulink	2 Hours
2	To design short and long transmission line using MATLAB.	2 Hours
3	To perform load flow analysis on a simple power system network using Simulink.	2 Hours
4	Develop a MATLAB simulation to analyze different types of faults occurring in a power system network.	2 Hours
5	Model a distribution feeder using MATLAB and simulate various scenarios such as load variations, fault occurrences, and integration of renewable energy sources.	2 Hours

Text Books:	
1	EPTD Lab Manual, Department of EEE, GIFT, Bhubaneswar

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.50	3.00	3.00	2.33	2.17	2.40	0.00	1.80	2.80	2.60	0.00

Type	Code	Control & Instrument Lab	L-T-P	Credits	Marks
PC	BTEE-P-PC-502		0-0-2	1	100

Objectives	To encourage the students to study advanced engineering developments To prepare and present technical reports. 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.

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

CO1	Analyzing a DC motor-driven position control system and understanding the speed-torque characteristics of a two-phase AC servomotor, including the determination of its transfer function
CO2	Evaluating the validation of controllers for temperature control systems and explore position control systems using a Synchroscope for enhanced understanding and application
CO3	Develop adeptness in measuring linear displacement with LVDT and ascertain unknown resistance, inductance, and capacitance employing various bridge circuits.
CO4	Observing second-order process time responses with P, PI, and PID control, apply PID control to a servomotor, and analyze lag and lead compensator frequency responses, advancing comprehension and application abilities
CO5	Utilize MATLAB's Control Systems Toolbox to derive transfer functions from block diagrams, enhancing both application and analysis skills.
CO6	Understanding in concept of stability by different plots.

Detailed Syllabus

(Perform any 10 Experiments)

HARDWARE BASED EXPERIMENTS

1.	Performance a dc motor driven position control system
2.	Performance of speed torque characteristics of two phase ac servomotor and determination of its transfer function
3.	To study and validate the controllers for a temperature control system
4.	To study the position control system using Synchroscope.
5.	Measurement of linear displacement using LVDT
6.	To measure unknown resistance, inductance and capacitance using different bridges
7.	To observe the time response of a second order process with P, PI and PID control and apply PID control to servomotor
8.	Obtain the frequency response of a lag and lead compensator

SOFTWARE OR SIMULATION BASED EXPERIMENTS

1.	Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2.	Determine the transfer function for given closed loop system in block diagram representation.
3.	Plot unit step response of given transfer function and finds delay time, rise time, peak time and peak overshoot.
4.	Plot root locus of given transfer function, locate closed loop poles for different values of k.
5.	Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.

Text Books:	
1	Control & Instrumentation Lab Manual, Department of EEE, GIFT, Bhubaneswar

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.33	2.83	2.33	2.83	3.00	2.80	2.80	2.80	1.80	2.20	2.60

Type	Code	Electrical Machine-II Lab	L-T-P	Credits	Marks
PC	BTEE-P-PC-501		0-0-2	1	100

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

CO1	Evaluate voltage regulation of alternator by ZPF and synchronous Impedance method.
CO2	Analyzing the speed control of 3-phase Induction motor by frequency variation method.
CO3	Understanding the V and Inverted V curve of synchronous motor.
CO4	Evaluate efficiency and parameters of 3-phase Induction motor.
CO5	Develop the idea of parallel operation of two alternators and calculation of Xd and Xq with power angle characteristics.

Detailed Syllabus

1.	Determination of the voltage regulation of an three phase alternator by synchronous
2.	Determination of the voltage regulation of an three phase alternator by ZPF method.
3.	Speed control of a three phase induction motor by frequency variation method.
4.	Determination of V and Inverted V curve of a synchronous motor.
5.	Determination of efficiency of a three phase induction motor.
6.	Determination of equivalent circuit parameters of a three phase induction motor.
7.	Determination of equivalent circuit parameters of a single phase induction motor .
8.	Determination of power angle characteristics of a synchronous generator
9.	Measurement of Xd and Xq value of a salient pole type synchronous generator.
10.	Parallel operation of two alternators.

Text Books:	
1	Electrical Machine-II Lab Manual, Department of EEE, GIFT, Bhubaneswar

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PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	3.00	2.83	2.83	2.83	0.00	2.60	1.33	0.00	3.00	2.40	2.40

Type	Code		L-T-P	Credits	Marks
PS	BTEE-P-PS-501	**SEMINAR -II**	0-0-2	1	100

Objectives	To encourage the students to study advanced engineering developments To prepare and present technical reports. 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.

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.

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 awarded 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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	1.33	2.80	2.33	2.83	2.67	1.33	2.20	2.67	2.50	2.50	2.50

Type	Code	Evaluation of Summer Internship-II	L-T-P	Credits	Marks
PS	BTSC-P-SC-501		0-0-2	2	100

Objectives	To encourage the students to study advanced engineering developments To prepare and present technical reports. 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.

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
CO5	Evaluate the internship experience in terms of personal, educational and career needs.
CO6	Develop ideas for suitable start-ups to become successful entrepreneur.

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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.80	1.5	2.25	2.5	2.67	2.00	2.67	2.8	2.67	2.8	2.5	2.67

6TH SEMESTER

Type	Code		L-T-P	Credits	Marks
PC	BTEE-T-PC-601	Microprocessor & Microcontroller	4-1-0	4	200

Objectives	The objective of this course is to be familiar about different microprocessors & microcontrollers, be able to develop assembly level programs as per user / industry requirements, and interface with other external devices.
Pre-Requisites	Basic knowledge of Digital Electronic Circuits is required.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on theory and programming activities.

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

CO1	Comprehend the basic concept of Bus structure, a basic 8-bit Microprocessor (like 8085) system, its architecture, concept of stack, Addressing modes etc.
CO2	Explain the architecture of a 16-bit Microprocessor like 8086 including the concept of instruction queue, segmented memory structure and address generation
CO3	Explain and analyze the Addressing modes, Assembly language instructions of 8086 and implement them to solve 8086 related design problems
CO4	Design Memory Interfacing using memory chips with proper decoder circuits with a 16-bit processor and analyze the interrupt structure of 8086 Microprocessor
CO5	Explain the features of the peripherals such as PPI, Programmable interrupt control, USART and their interfacing with a 16-bit processor
CO6	Explain and analyze memory organization of a 8-bit Microcontroller (like 8051), its addressing modes, instructions, timers & counters and its serial communication

Detailed Syllabus

Module	Topics	Hours
Speed Math		
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	**8 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; Advanced Co-processor Architectures – Intel 80386, Pentium.	**10 Hours**
Module-3	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.	**14 Hours**
Module-4	Microcontrollers: 8051 systems – Introduction to 8051 Microcontrollers, Architecture, Memory Organization, Special Function Register, Port Operation, Memory Interfacing, I/O Interfacing, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART, External Communication, Interfaces-RS232, USB, Programming.	**8 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

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.83	2.83	2.83	2.67	2.50	2.00	2.67	2.83	2.67	2.17

Type	Code	Optimization Engineering	L-T-P	Credits	Marks
BS	BTBS-T-BS-601		3-1-0	3	200

Objectives	Introduction to optimization techniques using both linear and non-linear programming.
Pre-Requisites	Basic knowledge of Linear algebra, Basic understanding of engineering principles
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.

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

CO1	Understand basic theoretical principles for formulation of optimization models and its solution
CO2	Learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques.
CO3	Apply detailed theoretical and practical aspects of intelligent modeling, optimization and control of linear and non-linear systems.
CO4	Cast engineering minima/maxima problems into optimization framework.
CO5	Learn efficient computational procedures to solve optimization problems.
CO6	Analyze Matlab to implement important optimization methods.

Detailed Syllabus

Module	Topic	Hours
Module-1	Idea of engineering optimization problems, modeling of problems and principle of modeling, Linear Programming: Formulation of LPP, Graphical solution, Simplex method, Big-M method, Dual simplex method, Duality theory.	**10 Hour**
Module-2	Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method,	**06 Hour**
Module - 3	Assignment problems: Hungarian method for solution of Assignment problems. Travel Salesman problem.	**04 Hour**
Module - 4	Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method.	**08 Hour**
Module-5	Constrained optimization with equality constraint: Lagrange multiplier method. Constrained optimization with inequality constraint: Kuhn-Tucker condition.	**06 Hour**
Module - 6	Inventory Theory: General characteristics, Deterministic Inventory models: EOQ model with constant rate of demand, different rates of demand, EPQ Model.	**06 Hour**
Total		**40 Hour**

Text Books:	
1	Operations Research- Principle and Practice, A. Ravindran, D. T. Philips, J. Solberg, Second edition, Wiley India Pvt Ltd.
2	Operation Research, Prabhakar Pai ,Oxford University Press
Reference Books:	
1	Linear and Non-linear Optimization, Stephen G. Nash, A. Sofer, McGraw Hill, 2nd Edition.
2	Engineering Optimization, A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Wiley India Pvt. Ltd, Second edition.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.50	2.83	2.50	2.83	1.00	2.67	1.83	2.67	1.83	2.83	2.67	2.83

Type	Code	Electrical Power System Protection	L-T-P	Credits	Marks
PE	BTEE-T-PE-601		3-1-0	3	200

Objectives	To expose to the field of Electric power systems.
Pre-Requisites	Fundamental of protection system .
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.

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

CO1	Understand the electrical protection system.
CO2	Recognize the details study of switchgear..
CO3	Analyze Relay Design and Construction.
CO4	Evaluate Feeder Protection Techniques.
CO5	Synthesize Apparatus Protection Strategies.
CO6	Understanding concept of Numerical Relays and over-voltage concept.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Introduction:** Principle and need for protective schemes, Nature and causes of faults, Zones of protection, Primary and back-up protection, Basic principle of operation of protective system, Components of Protection System. Sequence Components and Fault Analysis: sequence impedance, fault calculations, Single line to ground fault, Line to ground fault with Zf , Faults in Power systems, Concept of short circuit capacity of a Bus.	**09 Hours**
Module-2	**Switchgears and its field applications:** Circuit Breakers: Principle and operations (Theory of Circuit interruption) , Types and classifications (air, oil, vacuum, SF6, G3), testing and applications, Circuit constants in relation to Circuit breaking, Re-striking voltage transient, characteristics of Re-striking Voltage and Current chopping, Auto reclosing.	**08 Hours**
Module - 3	**Power system protection Relays and its practical applications:** relay principle and operation, Evolutions of relaying technology, types and classifications (Back-up relays, Directional relays, Distance relays, Differential relays, Bus bar, REF) , testing and applications, comparative study of electromagnetic, static and numerical relays.	**06 Hours**
Module - 4	**Electromagnetic and Static Relays with field applications:** (Comparators and different relays) Amplitude comparator, Phase Comparator, Coincidence type phase comparator, Basic elements of a static relay, **Numerical relays**: Block Diagram of Numerical Relay, Signal Sampling, Processing and applications. Specific applications for Back-up, Directional, Distance, Differential, Bus bar and REF relays.	**07 Hours**
Module-5	**Feeder Protection with real time examples:** Back-up (over current, earth fault), Distance and Pilot Protection. **Apparatus Protection with real time examples:** Transformer Protection (Electrical and mechanical protection) Differential , REF, Over-flux and back-up as electrical protections, Buchholz, WTI,OTI,PRV as mechanical protection Generator Protection (Electrical and mechanical protection) Differential , REF, Over-flux and back-	**05 Hours**

	up as electrical protections, over speed, vibration as mechanical protection Motor Protection (Electrical and mechanical protection) Differential , REF, Over-flux and back-up as electrical protections, over speed, vibration as mechanical protection Bus bar protection schemes.	
Module-6	**Over voltage Protection with real time examples:** Protection against surge-surge absorber, Surge diverter. Introduction to ESP.	**05 Hours**
Total		**40 Hours**

Text Books:	
1	Power System Protection and Switchgear – B.Ravindranath & M.Chander–New Age International Publishers (Second Edition).
2	Electrical Power System - C.L.Wadhwa New Age International Publishers. (Sixth Edition).
Reference Books:	
1	Bhavesh Bhalja, R P Maheshwari, Nilesh G.Chothani, Oxford University Press
2	Fundamentals of Power System Protection – Y.G.Paithankar and S.R.Bhide, PHI Publication.(Second Edition) Bhavesh Bhalja, R P Maheshwari, Nilesh G.Chothani, Oxford University Press
3	Power System Engineering - M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarti, Dhanpat Rai & Co. (P) Ltd.
4	Protection and Switchgear - B.Bhalja, R.P.Maheshwari, N.G. Chothani, OXFORD University Press.
5	Power System Protection and Switchgear - Badri Ram, Vishwakarma, Tata McGraw hill.
6	Switchgear and Protection – Sunil S Rao , Khanna Publishers, New Delhi.
7	Power System relaying by Horwitz, Phadke, Research Press.

Course Name: Power System Protection
Course Link: https://nptel.ac.in/courses/108/105/108105167/
Course Instructor: Prof. Ashok Kumar Pradhan, IIT Kharagpur

Course Name: NOC:Power System Protection and Switchgear
Course Link: https://nptel.ac.in/courses/108/107/108107167/
Course Instructor: Prof. Bhaveshkumar R. Bhalja, IIT Roorkee

Course Name: Power System Protection
Course Link: https://nptel.ac.in/courses/108/101/108101039

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.83	2.83	2.33	1.67	2.50	2.50	2.83	2.17	2.33	2.17

Type	Code	Power System operation and Control	L-T-P	Credits	Marks
PC	BTEE-T-PC-603		4-1-0	4	200

Objectives	The objective of this course is to study Power system, Z-transformation, Fourier series.
Pre-Requisites	Basic knowledge of Protection and Power 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

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

CO1	Understand concept of Indian Power sectors and load flow analysis.
CO2	Analyze the economic operation of Power system.
CO3	Accessing the concept of deregulation and restructuring.
CO4	Determining the control strategy for AGC.
CO5	Linking to power system stability.
CO6	Outlying the computer control strategy in power system

Detailed Syllabus

Module	Topics	Hours
Module-1	**Indian Power Sector – Past and present status with practical applications:** Growth of power sector in India – An overview, A time line of the Indian power sector, Players in the Indian power sector, Research and professional bodies. **Load Flow Analysis:** Review of the structure of a Power System and its components Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled method-Merits and demerits of the above methods-System data for load flow	**9 Hours**
Module-2	**Economic Operation and Management of Power System with practical applications:** Basic Pricing Principles: Generator Cost Curves, Utility Functions, Economic Operation with and without Transmission losses, Transmission loss coefficient, Economic Dispatch, Unit Commitment, Function of Load Dispatch Centers. Demand side- management.	**6 Hours**
Module-3	**Introduction to Power System Deregulation and Restructuring with practical applications:** Introduction; Motivation for Restructuring of power system; Electricity market entities and model; Benefits of Deregulation; Basic terminologies; Deregulation –	**6 Hours**
Module-4	**Automatic Generation Control and Voltage Control with practical applications:** Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators, ALFC of Single and Two Area Systems.	**7 Hours**
Module-5	**Power System Stability with practical applications:** The Stability Problem, Rotor Dynamics and the Swing Equation, The Power-Angle Equation, Synchronizing Power Coefficients, Equal- Area Criterion for Stability, Multi- machine Stability Studies: Classical Representation, Step-By-Step Solution of the Swing Curve, Factors Affecting Transient Stability.	**6 Hours**

Module-6	**Computer Control of Power Systems with practical applications:** Need of computer control of power systems. Concept of energy control center (or) load dispatch center and the functions - system monitoring - data acquisition and control. System hardware configuration –SCADA and EMS functions.	**6 Hours**
Total		**40Hours**

Text Books:
1. Modern Power System Analysis – D. P. Kothari, I. J. Nagrath, TMH Publication
2. Electrical Power Systems – P. Venkatesh, B.V. Manikandan, S.C. Raja, A. Srinivasan, PHI
Reference Books:
3. Power System Analysis – J. J. Grainger, W.D. Stevenson, Mc-GrawHill series publication
4. Power Generation Operation and Control – A. J. Wood, B. F. Woolenberg, John Wiley and Sons
5. Power System Analysis – Hadi Saadat, Mc-GrawHill series publication
6. Advanced Power System Analysis and Dynamics – L. P. Singh, New Age International
7. Operation of Restructured Power Systems – K. Bhattacharya, H. J. Bollen, J. E. Daalder, Kluwer academic publishers

Digital Learning Resources:

1. http://nptel.ac.in/courses/108101040/
2. http://www.electrical-engineering-portal.com/
3. http://nptel.iitm.ac.in/courses.php
4. www.vlab.co.in

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.83	2.67	2.83	2.33	1.50	1.00	2.67	1.33	2.67	2.50	2.83

Type	Code		L-T-P	Credits	Marks
HS	BTHS-TOE-601	Entrepreneurship Development	3-1-0	3	200
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 a bigger picture.			
Pre-Requisites		Students should develop Entrepreneurship bent of mind through motivational speech and attending Entrepreneurship program.			
Teaching Scheme		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.			

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.

Detailed Syllabus

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, Entrepreneur Vs. manager, Entrepreneur Vs Intrapreneur. Types of Entrepreneurs, Role of Entrepreneurship in Economic Development Case let	10 hours
Module-2	Entrepreneurship Environment: Entrepreneurship Environment in India and Odisha, Identification of Opportunities, Converting Business Opportunities into reality Case let	06 hours
Module-3	Entrepreneurial Motivation and Skill: Why to become entrepreneur, Entrepreneurship as a career: Role of family, Society. Meaning of Entrepreneurship skill, Types of Entrepreneurship Skills Case Let.	07 hours
Module-4	Need to know about Accounting, working capital Management, Marketing Management, Human Resources Management, and Labour Laws, Incentives and Subsidies Case Let.	08 hours

Module-5	Forms of Business Ownership: Sole proprietorship, partnership forms and others, Types of Industries, Concept of Start-ups Case Let.	05 hours
Module-6	Small-Scale Industries: Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Governments in reviving industries Case Let.	04 hours
Total		40 hours

Text Books:
Entrepreneurship Development and Management, Vasant Desai, HPH
Entrepreneurship Management, Bholanath Dutta, Excel Books
Reference Books:
Entrepreneurial Development, Sangeeta Sharma, PHI
Entrepreneurship Development and Management by R.K Singhal, Katson Books., New Delhi
Entrepreneurship Development and Management by U Saroj and V Mahendiratta, Abhishek Publications, Chandigarh

Digital Learning Resources:

1. https://startupodisha.gov.in/startup-policy
2. https://www.startupindia.gov.in/content/sih/en/startup-scheme.html
3. https://dpiit.gov.in/
4. https://www.fundable.com/learn/resources/guides/startup

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.67	2.33	2.67	0.00	2.33	2.17	2.83	2.67	2.50	2.17

Type	Code		L-T-P	Credits	Marks
OO	BTBS-T-OO-601	NPTEL	2-1-0	2	200

Objectives	This course covers two aspects of programming i.e. solving the problem using different techniques like algorithm, flowchart and decision table and then writing the programs using the syntax of Python language to obtain the computer solution to the problem. Python is a simple and easy to understand language.
Pre-Requisites	C,c++
Teaching Scheme	NPTL online videos

Detailed Syllabus

Module	Topics	Hours
Speed Math		

Type	Code		L-T-P	Credits	Marks
AEC	BTEE-T-AE-601	**Ability Enhancement Training-IV**	2-0-0	1	200

Objectives	To enhance the students ability to do work in Industry.
Pre-Requisites	Control system, power system.
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

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

CO1	Understand the control system
CO2	Analyze machines used in industry and its applications.
CO3	Adopting the concept of Smart Grid.
CO4	Create knowledge on technical skills and automation system.
CO5	Develop idea on Industry 4.0
CO6	Evaluate the knowledge of students in different practical field.

Detailed Syllabus

Module	Topics	Hours
Speed Math		
Module-1	**Introduction to control system**: - Basic knowledge on control system and application of control system in industry. Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform. R.M.S. value, average value calculation for any general periodic waveform. Transient and Steady-state analysis of linear time invariant systems, Stability analysis. Industrial automation.	**5hrs**
Module-2	**An introduction to industrial machineries**: - Machineries used in industry and their applications. Renewable sources for power generation. Application of solar PV cell in different fields. Different transformer and protection equipment's in grid	**5hrs**
Module-3	**Smart GRID system**: - Introduction to smart grid system and its applications. Series and shunt compensation, Electric field distribution and insulators, Distribution systems. Different types of Protection equipment's used in power system. Fault analysis and their clearing techniques.	
Module-4	**Technical Skills Enhancement**: - Advanced topics in electrical engineering: power systems, control systems, electronics, etc. Practical training on software tools commonly used in the industry (e.g., MATLAB, AutoCAD, ETAP), Hands-on experience with electrical equipment and instrumentation.	**5hrs**
Module-5	**Automation and Robotics**: - Industrial automation: PLC programming, SCADA systems, HMI design, Collaborative robots (cobots) and autonomous systems in electrical manufacturing, Hands-on experience with robotic programming and integration.	

Module-6	**Introduction to Industry 4.0**:- Overview of Industry 4.0 and its impact on the electrical engineering sector, Key technologies: Internet of Things (IoT), Artificial Intelligence (AI), Big Data, Cyber-Physical Systems (CPS), Case studies of Industry 4.0 implementations in electrical engineering. **Digitalization in Electrical Engineering**: - Digital twins and virtual prototyping in electrical systems design, Cloud computing and edge computing for real-time data processing, Smart sensors and actuators for condition monitoring and predictive maintenance.	**5hrs**
Total		**20hrs**

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	3	2.83	2	2.83	2.83	1.8	1.83	1.83	2.17	2.83	2.25	2.67

Type	Code		L-T-P	Credits	Marks
MC	BTEE-T-MC-601	**EIKT-II**	2-0-0	0	200

Objectives	Defining the concepts of Indian tradition Knowledge Understanding the importance of roots of knowledge system Implementing the traditional knowledge to the day to day life Distinguishing the types of traditional knowledge Evaluating the ideas and teaching s of TK
Pre-Requisites	Indian tradition Knowledge
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

Course Outcomes: At the end of this course, the students 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.
CO6	Identify the concept of Traditional knowledge and its importance.

Detailed Syllabus

Module	Topics	Hours
Speed Math		
Module-1	Introduction to Traditional Knowledge (Definition TK its Nature, characteristics and scope)	**3hrs**

Module-2	Protection and significance of Traditional knowledge (Significance of TK Protection , Value of TK , role of Govt.to harness TK)	**4 hrs**
Module-3	Legal Frame work and TK (Forest Dwellers forest right act 2001, 2002 and 2006.)	**3hrs**
Module-4	Traditional knowledge and Intellectual property (Systems & Legal concepts for the protection of traditional knowledge)	**3hrs**
Module-5	Traditional knowledge and Engineering (Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge)	**4 hrs**
Module-6	Importance of conservation and sustainable development of environment Management of Biodiversity (Traditional societies dependence on environment , Food security of the country and protection of TK)	**3hrs**
Total		**20hrs**

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	0.00	2.67	0.00	2.60	0.00	2.80	2.40		1.80	2.80	0.00	2.60

Type	Code	Power System Operation & Control Lab	L-T-P	Credits	Marks
PC	BTEEP-PC-603		0-0-2	1	100

Objectives	The objective of this course is gain knowledge of power system operation and control.
Pre-Requisites	Fourier transform, simulation and the concepts of protection.
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

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

CO1	Understand sequence current and voltage.
CO2	Create knowledge on alternator direct and quadrature axis.
CO3	Develop knowledge on different relays and its characteristics.
CO4	Testing fault of cables by fault locater.
CO5	Composing different types of simulation design for power system fault analysis.

Detailed Syllabus (Perform any 10 Experiments)

HARDWARE BASED EXPERIMENTS

Expt No	Topic	Hours
1	To determine negative and zero sequence synchronous reactance of an alternator.	2Hours
2	To determine sub-transient direct axis and sub-transient quadrature axis synchronous	2Hours

	reactance of a 3-ph salient pole alternator.	
4	To study the IDMT over-current relay and with different plug setting and time setting multipliers and plot its time – current characteristics.	2Hours
5	To determine the operating characteristics of biased different relay with different % of biasing.	2Hours
6	To study the MHO and reactance type distance relays.	2Hours
7	To determine location of fault in a cable using cable fault locator.	2Hours

SOFTWARE OR SIMULATION BASED EXPERIMENTS

Expt No	Topic	Hours
1	To obtain steady-state, transient and sub-transient short-circuit currents in an Alternator.	2Hours
2	To formulate the Y-Bus matrix and perform load flow analysis.	2Hours
3	To formulate the fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation by simulation.	2Hours
4	To compute voltage, current, power factor, regulation and efficiency at the receiving end of a three phase Transmission line when the voltage and power at the sending end are given. Use Π model.	2Hours
5	To perform symmetrical fault analysis in a power system.	2Hours
6	To perform unsymmetrical fault analysis in a power system.	2Hours
7	Write a program in 'C' language to solve economic dispatch problem of a power system with only thermal units. Take production cost function as quadratic and neglect transmission loss.	2Hours

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.83	2.67	2.83	2.83	2.50	0.00	2.80	0.00	2.40	0.00	1.40	0.00

Type	Code		L-T-P	Credits	Marks
PC		**Microprocessor and Microcontroller Lab**	0-0-2	1	100

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.

Expt. No.	Topic
1	Programs for 16 bit arithmetic operations using 8086.
2	2 Programs for Sorting and Searching (using 8086).
3	Programs for String manipulation operations (using 8086).
4	Programs for Digital clock and Stop watch (using 8086).
5	Interfacing ADC and DAC.
6	Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
7	Interfacing and Programming 8279, 8259, and 8253.
8	Serial Communication between two MP Kits using 8251.
9	Interfacing and Programming of Stepper Motor and DC Motor Speed control.
10	Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
	Beyond Syllabus
1	Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
2	Communication between 8051 Microcontroller kit and PC.

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 8086 Microprocessor.
CO2	Develop and apply assembly language programs using loop, branch, arithmetic, logical, shift, rotate, array & String operations.
CO3	Formulate programs like finding largest/smallest numbers, check existence of data, etc.
CO4	Experiment with assembly level programming of 8051 microcontroller & its functions for various applications.
CO5	Analyze modes of operation of 8255 PPI and peripheral interfacing using A/D and D/A converter, Stepper motor controller, and keyboard with display interface using 8279 PIC

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.50	2.83	2.83	2.50	2.83	2.20	2.33	2.60	2.80	2.83	2.40

Type	Code	Project-IV	L-T-P	Credits	Marks
PS	BTEE-P-PC-602		0-0-2	2	100

Objectives	The objective is to analyze the designing process of combinational and sequential circuits, express its operations.
Pre-Requisites	Knowledge of Electrical & Electronics Circuits
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessionsare planned to be interactive with different examples

Detailed Syllabus

Projects-IV

1. Smart Home Automation System.
2. Grid-Tied Solar Power System.
3. Wireless Power Transfer.
4. Electric Vehicle Charging Infrastructure.
5. Power Quality Improvement.
6. Microcontroller-Based Robotics.
7. Renewable Energy Monitoring and Control.
8. Embedded System for Biomedical Applications.
9. Industrial Automation and Control Systems.
10. Smart Energy Metering System.
11. Fault Detection and Diagnosis in Power Systems.
12. Wireless Sensor Networks for Environmental Monitoring.
13. Power Electronics for Renewable Energy Integration.
14. Electric Motor Drive Systems.
15. Biometric Security Systems.
16. Energy Harvesting Systems.
17. Digital Signal Processing (DSP) Applications.
18. Hardware Acceleration for Artificial Intelligence.
19. Power Distribution and Management in Data Centers.
20. Smart Irrigation System.
21. Power Electronics converters for Electric Vehicles.
22. Digital Control of Power Converters.

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

CO1	Identify Basic knowledge on electrical components and circuits.
CO2	Identify the problem statement of project.
CO3	Apply methods and find the components to design the project.
CO4	Develop the hardware based project.
CO5	Develop the pipeline and its performance.
CO6	Design innovative approach for report.

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Syllabus for B-Tech (4th Year)
(2022 Admission Batch)

Electrical and Electronics 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

4th Year Course Structure

7th Semester					
Theory					
Sl. No.	**Category**	**Course Code**	**Course Title**	**WCH L-T-P**	**Credit**
1	PE	BTEE-T-PE-703	Green Technology and Sustainability	3-0-0	3
2	PE	BTEE-T-PE-702	Electromagnetic Fields Theory	3-0-0	3
3	PC	BTEE-T-PC-701	SMART GRID	3-1-0	3
4	OE	BTEE-T-OE-701	Artificial Intelligence and Machine Learning	3-0-0	3
5	PE	BTEE-T-PE-701	FACTS and HVDC	3-0-0	3
			Total Hours / Credit(Theory)	**16**	**15**
Practical					
1	PS	BTEE-P-PS-701	Evaluation of Summer Internship-III	0-0-4	2
2	PS	BTPS-P-PS-702	Seminar-III	0-0-2	1
Total Hours/ Credit (Practical)				6	3
Grand Total Hours/ Credit (Practical)				**22**	**18**

8th Semester					
Theory					
Sl. No.	**Category**	**Course Code**	**Course Title**	**WCH L-T-P**	**Credit**
Total Hours/ Credit(Theory)					
Practical					
1	PS	BTPS-P-PS-801	Major Project/Internship	0-0-16	8
		BTEE-T-OO-809	nptel		3
2	PS	BTPS-P-PS-802	Comprehensive viva	0-0-4	2
Total Hours/ Credit (Practical)				13	13
Grand Total Hours/ Credit (Practical)				13	13
SUMMER INTERNSHIP TRAINING for 30 Days					

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, engineeringfundamentals, 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 andresearch 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.

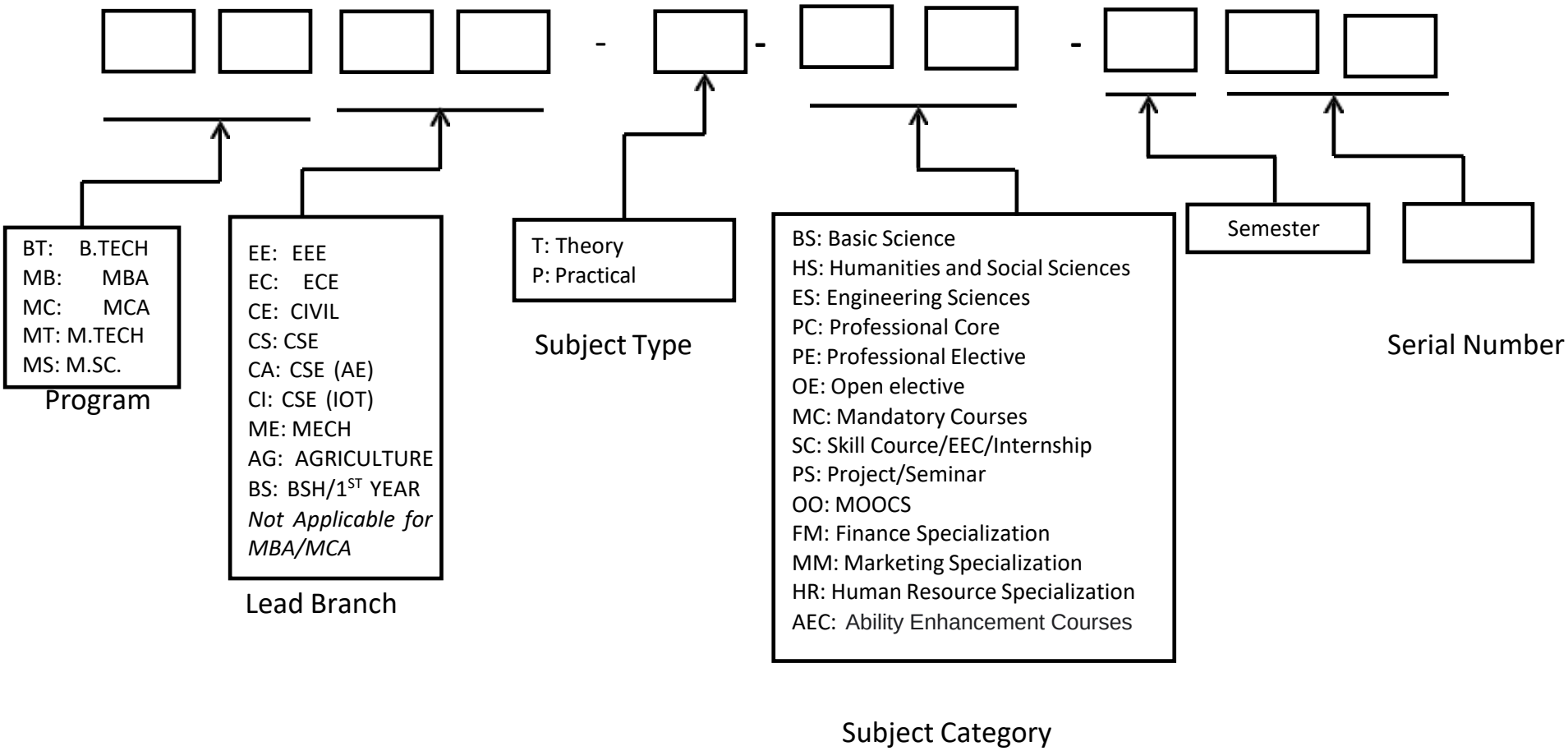
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Subject Code Format



7TH SEMESTER

Type	Code	SMART GRID	L-T-P	Credits	Marks
PC	BTEE-T-PC-701		3-1-0	4	200

Objectives	To equip students with knowledge of smart grid technologies, components, and their role in modernizing power systems for efficient and sustainable energy management.
Pre-Requisites	BTEE-T-PC-503: Power System Operation and Control
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

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

CO1	Explain the evolution and basic concepts of the electric power grid and the smart grid
CO2	Analyze the need for smart grid technology and compare it with conventional systems
CO3	Apply knowledge of smart grid components, such as smart meters, AMR, and automation technologies
CO4	Evaluate the role of monitoring system (PMUs, WAMS), supervision, control and operation in enhancing grid reliability and performance
CO5	Design strategies for integrating renewable energy sources into the smart grid while addressing power quality issues
CO6	Investigate of power quality in smart grids using advanced monitoring tools and methods

Module	Topics	Hours
Module-1	**Introduction to Smart Grid concept:** Evolution of Electric Power Grid, definitions, architecture and functions of Smart Grid. Need of Smart Grid. Difference between conventional & smart grid. Opportunities & Challenges of Smart Grid, Introduction to Smart Grid components and brief note on practical field applications	**6 Hours**
Module-2	**Functional Aspects of Smart Grid systems:** Substation Automation, Feeder Automation, Smart Sensors, Geographic Information System (GIS). Intelligent Electronic Devices (IED), Bay Controller Unit (BCU) and their functionality towards Monitoring, Supervision, Operation, Control and Protection and brief note on practical field applications	**7 Hours**
Module-3	**Applications of Smart Grid Components towards Grid Management:** Demand Side Management (DSM), Energy Management Solution (EMS), Outage Management System (OMS). Smart Building, Home & Building Automation, Phasor Measurement Units (PMU), Wide Area Measurement System (WAMS), Wide- Area based Protection and Control and brief note on practical field applications	**8 Hours**
Module-4	**Protection and Integration to Distributed Energy Resources (DER):** Micro-grid concepts: Need and application, Issues of Interconnection, Protection & control systems for micro-grid, Energy Storage systems (Battery Energy Storage System (BESS), SMES, Pumped Storage Plant, Compressed Air Energy Storage) and brief note on practical field applications	**8 Hours**
Module-5	**Advance and Futuristic concepts of Smart Grid:** Advance application towards AI, Integration of renewables and issues involved Advantages and Disadvantages of Distributed Generation and brief note on practical field applications	**6 Hours**
Module-6	**Power Quality, Reliability and Energy Audit:** Power Quality issues of Grid connected Renewable Energy Sources. Power Quality Conditioners for micro-grid. Web based Power Quality monitoring, Power Quality Audit, EMC in smart Grid and brief note on practical field applications	**5 Hours**
	Total	**40 Hours**

Books:

[1] Ali Keyhani, "Design of Smart power grid renewable energy systems", WileyIEEE, 2011

[2] Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and DemandResponse", CRCPress, 2009.

[3] Stuart Borlase, "Smart Grid: Infrastructure,Technology and solutions " CRC Press

Reference Books:

[4] Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.

[5] Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability: 1", Artech House Publishers July 2011

[6] MladenKezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "Substation Automation (Power Electronics and Power Systems)", Springer

Digital Learning Resources:

Course Name: Introduction to Smart Grid
Course Link: https://nptel.ac.in/courses/108/107/108107113/
Course Instructor: Prof. N.P. Padhy and Prof. Premalata Jena, IIT Roorkee

Course Instructor:

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.83	2.83	2.83	2.33	1.67	2.50	2.50	2.83	2.17	2.33	2.17

Type	Code	FACTS and HVDC	L-T-P	Credits	Marks
PE	BTEE-T-PE-701		3-0-0	3	200

Objectives	The primary objective of this topic is to provide students with a comprehensive understanding of Flexible AC Transmission Systems (FACTS), focusing on their concepts, components, and applications in modern power systems. The course aims to develop the ability to analyze and apply FACTS controllers to enhance power flow, stability, and efficiency in transmission networks.
Pre-Requisites	BTEE-T-PC-401: Power 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

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

CO1	Define the fundamental concepts and general system considerations of FACTS, including power flow in an AC system, transmission interconnections, and the limits of loading capability.
CO2	Explain the basic types, descriptions, and definitions of FACTS controllers, including their objectives and significance in transmission interconnections.
CO3	Demonstrate the methods of controllable VAR generation and analyze the functioning of Static Shunt and Series Compensators (e.g., SVC, STATCOM, TCSC) in enhancing system stability.
CO4	Examine the relative importance of controllable parameters and analyze how static voltage and phase angle regulators (TCVRs and TCPARs) contribute to power system performance.
CO5	Evaluate the role of advanced FACTS controllers such as UPFC and IPFC in improving power flow, dynamic stability, and overall system performance.
CO6	Comprehend the concepts of HVDC systems and design different Multi Terminal DC systems for existing ac transmission lines.

Detailed Syllabus

Module	Topics	Hours
Module-1	**FACTS concept and General System Considerations:** Transmission Interconnections, Flow of Power in an AC System, Factors limiting the Loading Capability, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, Basic Types of FACTS Controllers, Basic Description and Definitions of FACTS Controllers	**8 hrs**
Module-2	**Static Shunt Compensation:** Objectives of Shunt Compensation, Methods of Controllable VAR Generation, Static VAR Compensators.	**8 hrs**
Module-3	**SVC and STATCOM. Static Series Compensators:** Objective of Series Compensation (GCSC, TSSC, TCSC), Variable Impedance Type Series Compensators, Switching Converter Type Series Compensators (SSSC), Static Voltage and Phase Angle Regulators.	**6 hrs**
Module-4	**Voltage and Phase Angle Regulators:** Objectives, Approaches to Thyristor-Controlled Voltage and Phase Angle Regulators (TCVRs and TCPARs).	**5 hrs**
Module-5	**Combined Compensators:** Introduction, Unified Power Flow Controller (UPFC), The Interline Power Flow Controller (IPFC), Generalized and Multifunctional FACTS Controllers.	**5 hrs**
Module-6	**HVDC Transmission:** Types of DC links (Mono polar, Homo polar, bipolar), CSI and VSI based HVDC systems, Components of HVDC, Principles of HVDC Control, Configuration of HVDC system, Recent trends in HVDC transmission, HVDC systems in India, Case study	**8 hrs**
	Total	**40 Hours**

[1]	"Understanding FACTS: Concepts & Technology of Flexible AC Transmission Systems" By N.G.Hingorani&L.Gyugyi, IEEE Press, Standard Publishers Distributors, Delhi.
[2]	Facts Controllers in Power Transmission & Distribution by K.R.Padiyar, New Age International
[3]	S Kamakshaiah, V Kamaraju, "HVDC Transmission", Tata McGraw Hill, 2017

Digital Learning Resources:

Course Name: Facts Devices
Course Link: https://nptel.ac.in/courses/108/107/108107114/ Course
Instructor: Prof. Avik Bhattacharya, IIT Roorkee

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.60	2.83	2.50	2.50	2.33	0.00	1.00	0.00	2.50	1.83	0.00	2.33

Type	Code		L-T-P	Credits	Marks
OE	BTEE-T-OE-701	Artificial Intelligence and Machine Learning	3-0-0	3	200

Objectives	To develop systems that are able to see, learn, and adapt just like human beings, but with great precision and efficiency.
Pre-Requisites	BTBS-T-ES-103: Basic Programing Skill
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

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

CO1	Understand the fundamental concepts, theories, and principles of Artificial Intelligence to architect Intelligent agents.
CO2	Acquire knowledge about different search techniques of AI applications.
CO3	Develop practical skills to identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.
CO4	Learn techniques for logic, reasoning & knowledge representation in AI, basics of Machine Learning as a subfield of Artificial Intelligence area.
CO5	Learn and implement supervised learning methods along with gaining an understanding of basic unsupervised methods like clustering.
CO6	Gain an insight on the ethics and safety issues of AI and ML.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Introduction** –The Foundations of Artificial Intelligence, INTELLIGENT AGENTS – Agents and Environments, Good Behavior: The Concept of Rationality, the Nature of Environments, the Structure of Agents.	7 hrs
Module-2	**Solving problems by search - 1:** Problem-Solving Agents, formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information.	7 hrs
Module-3	**Solving problems by search – 2:** Informed (Heuristic) Search Strategies, Greedy best-first search, A* Search, CSP, Means- End-Analysis. Advanced Search: Constructing Search Trees, Stochastic Search, Minimax Search, Alpha-Beta Pruning Basic knowledge.	8 hrs
Module-4	**Knowledge Representation and Reasoning:** Propositional logic, Predicate logic, First order logic, Inference in first order logic, Clause form conversion, Resolution. Chaining- concept, forward chaining and backward chaining, Utility theory and Probabilistic reasoning, Hidden Markov model, Bayesian Networks.	8 hrs
Module-5	**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees Knowledge in Learning: Logical Formulation of Learning, Overfitting and Underfitting, Explanation-Based Learning, Learning Using Relevance Information, Unsupervised Learning.	6 hrs
Module-6	**Ethics and Safety in AI ML:** Limits of AI ML, Ethics of AI ML – Surveillance, security andprivacy, Fairness and bias, Trust and transparency, AI ML safety.	4 hrs
Total		**40hrs**

Text Books:
Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed.,2009
Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 2/e, Pearson, 2003.
Reference Books:
Nils J Nilsson, *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann Publications,2000
Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010
S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

Digital Learning Resources:

Course Name: Artificial Intelligence Search Methods For Problem Solving
Course Link: https://swayam.gov.in/nd1_noc20_cs81/preview
Course Instructor: Prof. D. Khemani, IIT Madras
Course Name: Fundamentals of Artificial Intelligence
Course Link: https://swayam.gov.in/nd1_noc20_me88/preview
Course Instructor: Prof. S. M. Hazarika, IIT Guwahati

Course Name: Introduction to Machine Learning
Course Link: https://nptel.ac.in/courses/106/105/106105152
Course Instructor: Prof. S. Sarkar, IIT Kharagpur

Course Name: Machine Learning
Course Link: https://nptel.ac.in/courses/106/106/106106202
Course Instructor: Prof. Carl Gustaf Jansson, IIT Madras

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	2.50	2.33	2.50	2.83	2.83	2.33	1.83	2.67	2.83	2.33	2.33

Type	Code		L-T-P	Credits	Marks
PE	BTEE-T-PE-703	Green Technology and Sustainability	3-0-0	3	200

Objectives	1. Define global warming and explain its effects on India. 2. Illustrate global carbon control methods and compare power sources. 3. Assess green city measures; develop comprehensive green technology plan.
Pre-Requisites	BTBS-T-ES-102: Basics of Electrical Engineering
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required; sessions are planned to be interactive with focus on examples, case-studies, and latest trends.

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

CO1	Define global warming and explain related protocols and their impact on India.
CO2	Interpret climate policies and analyze their effects on carbon emissions in India.
CO3	Apply green technologies for energy-efficient homes, campuses, and devices.
CO4	Evaluate energy systems using cost, carbon footprint, and life cycle data.
CO5	Design low-power, recyclable, and smart consumer electronics.
CO6	Plan local initiatives to reduce carbon and manage e-waste effectively.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Introduction to Green Technology and its impact towards Environment:** **Global warming:** Definition of global warming, Carbon Accumulation, Long Half-Life, Heating Potential, The Global Carbon Emission Situation and its effect in India, Kyoto and Other Protocols and its view in India. **Climate change:** Effect of climate change and its impact. Steps taken to Control Carbon missions universally, Use of Promotional and Punitive Mechanisms for Reducing Carbon in Atmosphere, Developing Countrywide Adaptive Measures for Safety of Local People, Approach for Carbon Reduction, NAPCC, Green India Mission	**6 Hours**
Module-2	**Types of Green Technologies:** Green Energy Solutions for Households and Campuses, Measures to be taken for Green city, Solar energy for home electronics (panels, micro inverters, charge controllers), Smart energy monitoring using IoT, Power optimization techniques in personal devices	**7 Hours**
Module -3	**Green Technologies for Personal and local Application:** Overview of renewable energy systems, Need for Sustainable Development in ECE, Life Cycle Assessment (LCA) of Electronic Products, Carbon Footprint and Energy Audit of Electronic Systems, Carbon Emission Reduction at Personal Level, Carbon Emission Reduction at Local Authority Level, Carbon Emissions from Imports.	**7 Hours**
Module-4	**Sustainability** Technical approach for Controlling Carbon Emissions: Control of Carbon Emissions and Accumulation, Procedure to develop own Priorities and Business Opportunities in India for control of carbon emissions and accumulation, Needs a Mix of Green and Traditional Power Sources in India, A Logical Approach for Carbon Reduction, Need in India -More Forests, Less Deforestation and payment rates procedure for controlling carbon emissions and its Promotional Mechanisms at India. Green Technologies for Energy Production: - Various Technologies Available for Energy Production, Cost Comparison of a Few Typical Systems for Power Generation, Sources of Energy Production Already in Use, Alternative Methods Ready for Use.	**7 Hours**

Module-5	**Advancements in Green Technology** **Eco-Friendly Consumer Electronics Design:** Use of recyclable, non-toxic materials in circuit boards and packaging, Low-power embedded systems (sleep modes, energy harvesting sensors), Low-power embedded systems (sleep modes, energy harvesting sensors), Low-power wireless protocols: ZigBee, LoRa, BLE, Smart community networks (e.g., mesh Wi-Fi for rural connectivity), Reducing RF pollution: optimization of wireless devices	**7 Hours**
Module-6	**Cultural Transformation at Community level:** Overview of Carbon Capture and Storage (Sequestration), A Quick SWOT Analysis. National Action Plan to a Low Carbon Path, The Missions Help Develop Awareness, few case studies on Projects undertaken by Various Countries, Adaptive Measures Essential for Indian People to Cope with Climate Change. Community Engagement Strategies, Organizing workshops, school/NGO visits, street plays, and demo installations (solar lights, e-waste bins), DIY repair culture for reducing e-waste, Local e-waste collection and sorting models, Building modular, repairable electronics.	**6 Hours**
Total		**40 Hours**

Text Books:	
1	Climate Change: A Very Short Introduction by Mark Maslin.
2	Introduction to Environmental Engineering and Science by Gilbert M. Masters.
Reference Books:	
1	Climate Change: The Science of Global Warming and Our Energy Future by Edmond A. Mathez and Jason E. Smerdon
2	Renewable Energy: Power for a Sustainable Future by Godfrey Boyle.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.33	2.33	2.50	2.83	1.83	1.50	1.80	0.00	2.80	2.80	0.00	2.80

Type	Code		L-T-P	Credits	Marks
PE	BTEE-T-PE-702	Electromagnetic Fields Theory	3-0-0	3	200

Objectives	1. To equip students with foundational knowledge of electric and magnetic fields, their interactions, and Maxwell's equations. Enable them to analyze, model, and solve problems related to electromagnetic wave propagation, transmission lines, and field behavior in various media
Pre-Requisites	BTBS-T-BS-301: Math-III
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.

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

CO1	Comprehend the basic mathematical concepts related to electromagnetic vector fields.
CO2	Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
CO3	Apply the principles of magneto statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density
CO4	Gain knowledge on the concepts of Faraday‘s law, induced emf and Maxwell‘s equations.
CO5	Develop solution to the developed wave equation and comprehend the Poynting theorem.
CO6	Apply Maxwell‘s equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Co-ordinate Geometry and Vector calculus:** Co-ordinate systems and Co-ordinate geometry (Cartesian, Cylindrical and Spherical), Conversion of Coordinates, Dot and Cross product of unit vectors. Line, Surface and Volume integrals, curl, divergence and gradient, Divergence theorem and Stokes' theorem. Laplacian for scalar and vectors. Vector identities	**8 Hours**
Module-2	**Electrostatics:** Coulomb's law, Field due to different charge distributions, electric flux density, dielectric constant, Gauss's law and its applications, Potential difference and potential, Potential field of a point charge and different charge distribution, Potential difference, Capacitance, Energy density in electrostatic field, Boundary conditions at abrupt discontinuities between two media including conducting boundaries, surface charge distribution, Poisson's and Laplace equation, Uniqueness theorem, Examples of solution of Laplace and Poisson's equations, capacitance between two isolated conductors. Continuity equation.	**11 Hours**
Module -3	**Magnetostatics:** Biot-Savart's law, magnetic field intensity, magnetic flux density, permeability, Ampere's circuital law, applications of Ampere's law, point form of Ampere's circuital law, vector magnetic potential	**5 Hours**
Module-4	**Time Varying Fields:** Lorentz force equation, Magnetomotive force, Faraday's law, Displacement current, modified Ampere's Circuital law, Magnetic boundary conditions, Reluctance, Magnetic circuit, Self-inductance and Mutual inductance	**6 Hours**
Module-5	**Maxwell's Equations:** Maxwell's equations in point and integral forms for time varying fields, Maxwell's equation for time harmonic field, wave equations in source free region, Poynting theorem, complex Poynting vector	**5 Hours**
Module-6	**Solutions to Wave Equation and Electromagnetic Wave Propagation:** Solution to wave equation, Intrinsic impedance, Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, complex permittivity, Skin Depth	**5 Hours**

Total	**40 Hours**

Text Books:	
1	Matthew Sadiku, Elements of Electromagnetics, Oxford University Press.
2	E.C. Jordan & K.G. Balmian: Electromagnetic wave and Radiating System, PHI.
3	**Reference Books:**
Reference Books:	
1	William H. Hayt, Engineering Electromagnetic, TMH
2	John D. Kraus, Electromagnetics, Mc. Graw Hill.
3	Joseph Edminister, Electromagnetics -Schaum's Outline Series, TMH
Online Resources:	
1	https://www.youtube.com/watch?v=pGdr9WLto4A&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&spfreload=10
2	https://www.youtube.com/watch?v=EiX3R6IkDDU&list=PLBZrb0wA6HTd9CclN_Ku_I065MXbHZh6U&index=2&spfreload=10
3	https://nptel.ac.in/courses/108104087

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.33	2.33	2.50	2.83	1.83	1.50	1.80	0.00	2.80	2.80	0.00	2.80

Type	Code	Evaluation of Summer Internship-III	L-T-P	Credits	Marks
PS	BTEE-P-SC-701		0-0-4	2	100
Objectives		1. To encourage the students to study advanced engineering developments. To prepare and present technical reports. 2. To encourage the students to use various teaching aids such as overhead projectors, 3. Power point presentation and demonstrative models.			
Teaching Pedagogy		Regular contact with interns and evaluation with record keeping.			

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
CO5	Evaluate the internship experience in terms of personal, educational and career needs.
CO6	Develop ideas for suitable start-ups to become successful entrepreneur.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	**2.80**	**1.5**	**2.25**	**2.5**	**2.67**	**2.00**	**2.67**	**2.8**	**2.67**	**2.8**	**2.5**	**2.67**

Type	Code	Seminar -III	L-T-P	Credits	Marks
PS	BTPS-P-PS-702		0-0-2	1	100

Objectives	To encourage the students to study advanced engineering developmentsTo prepare and present technical reports. To encourage the students to use various teaching aids such as overheadprojectors, power point presentation and demonstrative models.
Teaching Pedagogy	Regular seminar presentation and evaluation with record keeping.

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.

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO	2.67	1.33	2.80	2.33	2.83	2.67	1.33	2.20	2.67	2.50	2.50	2.50

8TH SEMESTER

GIFT Autonomous

Scheme of Teaching and Examinations – 2022-23

B.Tech in Electrical and Electronics Engineering

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

8th SEMESTER

Sl. No	Course	Course Code	Course Title	L - T - P	Duration in hours	Examination			Credits
						IE Marks	ESE Marks	Total Marks	
1	PS	BTEE-P-PS-801	Major Project/Internship	0-0-16	2	100	0	100	8
2	PS	BTEE-P-PS-802	Comprehensive Viva	0-0-4	2	100	0	100	2
				TOTAL					10

Note:

IE (Internal Evaluation) - **Internal Evaluation is done for total 100 marks** - which consist of (50 Marks Modular test Exam which will be evaluated 3 times per semester consisting of 2 modules each, 10 Marks Quiz in online mode,10 Marks for Assignment, 15 marks for Subject specific Project, 15 Marks for daily performance.

ESE (End Sem Exam) - 100 Marks

Internship: All the students have to undergo a mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. An examination shall be conducted during the III semester and the prescribed credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in the internship course and have to complete the same during the subsequent examination after satisfying the internship requirements.

Type	Code		L-T-P	Credits	Marks
PS	BTEE-P-PS-801	Major Project/Internship	0-0-16	8	100

Objectives	Provide hands-on experience in solving engineering problems and applying theoretical knowledge in real-world projects.
Teaching Pedagogy	Supervised project work with industry exposure and focus on team collaboration, problem-solving, and communication skills.

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

CO1	Understand the fundamental concepts of electronic circuits and systems.
CO2	Apply engineering principles to design and troubleshoot systems.
CO3	Analyze system requirements and design solutions with constraints.
CO4	Evaluate and assess system designs and methodologies.
CO5	Synthesize design elements to create innovative solutions.
CO6	Present and communicate project outcomes effectively.

Type	Code		L-T-P	Credits	Marks
PS	BTEE-P-PS-802	Comprehensive viva	0-0-4	2	100

Objectives	Evaluate the understanding of core concepts in Electronics and Communication Engineering.
Teaching Pedagogy	Combination of theory-based and practical assessments, with interactive discussions and problem-solving.

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

CO1	Explain basic concepts of circuits and systems.
CO2	Apply principles to design and troubleshoot systems.
CO3	Analyze system requirements and design solutions.
CO4	Assess system designs and methodologies.
CO5	Combine design elements for innovative solutions.
CO6	Present and communicate project outcomes.