Scheme of Teaching and Examinations and Syllabus

B.Tech in Civil Engineering

(2023 Admission Batch)

(Approved by Academic Council and Board of Studies)

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

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.

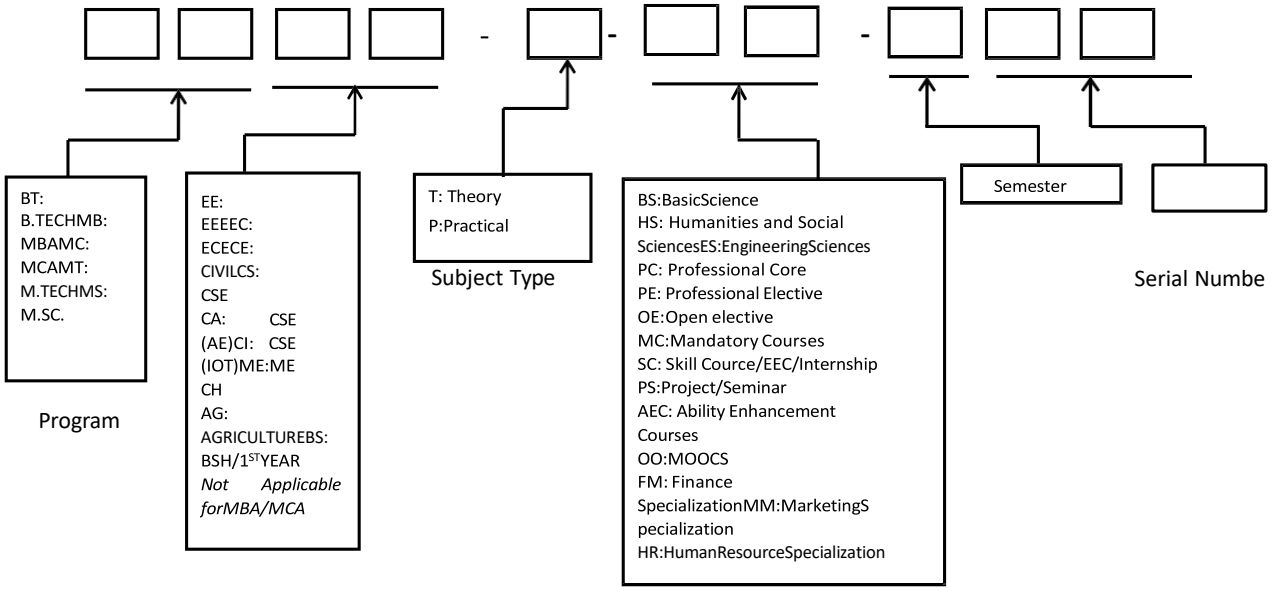
PO11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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
AEC	Ability Enhancement Course
SEPD	Skill Enhancement and Personality Development

Subject Code Format



Scheme of Evaluation :

Proposed Internal Examination (B. Tech, Autonomous)					
Sr No	**Type of Test**	**Mark**	**Frequency**	**Total Mark**	**Reduced Mark**
1	Modular Test	25	4	100	**50**
2	Online Quiz Test	10	4	40	**10**
3	Assignment	5	2	10	**10**
4	Subject Specific Project	15	1	15	**15**
5	Attendance	15	1	15	**15**
TOTAL				180	**100**
Pass Mark					**45**

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

Instructions:

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

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	Mathematics I	4-0-0	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 Engg./ Basic Electronics Engg.	3-0-0	2
4	ES	BTBS-T-ES-103	Basic Programming Skills	4-1-0	3
5	ES	BTBS-T-ES-104/ BTBS-T-ES-105	Basic Mechanical Engg/ Basic Civil Engineering	3-0-0	2
6	HS	BTBS-T-HS-101	English for Engineers-I	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)**	23	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 Engg. Lab/ Basic Electronics Engg. Lab	0-0-2	1
3	ES	BTBS-P-ES-103	Basic Programming Skill Lab	0-0-3	1.5
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Basic Mechanical Engg lab/ Basic Civil Engineering lab	0-0-2	1
5	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Engineering Graphics with AutoCAD / Workshop Practice-I	0-0-3	1.5
6	HS	BTHS-P-HS-101	English for Engineers Lab-I	0-0-2	1
7	PS	BTPS-P-PS-101	Project-1	0-0-2	1
			Total Hours/ Credit (Practical)	16	8
			Grand Total Hours/ Credit (Practical)	**39**	**21**

Second Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	BS	BTBS-T-BS-201	Mathematics II	4-0-0	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 Engg/ Basic Electronics Engg./	3-0-0	2
4	ES	BTBS-T-ES-203	Programming Using Data Structure	4-1-0	3
5	ES	BTBS-T-ES-104/ BTBS-T-ES-105	Basic Mechanical Engg/ Basic Civil Engineering	3-0-0	2
6	HS	BTBS-T-HS-201	English for Engineers-II	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)**	23	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 Engg. Lab/ Basic Electronics Engg. Lab	0-0-2	1
3	ES	BTBS-P-ES-203	Programming Using Data Structure Lab	0-0-3	1.5
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Basic Mechanical Engg lab/ Basic Civil Engineering lab	0-0-2	1
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	English for Engineers Lab-II	0-0-2	1
6	PS	BTPS-P-PS-201	Project-2	0-0-2	1
			Total Hours/ Credit (Practical)	16	8
			Grand Total Hours/ Credit (Practical)	**39**	**21**

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

Contents

First Year B.Tech

Curriculum Structure

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

Evaluation process

1. Evaluation Process of Theory Subjects:

Components	Marks	Frequency	Assigned To
Quiz Test	5	2	Concerned Faculty
Surprise Test	5	2	Concerned Faculty
Assignment	5	2	Concerned Faculty
Attendance	5	Closing of Instruction	To be retrieved from CMS
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	Mathematics - I	L-T-P	Credits	Marks
BS	BTBS-T-BS-111		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
Module-1	Solution of first order differential equations, Linear equation, Bernoulli's equation. Second order differential equations with constant coefficients, Euler-Cauchy equation. Experiential learning-Applications of differential equations in 2D using MATLAB.	**12 Hours**
Module-2	Introduction to vector space, sub space, linearly independent and linearly dependent vectors, solution of system of linear equations, Gauss elimination, and Gauss-Jordan methods, Determinant, Inverse of a matrix, Rank of a matrix. Basics of linear transformation, Eigen values and Eigen vectors. Experiential learning- Blending system of linear equations in Gauss elimination method, Computation of Eigen values and Eigen vectors using MATLAB.	**13 Hours**
Module-3	Vector Differential Calculus: Vector and Scalar functions and Fields, Derivatives, Curves, Tangents and Arc length, Gradient, Divergence and Curl with applications.	**8 Hours**
Module-4	Average, Problems on Ages, Percentage, Profit and Loss, Ratio and Proportion, Time and Work, Time and Distance, Simple and Compound Interest.	**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.
T3. R. S. Aggarwal, Quantitative Aptitude For Competitive Examinations, S. Chand publication.

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. Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Wiley 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	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.
CO2	Solve and demonstrate various physical models through second order differential equations.
CO3	Use the understanding of matrix algebra to solve systems of linear equations, harmonics problems, population models etc. arising in various engineering fields.
CO4	Demonstrate knowledge and applications of Eigen value problems related to engineering disciplines.
CO5	Application of mathematics for engineers through MATLAB.
CO6	Know the basic concepts of quantitative aptitude to meet real life requirements.

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 **Experiential learning:- Different Types of Oscillator circuits (Using inductor and capacitor frequency will be determined)**	**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. **Experiential learning:-Soft image using quantum Machine learning Algorithm**	**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. **Experiential learning: Magnetic energy storage devices, Construction of battery and diode.**	**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. **Experiential learning: Optical fiber communication, LED** **Design different types of sensors using optical fiber.**	**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. Physics for Engineering degree students, B. B Swain & P. K Jena.

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

R6. Heat and Thermodynamics: N Subramaniam

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**	4-0-0	2	150

Objectives	The objective of this course is to make students learn 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 point **Experiential learning:- Preparation of alloys, Isolation of Salts from Mixtures (By adjusting Temperature and Composition)**	**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. **Experiential learning:- Preparation of dry cell** **(Using metal ,carbon rod and insulating Separator)**	**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. **Experiential learning:- Preparation of Hexamethyelene diamine Adipic Acid(Nylon 66) Polymer.** **(Using Adipoyl Chloride)**	**12 Hours**
Module-4	**Nano materials**: Introduction, Classification, characteristics, 0D,1D, 2D Nanomaterials, Synthesis: Top Down & Bottom Up approach, Application to Pharmaceutical and Research . **Experiential learning:- CNTs are synthesized by thermal CVD method using hydrocarbon gas as carbon source** **(Using Quartz tube and RF heater)**	**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, Nano material synthesis methodologies and types of nanomaterial.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-101	**Basic Electrical Engineering**	3-0-0	2	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 generation and general structure of electrical Transmission**,** Distribution, and 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. Superposition theorem, Thevevnin's theorem, **Experiential learning:-** **Power generating station (Construction of Small hydro plant, Biomass plant)** **LED light using solar energy.**	**10 Hours**
Module-2	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. Concept of resonance in series and parallel R-L-C circuits. Magnetic circuits: Electro magnetism, simple magnetic circuit, magnetic material, B-H curve. **Experiential learning:-** **Design of Magnetic Circuits to learn self induction & Mutual inductance.**	**12Hours**
Module-3	Electrical Machines: Construction, working principle & Application of DC generator, DC Motor, 3 phase & single phase induction motor, Alternator & Special Motors (Stepper & **BLDC**) **Experiential learning:-** **Single phase transformer construction and working:** ➢ **Definition of Transformer, construction of Winding of shell type Transformer.**	**8 Hours**

Module-4	Electrical Installations & wiring: Layout of LT switchgear, Switch fuse unit (SFU), MCB, ELCB, MCCB. Type of earthing & Different types of Domestic Wiring. **Experiential learning:-** **Design of Electric Circuit using Circuit Breaker & Fuse for domestic house 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. Importance of IE rules and Electrical License rules. Different Illumination, Batteries and their applications. **Experiential learning:-** **Making of LED bulb and Determination of Ratings of Different types of Lamps. (Tungsten, Mucury Vapour, CFL & LED)**	**10 Hours**
Total		**40 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.

Reference Books:

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

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

R3. Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand.

R4."Basic Electrical Engineering" by C L Wadhwa, New Age pub.

R5.D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

R6.Electrical Safety Handbook, 4th Edition Hardcover by John Cadick Mary Capelli-Schellpfeffer Dennis Neitzel Al Winfield

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.
CO2	Analyses of different problems of electrical circuit using electrical theorems.
CO3	Understanding of magnetic circuit and solving the basic problems.
CO4	Impart conceptual analysis of electrical machineries & to familiarize the students with electrical safety equipment & domestic wiring.
CO5	Understand and implementation the earthing and wiring system.
CO6	Inculcate sound understanding of illumination scheme.

Type	Code	Basic Electronics Engineering	L-T-P	Credits	Marks
ES	BTBS-T-ES-102		3-0-0	2	100

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

Evaluation Scheme

Teacher's Assessment			Written Assessment		Total
Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	

Detailed Syllabus

Module-#	Topics	Hours
Module-1	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. **Experiential Learning :** Diode applications (half-wave and full-wave rectifier, clipper, clamper and zener /Avalanche Breakdown).	**10 Hours**
Module-2	Bipolar Junction Transistor :Construction, Operation of Bipolar Junction Transistor and **Experiential Learning :** Transistor Biasing : Fixed Bias, Voltage divider bias, Transistor as a switch, CB, CE, CC (Relationship between α, β, γ) circuit configuration Input-output characteristics, 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)	**10 Hours**
Module-3	Basics of Digital Electronics : Number System, Inter conversion of Number Systems,Binary Arithmetic,Boolean Algebra,Simplification of Boolean Expressions,Demorgan's Theorem,SOP,POS, Digital logic Gates (AND, OR, NOT, NAND, NOR, EXOR, EX-NOR); Realization of Basic logic gates using universal gates, Combinational Circuits-Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor.Basic concept of Sequential Circuits,latch and flip-flop	**12 Hours**

Module-4	Introduction to Microprocessors and Microcontrollers: Basic block diagram: input, output, ALU, CU, Registers ,Difference between microprocessor and microcontroller. **Experiential Learning :** Introduction to chip designing and manufacturing. Introduction to Sensors and their Applications : Introduction to different types of Sensors: Temperature sensor, Moisture Sensor, Rain Sensor, LDR, IR, Smoke Sensor	**8 Hours**
	Total	**40 Hours**

Text Books:

T1. Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylested and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.

T2.Digital Design, 5th Edition M. Morris Mano and Michael D Ciletti Pearson

T3.B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications

Reference Books:

R1 Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand.

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

R3.Microelectronic Circuits, 7th Edition Adel S Sedra and Kenneth C Smith Oxford University Press

R4.Fundamentals of Digital Circuits, 4th Edition A Anand Kumar PHI

R5. Integrated Electronics, 2nd Edition Jacob Millman and Christos Halkias Tata McGraw Hills

R6. A course in Electrical and Electronic Measurements and Instrumentation Author: AK Sawhney Publisher : Dhanpat Rai & Co. (P) Limited

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

CO1	To introduce fundamentals idea & techniques about electrical engineering & to provide
CO2	To impart conceptual analysis of electrical machineries & to familiarize the students with electrical safety equipment & domestic wiring.
CO3	To inculcate sound understanding of illumination scheme.
CO4	To give knowledge about basic electronic components , industrial applications and
CO5	To understand basic operation and applications of Diode, BJT and Op-Amp.
CO6	To Study basic digital concepts, sensors , microprocessors and microcontrollers

Type	Code		L-T-P	Credits	Marks
ES	BTES-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	Functions, Parameter passing in functions, call by value, idea of call by reference, recursion with examples of Finding Factorial, Fibonacci series, local and global variables, static variables. **Experiential Learning:** Arduino based Programming: Overview of the Arduino UNO Components, Analog and Digital Read, Controlling output	**8 Hours**
Module-4	Arrays: Arrays (1-D, 2-D), initialization, Accessing Array Elements, Matrix applications, passing arrays to functions, Character arrays and Strings, Pointers, Pointer arithmetic, dynamic memory allocation, pointer to array and array of pointers, Linear Search, Bubble Sort	**8 Hours**
Module-5	Structures, Array of structures, union, structure vs union, passing structure to function, File handling: ASCII and binary Files.	**6 Hours**
Total		**40 Hours**

Text Books:

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

Reference Books:

1. A.K.Rath and A. K. Jagadev, "Data Structures and Program Design using C", 2nd Edition, Scitech Publications, 2011
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication Pvt. Ltd
3. Rajaraman, V., Computer Programming in C, PHI Publications
4. Simon Monk, Programming Arduino: Getting Started with Sketches, 2nd Edition, McGraw Hill, 2016
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	To formulate simple algorithms for problem solving and translate the algorithms to programs.
CO2	To test and execute the programs and correct syntax and logical errors.
CO3	To implement different conditional branching and loops for problem solving.
CO4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO5	To use arrays, pointers and structures to formulate algorithms and programs.
CO6	To apply programming to solve searching and sorting problems.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-104	**Basic Mechanical Engineering**	3-0-0	2	150

Objectives	To expose to the field of Mechanical Engineering, and to acquire the fundamental knowledge in the said field.
Pre-Requisites	Knowledge of Physics, Mathematics and computer programming in Secondary
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on group task, project planning and video

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction to Engineering Materials and Mechanical Measurement:** **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.) Experiential learning 1. Preparation of Composite material	**8 Hours**
Module-2	**Introduction to Manufacturing Processes** History of industrial revolution, introduction to **Casting:** Sand casting, Die casting, investment casting; centrifugal casting; **Metal joining**: Soldering, Brazing and Welding, **Metal forming**: bulk metal forming (rolling, forging, extrusion, wire/bar drawing), sheet metal forming(bending, deep drawing, sheering), **Additive Manufacturing:** Introduction to 3d printing: working principle,physics of process; process modelling: computer aided process planning for 3d printing; classification: Extrusion(Detail study of Fused Deposited Modelling with video demonstration of working principle of in-house 3d printer), granular,laminated, light polymerized ; Related technologies. **Subtractive Manufacturing(working principle, details of machine tools and application only):** Introduction, Conventional Machining Processes: cutting,turning, milling, drilling, grinding, and boring; Non-conventional Machining Processes: CNC Machining, EDM, ECM,Laser Cutting, Wood router(Detail study and video demonstration of working principle),water jetting. Experiential learning 2. Wood carving of Art CAM using wood router 3. Small project using Metal joining process(Similar and Dis-similar) 4. Casting of different components	**12 Hours**

Module-3	**Fundamentals of Thermodynamics and Fluid Mechanics:** Basics of Thermodynamics, Steam formation& its properties. Evaporation and Condensation, Cryogenics: Dry ice Vs Liquid Nitrogen. Aircraft engines and its classifications, Fuels, Rockets. Application of Thermodynamics : Steam power plant, I.C Engine, Refrigerators and Air- Conditioners (Brief description of different components with Schematic diagram only.) Fluid Properties and their Applications: Fluid properties, Pascal's Law its application, Archimedes Principle, Bernoulli's theorem. Hydraulic machines: turbines, pumps, their types. CO4: Get knowledge of fluid properties and explain working principle of Hydraulic Machines Experiential learning 5.Hydraulic system design and manufacturing using Pascal's Law	**12 Hours** **13 Hours**
Module-4	Introduction power transmission: Power transmission devices: Belt, Rope, Gear & Gear drives. Coupling, clutch, brakes. (Working principle only), Mechanical Advantage, Velocity ratio. Experiential learning 6.Belt drive , muff coupling	**8 Hours**
	Total	**40 Hours**

Text Books:
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.

ReferenceBooks:
R1. Basic Mechanical Engineering by Basant Agrawal, 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 .

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

CO1	Discuss the Properties of Common Engineering Materials and measuring equipment
CO2	Describe the conventional and advanced Manufacturing process.
CO3	Explain the Working Principle of IC engines and Refrigeration and Air conditioning.
CO4	Get knowledge of fluid properties and explain working principle of Hydraulic Machines
CO5	Explain different power transmission systems.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-105	**Basic Civil Engineering**	3-0-0	2	150

Objectives	To expose to the field of Civil Engineering, and to acquire the fundamental knowledge in the said field.
Pre-Requisites	Knowledge of Physics, Mathematics and computer programming in Secondary Education
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on group task, project planning and video demonstration .

Detailed Syllabus

Module-#	Topics	Hours
Module-I	**Introduction to Construction materials** Basics of Civil Engineering & Broad disciplines of Civil Engineering Building components and Materials –Cement, Concrete, Steel,. Concept of smart building, Tiles for flooring, Different Types of Doors and windows, Paints. New and smart Materials – flyash, new-age concrete, recycling of materials.	**10 Hours**
Module-II	**Field Survey :** Scale,plan, map, principles of survey, Linear measurements, Ranging, Compass Survey, Bearing of a line, Levelling, Introduction to Modern Survey Instruments (EDM and Total Station), GIS and GPS (Introduction only). **Transportation** Railway , Airport ,Types of Bridges, concept of Tunnels and Metro rail (underground and overhead **engineering** - Different modes of transport, classification of road, , Introduction to), Basics of Port and Harbor, Breakwater – Concept of inland waterways.	**10 Hours**
Module-III	**Fundamentals of Soil Mechanics, Hydrology** Fundamentals of soil classification, properties, foundation (deep and shallow)and types. Fundamentals of Water Resource engineering- sources and Introduction to hydraulic structures like canals, siphons, weirs, dams etc.	**10Hours**

Module-IV	**Water supply (Experiential Learning)** Introduction, sources of water, advantages and disadvantages of water supply, water supply system and its components. Types of flow , Pumps- its types, centrifugal pump its principle, components and its limitations. Pressure Regulator, Working of Pressure Regulator **Sensors:** Introduction, Types of sensor, uses and use of relay in tanks. **Solenoid valve-** Solenoid valve types, Solenoid valves working principle, Advanced plumbing Technologies, Plumbing in Building, Plumbing system, Purpose of plumbing system, Plumbing safety tools, Plumbing tools, Safety during work, Fitting and fixtures in domestic building, Plumbing business tools, Valves, Types of joints **Waste Water Treatment** Sewerage, Characteristics of sewerage, effect of sewerage on ecosystem, waste water treatment, Importance of waste water, its treatment process. Sewerage system, types of sewerage system	**12 Hours**
Total		**42 Hours**

TextBooks:

T1. Basic Civil Engineering, S.Gopi, Pearson.

T2. Basics of Civil Engineering, M.S. Palanichamy, McGraw Hill.

ReferenceBooks:

R1. Surveying Vol -1, RAgor, Khanna Publisher.

R2. Water supply ana Waste water engineering, S.K. Garg.

R3. Introduction to Bridge Engineering, D. Jhonson Victor.

R4. Engineering Materials, S C Rangwala, Charotar Publishing House.

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

CO 1	Identify the different properties of building materials
CO 2	Understanding the different modes of transportation
CO 3	Study of engineering properties of soil
CO 4	Analyze of water supply system by sensors and solenoids
CO 5	Evaluating different types of pumps
CO 6	Explore the uses of different instruments used in civil engineering work

Experiential Learning :

1. Transparent centrifugal pump.
2. Aqueduct, Syphon aqueduct, Super passage, canal syphon , level crossing
3. Practical working model of port

4. Piping connection.
5. Piping network Connection
6. Solenoid Valve
7. Study of different water sensors.
8. Hydraulic bridge
9. Fly-ash Bricks.
10. New age concrete.- ferroconcrete, roller compacted concrete, FRC

Type	Code	English for Engineers –I	L-T-P	Credits	Marks
BS	BTBS-T-HS-111		2-0-0	1	100

Objectives	1. To develop the understanding of communication in different context.
	2.To identify the basics of professional Writing
	3. To acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
Pre-Requisites	NONE
Teaching Pedagogy	Regular classroom lectures with use of the interaction, experiential, activity oriented.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction to Communication** 1. **Process and Factors of Communication** 1.1. History & Significance of Communication 1.2. Communication loop 1.3. Factors Responsible (Sender, Receiver, Channel, Code, Feedback etc.) 2. **Verbal and Non-verbal communication** 2.1. Verbal Communication 2.3. Non-Verbal Communication (Body language, Paralanguage) 3. **Barriers to Communication** 3.1. Barriers and Filters 3.2. Types of Barriers (Physical, Psychological, , Cultural Barrier etc. 3.3. Tips to Overcome Barriers ***Experiential Learning: Non-verbal communication***	**06 hours 3+2+1 +1(EL) =7 hour**

Module-2	**Professional Writing** 1. **Letters &E-mail writing** 1.1 Block format, 1.2 E-Mail address 1.3 Subject Line 1.4 Organizing the body 1.5 E-Mail etiquette **2. Notice, Memo, Circular** 2.1 Format of the Notice 2.2 Writing strategy **3. Using social media for communication** 3.1 Writing blogs 3.2 What's app messages ***4. Experiential Learning :Using social media for communication***	2+3+3 **08 Hours**
Module-3	**Literature Appreciation** Name of the Lessons: 1.A.P.J Abdul Kalam from Wings of Fire, A.P.J Abdul Kalam with Arun Tiwari 2. "Spoken English & Broken English" by Bernard Shaw 3. Life Doesn't Frighten Me Poem by Maya Angelou 4. On Superstitions by A.G.Gardiner	**8 Hours**

Reference Books:

R1. An Introduction to Professional English and Soft Skills - Das et al.- Foundation Books
R2. Understanding Human Communication - by Ronald B. Adler
R3. Technical Communication, Fourth Edition-Meenakshi Raman & Sangeeta Sharma
R4. The Definitive Book of Body Language by Allan Pease
R5. Silent messages by Albert Mehrabian
R6. Advanced English Grammar by Martin Hewing
R7. English Grammar in use- Raymond Murphy

Online Resources:

www.britishcouncil.in
http://nptel.ac.in
http://eltai.in

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

CO1	Learn the fundamentals of communication
CO2	Understand the basic professional writing
CO3	Evaluate Literary convention

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-101	**Information Technology and Information Systems (IT & IS)**	2-0-0	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	Course to be Covered	Hours
Module 1	Introduction Windows OS, OS Commands and operations, Introduction to MS Office **MS-Word:** Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles. Insert tab: Cover page, blank page, page break, table, picture, clip art, shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.	5 Hours
Module 2	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. **MS-EXCEL:** Create workbook, Home tab, Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.	5 Hours
Module 3	MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, Print area, Background 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.	5 Hours
Module 4	**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. **Internet Technology** : MS-Outlook, E-mail **Social media Application:** Twitter, Linked-In, Facebook, Instagram	5 Hours
Module 5	**GRAMMERLY:** Creating and uploading documents, Editing text Using GrammarlyGO, Formatting text , Checking your document for plagiarism. **ChatGPT :** Introduction,ChatGPT in general life, Uses and Applications of ChatGPT: Blog Topics and Keyword Research, Assist in Generating Copy for a Website	4 Hours

	Proofreading and Editing,Creating WordPress Plugins, Writing and Debugging Code	
TOTAL		**24 Hours**

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

CO1	To give basic fundamental concept about computer system.
CO2	To get familiar with MS Windows OS.
CO3	To get hands on expertise in MS Word.
CO4	Able to solve mathematical problems systematically using MS excel.
CO5	Able to design professional presentation using MS PowerPoint.
CO6	Able to manage the information in computer system using internet technology.

EXPERIMENTS:

Experiment No.	**Course to be Covered**	**Hours**
Experiment-1	Introduction Windows OS, OS Commands and operations, Introduction to MS Office	2 Hours
Experiment-2	MS-Word: Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles.	2 Hours
Experiment-3	MS-WORD: Insert tab: Cover page, blank page, page break, table, picture, clip art, shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.	2 Hours
Experiment-4	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.	2 Hours
Experiment-5	MS-EXCEL: Create workbook, Home tab, Insert tab Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.	2 Hours
Experiment-6	MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, Print area, Background	2 Hours
Experiment-7	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)	2 Hours
Experiment-8	MS-EXCEL: Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group.	2 Hours
Experiment-9	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.	2 Hours
Experiment-10	Internet Technology : MS-Outlook, E-mail Social media Application: Twitter, Linked-In, Facebook, Instagram	2 Hours

Experiment-11	GRAMMERLY: Creating and uploading documents, Editing text Using GrammarlyGO, Formatting text , Checking your document for plagiarism.	2 Hours
Experiment-12	ChatGPT : Introduction, ChatGPT in general life, Uses and Applications of ChatGPT, Blog Topics and Keyword Research, Assist in Generating Copy for a Website Proofreading and Editing,Creating WordPress Plugins, Writing and Debugging Code	2 Hours
TOTAL		**24 Hours**

Reading Material (s)

1. IT & IS Lab Manual, Department of CSE, GIFT, Bhubaneswar
2. Microsoft Office 2010 Introductory BY Gary B. Shelly, Misty E. Vermaat.

Type	Code		L-T-P	Credits	Marks
MC	BTMC-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	Mathematics - II	L-T-P	Credits	Marks
BS	BTBS-T-BS-211		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
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. Experiential learning- Finding the root of transcendental equations using MATLAB.	**11 Hours**
Module-2	Interpolation: Lagrange interpolation, Newton's divided difference interpolation, Newton's forward and backward interpolation. Numerical differentiation and Integration: Newton-Cotes quadrature formula, Trapezoidal rule, Simpson's rule, 2-point and 3-point Gauss Legendre rule. Euler method, Modified Euler method. Experiential learning- Evaluation of numerical integrals and solution of initial value problems.	**14 Hours**
Module-3	Beta and Gamma functions, Vector Integral Calculus: Line Integrals, Independence of Path, Double Integrals, Green's theorem with applications.	**9 Hours**
Module-4	Series Completion, Coding-Decoding, Data Sufficiency, Basic concepts on Probability and statistics.	**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.
T3. R. S. Aggarwal, A Modern Approach to Verbal & Non-verbal reasoning, S. Chand publication.

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. Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Wiley

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	Apply the numerical methods to find the approximate solutions of algebraic and transcendental equations.
CO2	Evaluate the real time problems using MATLAB.
CO3	Solve the numerical solution of differential equations and use of various techniques for evaluating the integrals.
CO4	Calculate line integrals in two dimensions for differential forms and also calculate double integrals in Cartesian and polar coordinates over the domains.
CO5	Know the basic concepts of verbal, non-verbal reasoning and logical ability for better employability.
CO6	Understand the basic concepts of mathematical theory of probability.

Type	Code	Programming Using Data Structure	L-T-P	Credits	Marks
ES	BTES-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, **Experiential Learning:** application of stack.Types of Queue: Simple Queue, Circular Queue, Priority Queue ADT 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, **Experiential Learning:** Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix sort; Performance and Comparison among all the methods, Searching: **Experiential Learning:** 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 notation.
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	English for Engineers-II	L-T-P	Credits	Marks
HS	BTBS-T-HS-211		2-0-0	1	100

Objectives	To understand the nuances professional Communication
	To prepare students for real world interaction
	To enhance the soft skill competency of learners
Pre-Requisites	To have a common understanding of concepts of communication.
Teaching Pedagogy	Real world-based teaching learning pedagogy.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Professional Communication 1. Patterns of Communication 1.1 Formal &Semi Formal: Vertical, Horizontal, Diagonal communication 1.2 Informal: Grapevine 1.3 External and Internal Communication ***2. Experiential Learning: Patterns of Communication***	**3+1(EL) 4Hours**
Module-2	**Employment Communication & Soft skill** 1.1. Cover Letter and Resume' Building, Types of Resumes: Traditional & Electronics 1.2. Presenting to the audience :4ps 1.3. Cross Cultural Competency 1.4. Group Discussion, Types of GD, Do's and don'ts 1.5. Interview, Types of Interviews, How to Prepare for an Interview ***Experiential Learning: Cross Cultural Competency***	**2+2+2+2+2 =10+4(EL) Hours**

Module-3	Literature Appreciations 1. Steve Jobs by Isaacson Walter 2. An Interview with Microsoft CEO: Satya Nadella by Sudipta Sengupta, TNN, March 10,2023 ***Experiential Learning: Book Review***	**6 Hours+ 1(EL)=7Hr**

Reference Books:

R1. Corporate Soft Skills-Sarvesh Gulati- Rupa Publications
R2. Bridging the Soft Skills Gap- Brucetulgan
R3. Excellence in Business Communication - John V. Thill, Courtland Bovee
R4. Simply Said: Communicating Better at Work and Beyond by Jay Sullivan
R5. Steve Jobs by Isaacson Walter

Online Resources:

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

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

CO1	Understand the various forms and Channels of communication in a corporate world
CO2	Develop skills to meet the placement challenges
CO3	Implement different forms of writing for professional needs
CO4	Acquiring skills set to sustain the professional careers.

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

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

Detailed Syllabus

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

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

CO1	Understand the laws to various process and real system.
CO2	Study basics of semiconductor & devices and their applications in different areas.
CO3	Distinguish the importance of different properties of material.

CO4	Design new instruments with practical knowledge.
CO5	Analyze, interpret and summarize the experimental results and compare with theoretical
CO6	Troubleshoot effectively in laboratory settings.

Indicative Projects

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

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

Objectives	The laboratory will help the students on the volumetric analysis, calculations based on mass- volume relation etc. 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.
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Standardization of KMnO4 by using sodium oxalate. Determination of $Fe2^{+}$ ion in a double salt.	**2 Hours**
Experiment-2	Preparation of Aspirin	**2 Hours**
Experiment-3	To determine Dissolved oxygen in a given sample of water	**2 Hours**
Experiment-4	Determine the amount of Sodium Hydroxide and Sodium carbonate in the given solution using Standard acid	**2 Hours**
Experiment-5	Estimation of Ca^{2+} ion in a sample of limestone	**2 Hours**
Experiment-6	Determination of partition coefficient of I_2 between benzene and water.	**2 Hours**
Experiment-7	Determination of flash and fire point of an oil by Pensky Martine's apparatus.	**2 Hours**
Experiment-8	Determination of viscosity of lubricating oil by Redwood viscometer.	**2 Hours**
Experiment-9	Determination of available chlorine in a sample of bleaching powder	**2 Hours**
Experiment-10	Determination of TH value of water by EDTA method.	**2 Hours**
	BEYOND SYLLABUS	
Experiment-11	Preparation of soap and detergent.	**2 Hours**
	Total	**22 Hours**

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

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

Indicative Projects

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

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

Objectives	To train the students in conducting load tests on electrical circuit and equipment's To gain practical experience in characterizing electrical machinery.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Study of Different Electrical measuring Instruments and other electrical equipment	**2 Hours**
Experiment-2	Verification of thevenin's theorem using DC circuits.	**2 Hours**
Experiment-3	Verification of Superposition theorem theorem using DC circuits.	**2 Hours**
Experiment-4	Verification of Maximum power transfer theorem using DC circuits.	**2 Hours**
Experiment-5	Measurement of Voltage, current, power and power factor calculation in series R-L-C circuit.	**2 Hours**
Experiment-6	Verification and calculation of Resonance frequency in series R-L-C circuit.	**2 Hours**
Experiment-7	Connection and Demonstration of Domestic Wiring System	**2 Hours**
Experiment-8	Connection and Running of DC Motors, DC generators, 3- phase Induction motors and 1- phase Transformers	**2 Hours**
Experiment-9	Power and phase measurements in three phase system by two wattmeter method	**2 Hours**
Experiment-10	OC and SC test on single phase transformer	**2 Hours**
	BEYOND SYLLABUS	
Experiment-11	Verification of Ohm's Law	**2 Hours**
Experiment-12	Verification of B-H curve	**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	Mobile Charger
2	Extension Board
3	Multiple USB Port
4	Brushless DC Motor Driver
5	Small Transformers Upto 7V.
6	Small Model Of Bio-Gas Plant
7	Temperature Control 12v DC Fan
8	Making Of Led Bulbs.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-P-ES-102	**Basic 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 Scheme	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/
3.

CO1	To identify different Electrical Instruments and measure different parameters.
CO2	To study connection and demonstration of DC generators, motors and wiring systems.
CO3	To study design and connection of Different Lamps
CO4	To identify active and passive electronic components and handle measuring instruments like CRO and DSO.
CO5	To design different circuits using diode, BJT and opamps.
CO6	To 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	Fire Alarm using Temperature Sensor.
5	Light ON /OFF using Piezo Sensor.
6	Clap sound Operated using Sound Sensor.
7	Rain Detector
8	Power supply Circuit
9	Touch less Doorbell
10	Motion Detector using Ultrasonic Sensor

Type	Code		L-T-P	Credits	Marks
ES	BTES-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.	**2 Hours**
Experiment-5	Programs on single dimensional array.	**2 Hours**
Experiment-6	Programs on two-dimensional array.	**2 Hours**
Experiment-7	Programs on Functions.	**2 Hours**
Experiment-8	Programs on Recursive Functions.	**2 Hours**
Experiment-9	Programs on Pointers.	**2 Hours**
Experiment-10	Programs on Dynamic Memory Allocation.	**2 Hours**
Experiment-11	Programs on Structure.	**2 Hours**
Experiment-12	Programs on Union.	**2 Hours**
Experiment-13	Programs on File Handling.	**2 Hours**
Experiment-14	Implementation of Linear search.	**2 Hours**
Experiment-15	Implementation of sorting algorithm: Bubble Sort	**2 Hours**
Experiment-16	Arduino Programming – Introduction to Sensors, Introduction to Microcontrollers.	**2 Hours**
Experiment-17	Programing, Serial Communication	**2 Hours**
Experiment-18	Arduino based Project	**2 Hours**

	Total	38 Hours

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

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

Projects using C Programing

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

Arduino based Project

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

Type	Code	Basic Mechanical Engineering Laboratory	L-T-P	Credits	Marks
ES	BTBS-P-ES-104		0-0-2	1	100

Objectives	To train the students in conducting experiment and get acquainted with different measuring devices, gain practical experience on Refrigerator, IC engine, Hydraulic Machines, Power transmission system and Gear trains. Experience application of Bernoulli's theorem and Meta center.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Scheme	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	Validation of Bourdon tube pressure guage with U-tube Manometer	**2 Hours**
Experiment-2	Verification of Flow measuring apparatus (Venturi meter/ orifice meter/ rota meter)	**2Hours**
Experiment-3	Determination of COP of Domestic refrigerator	**2 Hours**
Experiment-4	Draw valve timing diagram of two stroke & four stroke petrol and diesel engine	**2Hours**
Experiment-5	Verification of Bernoulli's Theorem	**2 Hours**
Experiment-6	Determination of Meta centre	**2 Hours**
Experiment-7	Determination of mechanical efficiency of Pelton & Francis Turbine	**2 Hours**
Experiment-8	Comparison of efficiency of Centrifugal pump apparatus, Reciprocating	**2 Hours**
Experiment-9	Determination of speed ratio of Simple ,Compound & reverted Gear train	**2 Hours**
Experiment-10	Demonstration of power transmission system	**2 Hours**
Total		**20 Hours**

At the end of the semester students will able to

CO1	Experience different pressure and flow measuring instruments
CO2	Experience working principle of refrigerator and IC engines
CO3	Get knowledge about application of Bernoulli's Theorem and Meta centre
CO4	Get knowledge of different types of hydraulic machines
CO5	Experience different types gear trains and able to find out mechanical advantage and gear
CO6	Get idea of power transmission system

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.

Type	Code	Basic Civil Engineering Laboratory	L-T-P	Credits	Marks
ES	BTES-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	Water absorption test of brick.	**2 Hours**
Experiment-2	Compressive strength of Brick.	**2 Hours**
Experiment-3	Determination of Specific gravity of soil	**2 Hours**
Experiment-4	Sieve Analysis of Soil.	**2 Hours**
Experiment-5	Study of different instruments used in survey.	**2 Hours**
Experiment-6	Compressive strength of Concrete.	**2 Hours**
Experiment-7	Study of Different types of pipe fittings	**2 Hours**
Experiment-8	Measurement of bearing of a line.	**2 Hours**
Experiment-9	Study of Solenoid Valve	**2 Hours**
Experiment-10	Study of Sensors.	**2 Hours**
	BEYOND SYLLABUS	**2 Hours**
Total		**20 Hours**

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

CO-1	Identify the different properties of building materials
CO-2	Understanding the different modes of transportation
CO-3	Study of engineering properties of soil
CO-4	Analyze of water supply system by sensors and solenoids
CO-5	Evaluating different types of pumps
CO-6	Explore the uses of different instruments used in civil engineering work

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	BTES-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	BTES-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 Square 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 butt/T-joint by gas welding	**3 Hours**
Experiment-6	To prepare joint by Soldering /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 make funnel in sheet metal	**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	English for Engineers –I (Laboratory)	L-T-P	Credits	Marks
BS	BTHS-P-HS-111		0-0-2	1	100

Objectives	To develop the skills in communication.
	To evaluate the LSRW skills with efficiency.
	To distinguish the sub skills of reading comprehension for better understanding.
	To implement the process of effective writing.
Pre-Requisites	To have basic knowledge on LSRW skills
Teaching Pedagogy	Regular sessions are planned to be interactive with examples to be acquainted with different types of communication context. .

Detailed Syllabus

SL N0	NAME OF THE ACTIVITY	HOURS
ACTIVITY 1	Ice Breaking & Self- Introduction	2 Hours
ACTIVITY 2	The Raman Effect, Reading: Task1- Task 3, Vocabulary: Task4- Task 5 (Prefixes and Suffixes)	2 Hours
ACTIVITY 3	The Raman Effect, Grammar: Identifying Common Errors in Writing. (Task 6 to Task 15)	2 Hours
ACTIVITY 4	The Raman Effect, Writing: (Task 16 to Task 29) Paragraph Writing	2 Hours
ACTIVITY 5	Ancient Architecture, Vocabulary: Task1 to Task 3 (Synonym and Antonym), Grammar: Subject-verb Agreement. (Task 4 to Task 7)	2 Hours
ACTIVITY 6	Ancient Architecture ,Writing: Task11 to Task 18 (Formal Letter an)	2 Hours
ACTIVITY 7	Sounds of English	2 Hours
ACTIVITY 8	Sounds of English	2 Hours
ACTIVITY 9	Role Play	2 Hours
ACTIVITY 10	Debate	2 Hours

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

CO1	Develop the understanding of language
CO2	Discuss the rules of language for effective communication
CO3	Analyze the pronunciation of English language
CO4	Recognize different forms of formal writing

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

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

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Write a C program to perform matrix addition and multiplication using array	**2Hours**
Experiment-2	Write a C program to create a stack using an array and perform (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	**2Hours**

	(ii) Insertion (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	English for Engineers –II (Laboratory)	L-T-P	Credits	Mark
BS	BTBS-P-HS-211		0-0-2	1	100

Objectives	
	To equip the students with different forms of professional writing
	To acquaint them with interpersonal etiquette to face corporate challenges
	To understand the nuances of GD-PI
Pre-Requisites	Basic knowledge of applications of communication
Teaching Pedagogy	Application oriented, task based, need based, teaching Pedagogy

Detailed Syllabus

Activity No	Activity Name	Hours
Activity: 1	Blue Jeans Sub Skills of Reading: Task14- Task 15	2 Hours
Activity:2	How a Chinese Billionaire Built Her Fortune Vocabulary: Task1 to Task 3 (Technical and Computer related Terms)	2 Hours
Activity:3	How a Chinese Billionaire Built Her Fortune Writing: Task12 to Task 14(Report)	2 Hours
Activity:4	Sop practice,	2 Hours
Activity:5	Proposal Writing	2Hours
Activity:6	Oral Presentation 1	2 Hours
Activity:7	Oral Presentation 2	2 Hours
Activity:8	Group Discussion1	2 Hours
Activity:9	Group Discussion 2	2 Hours
Activity:10	Mock Interview	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	Develop skills for corporate readiness.
CO3	Implement the different forms of professional correspondence.
CO4	Apply English grammar and essentials of language skills as per present requirement.

3rd SEMESTER

Sl. No	Course	Course Code	Course Title	L - T - P	Duration in hours	Examination			Credits
						IE Marks	ESE Marks	Total Marks	
1	BS	BTBS-T-BS-312	Applied Mathematics	3-1-0	5	100	100	200	3
2	HS	BTBS-T-HS-302	Engineering Economics	3-1-0	5	100	100	200	3
3	PC	BTCE-T-PC-301	Mechanics of Solids	4-1-0	5	100	100	200	3
4	PC	BTCE-T-PC-302	Fluid Mechanics	3-1-0	5	100	100	200	3
5	PE	BTCE-T-PE-301	Construction Technology	3-1-0	5	100	100	200	3
6	ES	BTCS-T-ES-301	Object Oriented Programming using JAVA	3-1-0	5	0	100	100	3
7	AEC	BTSC-T-AE-301	Ability Enhancement Training - B	3-0-0	2	100	0	100	1
8	MC	BTMC-T-MC-302	Essence of Indian Knowledge and Tradition -I	3-0-0	2	100	0	100	0
9	PC	BTCE-P-PC-301	Computer Application for Civil Engineering Lab	0-0-3	2	100	0	100	1
10	PS	BTCE-P-PS-301	Seminar -I	0-0-3	2	100	0	100	1
11	SC	BTCE-P-SC-301	Evaluation of Summer Internship -I	0-0-3	2	100	0	100	2
12	ES	BTBS-P-ES-301	Object Oriented Programming using JAVA lab	0-0-3	2	100	0	100	1
TOTAL									**24**

4th SEMESTER

Sl. No	Course	Course Code	Course Title	L - T - P	Duration in hours	Examination			Credits
						IE Marks	ESE Marks	Total Marks	
1	PC	BTCE-T-PC-401	Survey - I	3-0-0	5	100	100	200	3
2	HS	BTBS-T-HS-301	Organizational Behavior	3-0-0	3	100	100	200	3
3	PE	BTCE-T-PE-401	Structural Analysis -I	3-0-0	5	100	100	200	3
4	PC	BTCE-T-PC-402	Transportation Engineering -I	3-0-0	5	100	100	200	3
5	PC	BTCE-T-PC-403	Geotechnical Engineering	3-0-0	4	100	100	200	3
6	OO	BTCE-T-OO-402	NPTEL	3-0-0	2	--	0	100	3
7	AEC	BTSC-T-AE-401	Ability Enhancement Training - C	3-0-0	2	100	-	100	1
8	MC	BTMC-T-MC-301	Environmental Engineering	3-0-0	2	100	0	100	0
9	PC	BTCE-P-PC-401	Surveying Lab	0-0-3	2	100	-	100	1
10	PC	BTCE-P-PC-403	Fluid Mechanics Lab	0-0-3	2	100	-	100	1
11	PC	BTCE-P-PC-402	Transportation Engineering Lab	0-0-3	2	100	-	100	1
12	PS	BTCE-P-PS-401	Project - III	0-0-3	2	100	-	100	2
			TOTAL						**24**

3rd SEMESTER

Applied Mathematics

Course Code	**BTBS-T-BS-301**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. The objective of this course is to Apply the knowledge of the Laplace & Fourier transformation. To Partial differential equations and used in Engineering problems.
2. To Solve the first & second order differential equations analytically using standard method.
3. To demonstrate various physical models through higher order differential equation and solve such linear ordinary differential equation.
4. To Solving the ordinary differential equation by using Laplace transformation.

Module-1 – (8 Hours)

Laplace transformation:

Introduction and its formula. First shifting theorem, Inverse Laplace Transformation. Derivative & Integration properties of Laplace transformation. Convolution & Convolution theorem (Without Proof).

Module -2 – (8 Hours)

Fourier Series & Transformation:

Unit step function & Dirac-Delta function. Solutions of the differential equations by using Laplace Transformation. Periodic function, Fourier series for 2π period, Fourier expansion of functions of any period, Even and odd functions, Half range Expansion& Fourier transform.

Module -3 –(6 Hours)

Application of Partial Differential equations (PDE):

Introduction of Partial Differential Equation.
Solution of PDE by variable separable method only.

Module -4 – (10 Hours)

Type and Normal forms of PDEs.
One dimensional heat equation with insulated & non-insulated ends.
D'Alembert's Solution of wave equation.

Module -5 – (6 Hours)

Two dimensional Laplace equations.
Two dimensional heat equations with steady state & unsteady.

Module -6 - (8 Hours)

Power Series Method:

Convergent & Divergent condition of the power series. Power series method for solving differential equations. Legendre equation and Legendre polynomial. Bessel's function and its properties.

Course outcomes:

At the end of the course the student will be able to:

1. Apply the knowledge of the Laplace & Fourier transformation.
2. Partial differential equations and used in Engineering problems.
3. Solve the first & second order differential equations analytically using standard method.
4. demonstrate various physical models through higher order differential equation and solve such linear ordinary differential equation.
5. Solving the ordinary differential equation by using Laplace transformation.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Advance Engineering Mathematics	E Kreyszig	Wiley	9th Edition
1	Higher Engineering Mathematics	B S Grewal	Khanna Publishers	
2	" Higher Engineering Mathematics"	B V Ramana		

Mechanics of Solids

Course Code	**BTCE-T-PC-301**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To Compute the force moment and heir application through their solving problems.
2. To determine the C.G and moment of inertia of different geometrical figures.
3. To understand the concept of stress and strain, principal stresses and principal planes.
4. To study the concept of shear fore and bending moment due to external load in beams.
5. To understand deflection, bending stress and shear stress using different methods.
6. To Analyze the design the thin cylinder.

Module-1 – (8 Hours)

Introduction to Forces ,Centre of Gravity & Moment of Inertia :

Force, Moments & couples,: Principle of transmissibility, Principle of superposition, Coplanar and collinear forces, , Law of parallelogram of forces.

Lami's theorem. Conditions of Equilibrium, Friction. Center of Gravity and Moment of Inertia.

Module -2 – (10 Hours)

Concept of Stress

Stress, strain, Hook's law, Modulus of elasticity, Bulk Modulus, modulus of rigidity, FOS, stress –strain diagram. Relation between elastic constants.

Strain Energy, Resilience, Modulus of resilience, Bars of varying cross section, temperature stresses and strain.

Mohr's Circle :

Principal Plane, Principal Stress,

Mohr's Circle for stress and Strain, Major principal stress and strain.

Module -3 –(6 Hours)

Shear Force and Bending Moments:

Definition of Shear Force and Bending Moment. Types of support and Types of Loads , Relation Between SF and BM, point of contra flexure, SF and BM diagrams for simply supported and Cantilever Beams.

Module -4 – (8 Hours)

Bending in Beams:

theory of simple bending, assumptions, section modulus, flexural rigidity. Shear stress distribution for rectangular section.

Thin cylinder and spherical shells.

Torsion.

Module -5 – (8 Hours)

Deflection of beam and theory of column:

Elastic curve, differential equation, double integration method, moment of area method for computation of slope and deflection of simply supported beams and cantilever beam.

THEORY OF COLUMN: Short column, long column, Slenderness ratio , Euler's theory.

Module -6 - (6 Hours)

Analysis of Truss:

Plane Truss - assumptions used in the analysis of Truss. Perfect, imperfect and redundant truss, analysis of Truss by method of joints and method of sections.

Course outcomes:

At the end of the course the student will be able to:

1. Compute the force moment and their application through their solving problems.
2. Determine the C.G and moment of inertia of different geometrical figures.
3. Understand the concept of stress and strain, principal stresses and principal planes.
4. Study the concept of shear fore and bending moment due to external load in beams.
5. Understand deflection, bending stress and shear stress using different methods.
6. Analyze the design the thin cylinder.

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Engineering Mechanics	S.S. Bhavikatti	NEW AGE International Publishers.	
2	Strength of Materials (Mechanics of Solids)	R.K. Rajput	S. Chand & company Ltd., New Delhi,	7th edition, 2018.
Reference Books :				
1	Engineering Mechanics	Timoshenko	(TMH Publication Delhi)	
2	Applied Mechanics & Strength of Material	I.B. Prasad		
3	“Strength of Materials",	Rattan S.S.,	Tata McGraw Hill Education Pvt .Ltd.,	New Delhi, 2017

Fluid Mechanics

Course Code	**BTCE-T-PC-302**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To understand the properties of fluids and types of fluids.
2. To Apply conservation laws to fluid flow problems in engineering applications and examine the stability of a floating bodies.
3. To Apply Euler's Equation of motion and Bernoulli's equation for flow measuring devices and hydraulic machines.
4. To understand the concepts of fluid flow measurement and flow through pipes.
5. To analyze the performance of various types of Hydraulic pumps and turbines.
6. To determine the basic principles and characteristic curves of turbines and pumps.

Module-1 – (8 Hours)

Fluids and Their Properties :

Properties of Fluid: Fluid classification, Types of pressures, Pascal's law ,pressure variation, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure.

Module -2 – (8 Hours)

Equilibrium of floating bodies:

Equilibrium and stability of a submerged body, stability of floating bodies, determination of the metacentric height, determination of the position of the metacentre relative to the center of buoyancy.

Module -3 –(7 Hours)

Pressure and Its Measurement :

FLUID STATICS: dimensions and units: Physical Properties of fluids, specific gravity, Viscosity, surface tension- vapour pressure and their influence on fluid motion- atmospheric, gage pressure and vacuum pressure. measurement of pressure, piezometer, U-tube manometer and differential manometers.

Module -4 – (7 Hours)

Hydrostatics :

Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Kinematics of Flow: Kinematics of fluid flow: fluid flow and classifications. Continuity equation in 1D & 3D. Potential flow & Stream function; types of flow lines.

Dynamics of fluid:

equations of motion; Euler's equation; Bernoulli's equation; Applications of Bernoulli's equation.

Flow through pipes and ducts; Darcy Weisbach equation of friction loss; . Loss due to friction . Minor energy losses in pipes, Hydraulic Gradient Linc (HGL), Total Energy Line (TEL), Power transmission in the fluid flow in pipes. fluid flow in pipes in series and parallel.

Flow through nozzles:

Basic principle for flow through orifices, V-notches, weirs (rectangular). Flow through open channels; use of Chezy's formula.

Module -5 – (6 Hours)

BASICS OF TURBO MACHINERY :

Impact of Jets : Flat, inclined and curved plates with stationary and moving case.

Hydraulic turbines: Classification, Impulse and Reaction turbine; Tangential , Radial and axial turbine.

Impulse turbine and Reaction Turbines - velocity triangle and efficiencies, performance curve.

Function of draft tube.

Unit quantities, Governing of turbines. Cavitation.

Module -6 - (6 Hours)

Hydraulic Pumps :

Centrifugal Pump: Classification, working, work done-barometric head- losses and Efficiencies, specific speed, performance characteristic curves, NPSH, Velocity diagrams. Cavitation. Unit quantities.

Reciprocating Pump: Components & Principles, working, Classification, discharge, work done, power requirement, Slip, Indicator diagram.

Course outcomes:

At the end of the course the student will be able to:

1. Understand the properties of fluids and types of fluids.
2. Apply conservation laws to fluid flow problems in engineering applications and examine the stability of a floating bodies.
3. Apply Euler's Equation of motion and Bernoulli's equation for flow measuring devices and hydraulic machines.
4. Understand the concepts of fluid flow measurement and flow through pipes.
5. Analyze the performance of various types of Hydraulic pumps and turbines.
6. Determine the basic principles and characteristic curves of turbines and pumps.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Textbook of fluid mechanics and hydraulic machine	Bansal, R. K	Laxmi Publication,	2011.
2	Hydraulics & Fluid Mechanics Including Hydraulics Machines	Modi, P.N. & Seth, S.M.,	Standard Book House,	2017.
Reference Books				
1	Fluid Mechanics & Turbo Machines	M.M.Das	PHI,	2010.
2	Theory and Applications of Fluid Mechanic	K. Subramanya	Tata McGraw-Hill Publishing Company Ltd.,	1993
3	Fluid Mechanics and its applications	Vijay Gupta and Santosh K. Gupta,	Wiley Eastern Ltd.,	1984.

Construction Technology

Course Code	**BTCE-T-PE-301**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To understand and apply, basic project management concept and technique to achieve the project
2. To learn various component of building in details
3. To optimization of plumbing and electrification technique
4. To familiar with various construction material
5. To learn and understand utility, advantage and limitation of various construction equipment
6. To identify building defect and learn maintenance technique

Module-1 – (5 Hours)

Fundamentals of Construction Technology:
Introduction, Construction activities, construction process, construction workers, construction estimating, construction estimate, construction schedule, productivity and mechanized construction, Quality and safety.

Module -2 – (6 Hours)

Preparatory Work and Implementation:
Site layout, Infrastructure development, construction methods, construction materials, prefabrication in construction, false work and temporary work. Components of building, various types of door and windows, stair and its component, Floor and Flooring: Introduction, Types of Flooring, IPS Flooring, Materials used in Flooring, Terrazzo flooring, Timber flooring. Roof and roofing: Introduction, cast-in-situ reinforced concrete roofs, precast reinforced concrete roofs, roofs covered with sheets, waterproofing over roofs.

Module -3 –(9 Hours)

Finishing Work:
Introduction, plastering, pointing, facing, glazing, painting, Construction joints-need and materials used, Plumbing and electrification- various types of fittings and laying procedure.
Concrete and Advance construction material: Introduction, Important properties of concrete, Use of admixtures, formwork, shotcrete, lightweight and heavyweight concrete, ready-mix concrete, high performance concrete, Green concrete, self-compacting concrete, extreme weather concreting, pre-stressed concrete, under water concreting, Fiber Reinforced concrete, curing of concrete, non-destructive testing of hardened concrete.
Plastic and its types, Steel and its types, Fly ash

Module -4 – (7 Hours)

Mechanized Construction: Introduction, general consideration, deployment of construction equipment, plants for earth work tractor, bulldozer, ripper, scraper, face shovel, backhoe, dragline, clamshell etc., roller, plants for transportation, movement and handling-derrick, crane, hoist, concrete mixers and pumps, scaffolding, Damp proof course (DPC), Anti-termite measures and treatment.

Module -5 – (7 Hours)

Building Maintenance and Safety Measures:
Causes and types of defects in buildings, Preparation of report on maintenance work, Remedial measure, Importance of various Laws /Norms/Regulations/Acts for safety, Precautions and precautionary Measures, Post-accident procedures.

Module -6 - (6 Hours)

Building items:
Plastering & pointing-its purpose, various types, construction procedures, advantages and disadvantages, suitability of each, ,Construction joints-need and materials used, Plumbing and electrification-various types of fittings and laying procedure.

Course outcomes:

At the end of the course the student will be able to:

1. Understand and apply, basic project management concept and technicqe to achive the project.
2. Learn various component of building in details.
3. Optimization of plumbing and electrification technicqe.
4. Familiar with various construction material Learn and understand utility, advantage and limitation of various
5. Construction equipment
6. Identify building defect and learn maintained technique.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Construction Technology,	Subir Sarkar and Subhajit Saraswati,	Oxford University Press	
2	Construction Planning and Management,	U.K. Srivastava,	Galgotia Publications Pvt Ltd	
3	Construction Technology Analysis and Choice,	Tony Bryan,	Wiley	
4	Building Construction,	Sushil Kumar,	Standard Publisher	

Object Oriented Programming using JAVA

Course Code	**BTCS-T-ES-301**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	3	Exam Hours	03

Course Objectives:
To expose in the field of Programing Language (Core java)

Prerequisites:
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.

Module-1 – (3 Hours)

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, How Java program executes? What is JVM and its significance in executing a program? Architecture of JVM.

Module -2 – (3 Hours)

Understanding First Program and a step forward, understanding every term of the program, Java Tokens, Datatypes, Operators, what are Operators? Different types of Operators, Typecasting, Control Structures and Arrays, Different types of control structures, Conditional Statements, Loops/ Iterators, Jumping Statements, Java Arrays, Multidimensional Arrays, Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class.

Module -3 –(4 Hours)

Object and Classes: Specifying and using classes, access specifies: private, public, functions and data members, default arguments, function overloading, friend functions, static members. Objects: memory considerations for objects, new and delete operators. Constructors - default constructor, parameterized constructor, constructor with dynamic allocation, copy constructor, destructors. Inheritance: Derived and base classes, Class hierarchies, public, private, and protected derivations, constructors in derived classes, destructors in derived classes, constructors' invocation and data members initialization in derived classes, classes within classes, virtual base class.

Module -4 – (3 Hours)

Use of super keyword in Java, Polymorphism, Understanding 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.

Module -5 – (3 Hours)
Concept of Wrapper Classes, Introduction to wrapper classes, Different predefined wrapper classes, Predefined Constructors for the wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing. Data Abstraction: Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple Inheritance Using Interfaces, Packages, Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages.

Module -6 – (4 Hours)
Exception handling and Templates: Introduction to exception handling, throw point outside try, Multiple catch, Catch-all, throwing objects. Introduction to templates, class templates, function templates. Files and Streams: Introduction to file handling, hierarchy of file stream classes, opening and closing of files, file modes, file pointers and their manipulators, sequential access, random access.

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

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

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Programming in Java. Second Edition	(SACHIN MALHOTRA/SAURAV CHOUDHARY)	OXFORD HIGHER EDUCATION	
2	CORE JAVA For Beginners.	(Rashmi Kanta Das)	Vikas Publication	
3	JAVA Complete Reference	(9th Edition)	Herbalt Schelidt	
4	Effective Java	3rd Edition	Joshua Bloch (Author)	

Type	Code	Ability Enhancement Training - B	L-T-P	Credits	Marks
AET	BTSC-T-AE-301		2-0-0	0.5	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	To help students practiced and understand the various company pattern tests.
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.

Course Outcome

1. To help students explore their values and career choices through individual skill assessments.
2. To make realistic employment choices and to identify the steps necessary to achieve a goal.
3. To develop and practice self-management skills for the work site.
4. To explore and practice basic communication skills.
5. To learn skills for discussing and resolving problems on the work site.
6. To assess and improve personal grooming.
7. To promote safety awareness including rules and procedures on the work site.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to pre- placement talk, Syllogism (Introduction to syllogisms, Statements of syllogisms, Application of Venn diagrams, Logical deduction), Blood Relationship (Dialogue/ Conversation Based, Based on puzzles, coding-decoding),Mirror Image, Water Image< Incomplete pattern< Paper cutting, Data sufficiency.	**4 Hours**
Module-2	Introduction to Speed math (speed & accuracy in Addition, Subtraction, Multiplication, Fractions, Percentage, Squares, Cubes, Square Roots, Cube Roots, etc.), 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).	**6 Hours**
Module-3	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 and Proportion(direct proportion, inverse proportion, continued proportion). Profit &Loss(Profit, Loss, Cost Price, Selling Price, Marked Price) , Simple Interest & compound interest, Puzzles(Floor, Scheduling, Double line up, Linear, Square, Box)	**6 Hours**
Module-4	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 information).	**4 Hours**
Module-5	Rules For Tenses ; Rules For Prepositions ; List of Prepositions; Rules and List of Conjunctions ; Active And Passive Voice Rules; List of One Word Substitutions; List of Homophones/Homonyms; List of Synonyms and Antonyms; Idioms And Phrases; Spotting the Error; Sentence Correction Questions; Adjective Degree Of Comparison Rules; Article Rules; Direct & Indirect Speech Rules; Sentence Rearrangement & Para jumbles.	**4 Hours**
Module-6	Market Research and Business Plan - Basics on Conducting Market Research - Assignment Preparing a business plan - Assignment Inspirational Stories of Entrepreneurs -	**6 Hours**
	Total	**30 Hours**

Text Book	
1.	Quantitative aptitude by R S Aggarwal
2.	Quantitative Aptitude for CAT by Arun Sharma
3.	Entrepreneurship Development by Dr. R. K. Singhal
4.	Entrepreneurship Development by M.L.Sharma
1	Fast Track Objective Arithmetic by Arihant Publications

Type	Code	Computer Application in Civil Engineering Lab.	L-T-P	Credits	Marks
PC	BTCE-P-PC-301		0-0-3	1	100

Objectives	To Draw various components of the structure using AutoCAD . To Prepare 2D and 3D elevation diagrams of multistory frames using CAD. To draw Culverts and Retaining walls. To Draw several types of footings using CAD. To Prepare drawings of commercial buildings.
Pre-Requisites	Basic Knowledge in AutoCAD and Computer Programming.
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.

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Familiarize with different tools and command in AutoCAD.	3Hours
Experiment -2	Drawing of Plan for a 1BHK residential Building.	3Hours
Experiment- 3	Drawing of Elevation for a 1BHK residential Building showing front and side view.	3Hours
Experiment- 4	Drawing of Plan, Elevation and side view of a 2BHK, G+3 Office Building.	3Hours
Experiment- 5	Detail drawing of doors and windows.	3Hours
Experiment- 6	Draw details plan of School building having all the required facilities.	3Hours
Experiment- 7	Details drawing of various staircase.	3Hours
Experiment- 8	Drawing of plan and elevation of various footings.	3Hours
Experiment- 9	Drawing Details plan of Hostel and Library of a college.	3Hours
Experiment- 10	Drawing of detail plan of slab culvert and Retaining Wall.	3Hours
Total		**30 Hours**

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

CO1	Draw various components of the structure using AutoCAD .
CO2	Prepare 2D elevation diagrams of multistory frames using CAD.
CO3	Prepare 3D elevation diagrams of multistory frames using CAD.
CO4	Sketch the structural drawings for Culverts and Retaining walls.
CO5	Draw several types of footings using CAD.
CO6	Prepare drawings of commercial buildings.

Type	Code	Seminar - I	L-T-P	Credits	Marks
PS	BTCE-P-PS-301		0-0-2	1	100

Objectives	1. To enhance students' knowledge on contemporary topics and advancements in engineering through collaborative learning and expert insights. 2. To develop critical thinking and problem-solving skills by engaging students in research-based discussions and presentations. 3. It provides a platform for students to explore interdisciplinary concepts and innovative solutions. 4. It encourages self-directed learning and the ability to synthesize complex technical information. 5. To prepare students for professional challenges and lifelong learning.
Pre-Requisites	1. Basic understanding of core engineering concepts related to the student's specialization. 2. Familiarity with technical writing and report preparation. 3. Proficiency in using presentation tools like PowerPoint or other visualization software. 4. Ability to perform literature reviews and access academic journals, research papers, and industry reports. 5. Strong communication skills for effective presentation and discussion. 6. Willingness to engage in independent research and collaborative learning activities.
Teaching Pedagogy	1. Student-Centered Learning: Encourage students to take ownership of their learning by selecting seminar topics relevant to their interests and specialization. 2. Research-Based Approach: Guide students to conduct in-depth research using credible academic and industry sources, emphasizing critical thinking and data analysis. 3. Collaborative Learning: Foster peer discussions, group activities, and feedback sessions to enhance idea sharing and teamwork.

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

CO1	**Identify** and select relevant engineering problems or emerging topics for research and presentation using comprehensive literature review.
CO2	**Analyze** and interpret data from credible sources to draw meaningful insights and conclusions.
CO3	**Apply** effective communication and presentation techniques to deliver professional and impactful seminar sessions.
CO4	**Evaluate** technical information and arguments presented by peers, providing constructive feedback and critical suggestions.
CO5	**Design** and structure a well-organized seminar report and presentation using clear, concise, and visually appealing formats.
CO6	**Develop** teamwork and leadership skills by collaborating with peers in group discussions and activities.

Type	Code	Object Oriented Programming Using Java Lab	L-T-P	Credits	Marks
CS	BTBS-P-ES-301		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.

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Introduction, compiling and executing java program	3 Hours
Experiment -2	Data types, variables and design control structures	3 Hours
Experiment- 3	Loop control structures	3 Hours
Experiment- 4	Introduction to object and class	3 Hours
Experiment- 5	Inheritance, polymorphism and abstract class	3 Hours
Experiment- 6	package	3 Hours
Experiment- 7	Interfaces, Inner classes	3 Hours
Experiment- 8	Exception handling and java threads	3 Hours
Experiment- 9	Java applets	3 Hours
Experiment- 10	AWT and swings	3 Hours
Total		**30 Hours**

Type	Code	Evaluation of Summer Internship - I	L-T-P	Credits	Marks
SC	BTEC-P-SC-301		0-0-3	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.

METHOD OF EVALUATION:

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

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

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

4TH SEMESTER

Survey - I

Course Code	BTCE-T-PC-401	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To introduce the principle of surveying.
2. To impart awareness on the various fields of surveying and types of instruments.
3. To understand the various methods of surveying and computations.
4. To understand the various methods of Leveling and computations.
5. To establish horizontal control and vertical control by traversing and triangulation.
6. To prepare topographical map and contour map on an area.

Pre-Requisites :
Knowledge of Physics and Mathematics in Secondary Education.

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.

Module-1 – (8 Hours)

Linear measurement and chain survey: Use of chains and tapes for measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination, Concept of field book, selection of survey station, base line, tie line, check lines.

Module -2 – (8 Hours)

Compass surveying: Use of prismatic compass, dip, magnetic declination, numerical problems temporary adjustment, bearing of a line, local attractions, and correction of bearing.

Module -3 –(8 Hours)

Leveling: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Study of Level book Curvature and refraction error, sensitiveness of level tube, reciprocal leveling, leveling difficulties and common errors, Automatic and Electronic or Digital levels.

Module -4 – (8 Hours)

Contouring: Contour interval and horizontal equivalent, characteristics of contours, methods of contouring- different and indirect method, inter contour gradient.

Module -5 – (8 Hours)

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles, theodolite traversing.

Module -6 - (8 Hours)

Modern Surveying Instruments – Electromagnetic Spectrum, Radar, Electronic Distance Measurement, EDM Equipment, Corrections to measurement, Digital Theodolite, Total Stations, Introduction to Remote Sensing and GIS.

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

1. **Measure** distances using chains and tapes, perform ranging, and handle obstacles in chaining with error elimination techniques.
2. **Operate** a prismatic compass to determine bearings, account for local attraction, and correct magnetic declination errors.
3. **Perform** leveling using dumpy levels, reduce levels with various methods, and address errors like curvature and refraction.
4. **Interpret** contour characteristics, calculate contour gradients, and apply methods of contouring for terrain representation.
5. **Use** a theodolite for angle measurements and traversing, including horizontal and vertical adjustments.
6. **Demonstrate** proficiency with modern surveying tools like EDM, total stations, and remote sensing for advanced measurement and analysis.

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Surveying- Vol.I	B.C. Punmia	Laxmi Publications	
2	Surveying & Levelling. Vol-I	T.P.Kanethar & S.V.Kulkarni	Pune Vidyarthi Griha Prakashan	
3	Surveying Vol-1	R Agor	Khanna Publishers	

4	A Textbook of Surveying	C. Venkatramaiah	Universities Press	
5	Surveying And Levelling	N.N. Basak	McGraw-Hill Education	
6	Surveying and Leveling	R. Subramanian	Oxford University Press.	

Organizational Behavior

Course Code	BTBS-T-HS-301	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course 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.

Module-1 – (8 Hours)

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.

Module -2 – (8 Hours)

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.

Module -3 –(8 Hours)

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.

Module -4 – (8 Hours)

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.

Module -5 – (8 Hours)

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. Case Let.

Module -6 - (8 Hours)

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.

Course outcomes:

1. To discuss the development of the field of organizational behavior and explain the micro and macro approaches.
2. To analyses and compare different models used to explain individual behavior related to motivation and rewards
3. To explain group dynamics and demonstrate skills required for working in groups.
4. To identify the various leadership styles and the role of leader in a decision making process.
5. To explain organizational culture and de4scribe its dimensions and to examine various Organizational designs.

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	A Textbook of Organizational Behavior	S.S. Khanka	S Chand.	

2	Organizational Behaviour	M. N. Mishra	Vikas Publishing House.	
3	Organizational behavior	N. Kumar & R. Mittal	Anmol Publication.	
4	Organizational behavior	K.C.S. Ranganayakulu	Atlantic Publishers & Distributors (P) Limited.	
5	A Textbook of Organizational Behavior	C. B. Gupta	S Chand.	
6	Organizational Behaviour	Robbins/Vohra	Pearson.	

Structural Analysis - I

Course Code	BTCE-T-PE-401	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To distinguish between Determinate and Indeterminate structures..
2. To Understand various Deflection method of Determinate Beam.
3. To apply Energy Method in Deflection Of Beam.
4. To analyse of Trusses by various loading condition.
5. To Evaluating different types of Beams under Moving Load Condition.
6. To Deriving expressions for different types of Beam when exposed to different types of Loads

Pre-Requisites :

Knowledge of Physics and Mathematics in Secondary Education.

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.

Module-1 – (8 Hours)

Concept of determinate and indeterminate structures, determination of degree of static and kinematic indeterminacy in plane frame and continuous structures.
Methods of Analysis: Equilibrium equations, compatibility requirements, Introduction to force and displacement methods.

Module -2 – (8 Hours)

Analysis of propped cantilever by consistent deformation method.
Double Integration Method and Macaulay Method. Analysis of fixed and continuous beams by Moment-Area method, Conjugate beam method and theorem of three moments.

Module -3 –(7 Hours)

Energy theorems and its application, Strain energy method, Virtual work method, unit load method, Betti's and Maxwell's laws, Castigliano's theorem, concept of minimum potential energy.

Module -4 – (7 Hours)

Introduction of trusses, determining the static and kinematic indeterminacy, determination of forces in member of trusses by method of joints, method of sections, Analysis of redundant plane trusses.
Deflection of pin jointed plane trusses. Analytical method and Williot –Mohr diagram.
Introduction to space truss.

Module -5 – (6 Hours)

Rolling loads and influence lines for determinate structures, simply supported beams, cantilever, ILD for reaction, shear force and bending moment at a section, ILD for wheel loads, point loads and udl, maximum bending moment envelope.

Module -6 - (6 Hours)

Analysis of three hinged arches, Suspension cable with three hinged stiffening girders subjected to dead and live loads, ILD for Bending Moment, Shear Force, normal thrust and radial shear for three hinged arches.

Course outcomes:

At the end of the course the student will be able to:

1. Identify determinate and indeterminate structures using static and kinematic indeterminacy.
2. Apply force and displacement methods to analyze fixed, continuous, and propped cantilever beams.
3. Analyze deflections in trusses using analytical methods and determine member forces.
4. Evaluate energy methods for deflections and internal force analysis in structures.
5. Construct ILDs for reactions, shear forces, and bending moments in determinate structures.
6. Examine forces in three-hinged arches and suspension cables, including ILDs.

Textbooks :				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Year**
1	Structural Analysis-I	S.S. Bhavikatti	Vikas Publishing House	2021 (5th Edit)
2	Basic Structural Analysis	C. S. Reddy	Tata McGraw-Hill	1981
3	Structural Analysis	R. C. Hibbeler	Pearson Education	2012 (8th Edit)
4	Structural Analysis	S. Ramamrutham	Dhanpat Rai Publishing Company	2014

Transportation Engineering - I

Course Code	BTCE-T-PC- 402	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To Understand the principles of Highway geometrics design as per IRC standards.
2. To Know basic concepts about highway engineering.
3. To Perform geometric design for the Highway& Basic concept of Pavement design.
4. To Understand Types of pavements & Materials required for highway construction.
5. To Understand Construction procedure for different type of pavements.
6. To Understand the Traffic engineering& different types of traffic control device.

Pre-Requisites :

Knowledge of Physics and Mathematics in Secondary Education.

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.

Module-1 – (7 Hours)

Modes of transportation, importance of highway transportation, history of road construction. Principle of highway planning, road development plans, highway alignments requirements, engineering surveys for highway location.

Module -2 – (7 Hours)

Geometric design- Design controls, highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads, design speed, sight distance, design of horizontal curve, curve resistance, set back distance, grade compensation and vertical alignment and vertical alignments.

Module -3 –(7 Hours)

Highway Materials:- Properties of sub grade , sub-base , base course and surface course materials , test on sub grade soil, aggregates and bituminous materials, sustainable road material.

Module -4 – (7 Hours)

Highway Construction: Construction of various layers, earthwork, WBM, GSB, WMM, various types of bituminous layers as per Morth specification ,joints in rigid pavements, Hot Mix Plants, Construction of Rigid Pavements.
Highway Maintenance: Various type of failures of flexible and rigid pavements.

Module -5 – (7 Hours)

Design of Highway Pavements: Flexible pavements and factors affecting their design, CBR method, IRC:37-2018, Introduction to IIT Pave, rigid pavements, stress in rigid pavement, IRC design method (IRC:58-2015).

Module -6 - (7 Hours)

Traffic Engineering:- definition , fundamentals of traffic flow , traffic management, accident studies, prevention of road accidents, elements of transport planning, traffic sign and signal design, highway capacity.

Course Outcomes:

At the end of the course the student will be able to:

1. Describe modes of transportation, highway importance, planning principles, and alignment requirements.
2. Apply geometric design to highway cross-sections, alignments, and sight distance calculations.
3. Evaluate highway material properties and conduct tests for sustainable road construction.
4. Demonstrate highway layer construction and identify failures in pavements.
5. Design flexible and rigid pavements using CBR, IRC guidelines, and software tools.
6. Analyze traffic flow, signals, and strategies for traffic management and accident prevention.

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Highway Engineering	Khanna, S.K and Justo C.E.G.	Nem Chand and Bros	
2	Traffic Engineering and Transport Planning	Kadiyali, L.R	Khanna Publishers , New Delhi	
3	Principles of Highway Engineering	Kadiyali	Khanna Publishers.	

4	Transportation Engg.	P. Chakraborty & A. Das	PHI	
5	Relevant latest IRC Codes (IRC-37 – 2018, IRC 58 – 2015, IRC 73 - 1980, IRC 86 - 1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15-2002)			
6	Morth specifications for road and bridges.(5th revision)			

Geotechnical Engineering

Course Code	BTCE-T-PC- 403	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. To Define the common terminology used for geotechnical engineering.
2. To Identify interaction between water and soil with various laboratory test.
3. To Apply compaction, consolidation and various compaction technique.
4. To Analyze different attribute of consolidation and various stresses distribution.
5. To Evaluate different soil strength parameters and its tests.
6. To Create practical tools for understanding characteristics of soil strength parameters.

Pre-Requisites :

Knowledge of Physics and Mathematics in Secondary Education.

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.

Module-1 – (7 Hours)

Origin of Soil: Rock Cycle and the origin of soil, clay mineralogy. Mechanical analysis of soil, grain size distribution curve, particle shape and size, weight volume relationships, specific gravity, unit weight, void ratio, moisture content, and relationships, relative density.

Module -2 – (7 Hours)

Consistency of soil: Atterberg limits - Liquidity index and consistency index, activity, soil structure. sensitivity and thixotropy of clay.
Engineering classification of soil: Types of Soil classification, IS, USCS, HRB and ASTM.

Module -3 –(7 Hours)

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships.
Permeability - Bernoulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, Factors affecting hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.
Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Module -4 – (7 Hours)

Soil Compaction: mechanism and principles, Laboratory compaction, factors affecting Compaction, effect of compaction on soil properties, field compaction techniques.
Consolidation of soils: Consolidation and compaction difference, primary and secondary consolidation, Terzaghi's theory of one dimensional consolidation (Only Expression).

Module -5 – (7 Hours)

Stress distribution and shear strength of soil
Stress Distribution: Normal and shear stresses on a plane, Bossiness's solution for a point load, line load, strip load, circular Loading(Expression only)
Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination: direct and tri-axial shear test, unconfined compression test, vane shear test.

Module -6 - (7 Hours)

Soil stabilization technique
Stabilization of soil: Introduction, mechanical stabilization, cement stabilization, lime stabilization, bituminous stabilization, chemical stabilization, thermal stabilization, electrical stabilization, Introduction to modern methods of stabilization.

Course Outcomes:

At the end of the course the student will be able to:

1. Define the common terminology used for geotechnical engineering.
2. Identify interaction between water and soil with various laboratory test.
3. Apply compaction, consolidation and various compaction technique.
4. Analyze different attribute of consolidation and various stresses distribution.
5. Evaluate different soil strength parameters and its tests.
6. Create practical tools for understanding characteristics of soil strength parameters.

Textbooks :				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Year**
1	Geotechnical Engineering and Foundation Engineering	BC Punmia	Laxmi Publications	2005
2	Soil Mechanics	SK Garg	Khanna Publishers	1987
3	Soil mechanics and Foundation Engineering	DR.K.R. ARORA	Standard Publishers Distributors	2005
4	Soil mechanics and Foundation Engineering	Dr. P.N Modi	Standard Book House	2010
5	Craig's Soil Mechanics	R.F Craig	CRC Press	2004

Type	Code		L-T-P	Credits	Marks
OO	BTCE-T-OO-402	**NPTEL**	2-0-0	2	150

Objectives	Enhance their learning experience by providing access to high-quality educational content.
Pre-Requisites	Knowledge of Technical Papers in Secondary Education
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module -1	As given in NPTEL portal.	06 Hours
Module -2	As given in NPTEL portal.	06 Hours
Module -3	As given in NPTEL portal.	06 Hours
Module -4	As given in NPTEL portal.	06 Hours
Module- 5	As given in NPTEL portal.	06 Hours
Module- 6	As given in NPTEL portal.	06 Hours
	Total	36 Hours

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

CO1	Access to Quality Education: Provide access to lectures and materials from top educators across premier institutions like IITs and IISc.
CO2	Skill Enhancement: Improve technical and analytical skills in core engineering and interdisciplinary subjects.
CO3	Standardization: Offer a uniform curriculum across institutions, ensuring consistent educational quality.
CO4	Flexibility in Learning: Allow students to learn at their own pace through online courses and video lectures.
CO5	Certification Opportunities: Enable students to earn certificates for completing courses, which can improve employability.
CO6	Research and Industry Linkage: Bridge gaps between academic learning and industry requirements.

Ability Enhancement Training - C

Course Code	**BTSC-T-AE-401**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	1	Exam Hours	03

Course 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.

Prerequisites:

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.

Module-1 – (5 Hours)

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),

Module -2 – (3 Hours)

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) Calenders (Counting odd day, counting with reference date, without reference date, Repetition) Simplification and approximation (missing numbers , simplifying equation).

Module -3 –(4 Hours)

Direction(Left & Right Dilemma, Direction of shadows, Direction with reference point), 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).

Module -4 – (3 Hours)

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), Probability. Data sufficiency(checking and testing a given set of information)

Module -5 – (3 Hours)

Train problems (length, speed, distance, relative speed, direction),Average,Partnership,Progression(Arithematic,Geometric,Harmonic). Algebra(,Elementary Algebra, Advanced Algebra, Abstract Algebra, Linear Algebra) Mensuration(2D&3D), Height and distance, HCF & LCM, Clocks.

Module -6 – (4 Hours)

Designing and Testing a Pilot
Preparing a Pilot for Entrepreneurship - Assignment
Compliances
Financial Linkage
Preparation for getting a bank loan
Introduction to various Govt. Schemes

Course Outcomes:

1. To help students explore their values and career choices through individual skill assessments.
2. To make realistic employment choices and to identify the steps necessary to achieve a goal.
3. To develop and practice self-management skills for the work site.
4. To explore and practice basic communication skills
5. To assess and improve personal grooming.
6. To promote safety awareness including rules and procedures on the work site.

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Quantitative aptitude	R S Aggarwal		
2	Quantitative Aptitude for CAT	Arun Sharma		
3	Entrepreneurship Development	Dr. R. K. Singhal		
4	Entrepreneurship Development	M.L.Sharma		

Environmental Engineering

Course Code	BTMC-T-MC- 301	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0		
Credits	00		

Course 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.

Module-1 – (7 Hours)

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. Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study).

Module -2 – (7 Hours)

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, Nuclear hazards

Module -3 –(7 Hours)

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.

Module -4 – (7 Hours)

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. Miscellaneous treatment: Removal of color, tastes and Odour control, removal of iron and manganese, fluoridation and defloridation.

Module -5 – (7 Hours)

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. 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.

Module -6 - (7 Hours)

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).

Course Outcomes:

At the end of the course the student will be able to:

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

Textbooks :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Environmental Engineering	G. Kiely	TMH	2007
2	Environmental Engineering	H.S. Peavy , D.R.Rowe and G. Tchobanoglous	McGraw Hill	1985.
3	Introduction to Environmental Engineering	M. L. Davis and D. A Cornwell	McGraw Hill International	2005

Type	Code	Surveying Lab	L-T-P	Credits	Marks
PC	BTCE-P-PC-401		0-0-3	1	100

Objectives	1. **Practical Knowledge:** Gain hands-on experience with survey instruments like theodolites, total stations, and GPS. 2. **Data Collection:** Learn accurate methods to measure distances, angles, and elevations. 3. **Map Preparation:** Develop skills to prepare and interpret topographic maps and site plans. 4. **Problem-Solving:** Understand real-world surveying challenges and solutions. 5. **Team Collaboration:** Work effectively in teams to complete field projects. 6. **Application:** Apply surveying techniques in civil engineering projects like road alignments and construction layouts.
Pre-Requisites	Basic Mathematics: Knowledge of geometry, trigonometry, and coordinate systems. Surveying Fundamentals: Understanding of basic surveying concepts like leveling, triangulation, and traversing. Instrument Familiarity: Awareness of common surveying instruments such as tapes, levels, and compasses. Engineering Drawing: Ability to read and interpret technical drawings and maps
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Testing of chain and measurement of correct length of the line and chain traversing.	3Hours
Experiment -2	Traversing by Compass	3Hours
Experiment- 3	Horizontal measurement by theodolite	3Hours
Experiment- 4	vertical angle measurement by theodolite	3Hours
Experiment- 5	Traversing by theodolite	3Hours
Experiment- 6	Use of dumpy level and automatic level for fly leveling.	3Hours
Experiment- 7	Contouring	3Hours
Experiment- 8	Measurement of distance, horizontal	3Hours
Experiment- 9	Measurement of vertical angle by Total Station	3Hours
Experiment- 10	Contouring by Total Station.	3Hours
Total		**30 Hours**

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

CO1	Demonstrate the ability to test chains and measure accurate line lengths using chain traversing techniques.
CO2	Perform compass traversing and interpret angular measurements for field layouts.
CO3	Use theodolites to measure horizontal and vertical angles accurately for construction planning.
CO4	Operate dumpy and automatic levels to conduct precise fly leveling and contour mapping.
CO5	Generate contour maps and measure distances and angles using Total Station equipment.
CO6	Explain the principles and methods of distance and angular measurements in various surveying techniques.

Type	Code	Fluid Mechanics Lab	L-T-P	Credits	Marks
PC	BTCE-P-PC-403		0-0-3	1	100

Objectives	1. **Practical Application:** Understand the behavior of fluids through hands-on experiments. 2. **Flow Measurement:** Learn techniques to measure flow rates, velocity, and pressure in pipes and open channels. 3. **Verify Theories:** Validate fundamental fluid mechanics principles like Bernoulli's theorem and continuity equation. 4. **Equipment Familiarity:** Gain experience with devices like Venturi meters, orifice meters, and manometers. 5. **Problem-Solving:** Analyze and interpret experimental data to solve real-world fluid flow problems.
Pre-Requisites	1. **Basic Physics:** Understanding of fluid properties like density, viscosity, and pressure. 2. **Mathematics:** Knowledge of calculus and differential equations for analyzing fluid flow. 3. **Hydraulics Fundamentals:** Familiarity with concepts like Bernoulli's equation, continuity equation, and flow regimes. 4. **Instrumentation:** Awareness of measuring devices like manometers, Venturi meters, and orifice meters. 5. **Laboratory Skills**: Basic skills in handling lab equipment and recording observations accurately.
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Determination of Metacentric Height and application to stability of floating bodies.	3Hours
Experiment -2	Determination of C_v and C_d of Orifice and Venturi Meter.	3Hours
Experiment- 3	Verification of Bernoulli's Theorem.	3Hours
Experiment- 4	Experiments on Reynold's Apparatus.	3Hours
Experiment- 5	Experiments on impact of Jets.	3Hours
Experiment- 6	Experiments on performance of centrifugal pump.	3Hours
Experiment- 7	Experiments on performance of reciprocating pump.	3Hours
Experiment- 8	Experiments on performance of Pelton Turbine.	3Hours
Experiment- 9	Experiments on performance of Francis Turbine.	3Hours
Experiment- 10	Experiments on Flow through pipes.	3Hours
Total		**30 Hours**

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

CO1	Explain the principles of stability in floating bodies and determine the metacentric height.
CO2	Evaluate the coefficients of velocity and discharge for orifices and Venturi meters.
CO3	Demonstrate and verify Bernoulli's theorem through experimental observations.
CO4	Classify flow regimes using Reynold's apparatus and analyze their characteristics.
CO5	Assess the performance of hydraulic machines like centrifugal pumps, reciprocating pumps, and turbines (Pelton and Francis).
CO6	Measure and analyze flow characteristics through pipes and understand their practical implications.

Type	Code	Transportation Engineering Lab	L-T-P	Credits	Marks
PC	BTCE-P-PC-402		0-0-2	1	100

Objectives	1. Determining the crushing, impact, and abrasion resistance of aggregates to assess their suitability for various construction applications. 2. Evaluating the penetration, softening point, ductility, specific gravity, and stripping value of bitumen to ensure quality and performance in flexible pavements. 3. Measuring the flakiness and elongation indices, as well as the specific gravity and water absorption characteristics of coarse aggregates, to assess their shape, density, and porosity. 4. Performing the California Bearing Ratio (CBR) test to evaluate the strength of soil subgrade for pavement design. 5. Applying the Marshall Method of Mix Design to optimize asphalt mixtures for durability, stability, and workability in road construction.
Pre-Requisites	6. **Basic Physics:** Understanding of fluid properties like density, viscosity, and pressure. 7. **Mathematics:** Knowledge of calculus and differential equations for analyzing fluid flow. 8. **Hydraulics Fundamentals:** Familiarity with concepts like Bernoulli's equation, continuity equation, and flow regimes. 9. **Instrumentation:** Awareness of measuring devices like manometers, Venturi meters, and orifice meters. 10. **Laboratory Skills**: Basic skills in handling lab equipment and recording observations accurately.
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus:

Experiment No	NAME OF THE EXPERIMENT	HOURS
Experiment- 1	Determination of aggregate crushing and Impact value.	3 Hours
Experiment -2	Determination of Los Angeles abrasion value of aggregates.	3 Hours
Experiment- 3	Determination of penetration value and softening point of bitumen.	3 Hours
Experiment- 4	Determination of ductility value of bitumen.	3 Hours
Experiment- 5	Determination of specific gravity of bitumen.	3 Hours
Experiment- 6	Determination of stripping value of aggregate.	3 Hours
Experiment- 7	Determination of flakiness index and elongation index of coarse aggregate.	3 Hours
Experiment- 8	Determination of specific gravity and water absorption of coarse aggregate.	3 Hours
Experiment- 9	Determination of CBR of soil subgrade.	3 Hours
Experiment- 10	Marshall method of Mix Design.	3 Hours
Total		**30 Hours**

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

CO1	Assess aggregate properties like crushing, impact, and abrasion resistance for construction suitability.
CO2	Perform tests on bitumen for penetration, softening point, ductility, and specific gravity.
CO3	Analyze stripping value of aggregates for bitumen adhesion.
CO4	Determine flakiness, elongation indices, specific gravity, and water absorption of aggregates.
CO5	Evaluate soil subgrade strength using the CBR test for pavement design.
CO6	Design durable asphalt mixtures using the Marshall Method.

Type	Code	Project - III	L-T-P	Credits	Marks
PS	BTCE-P-PS-401		0-0-3	2	100

Course Outcome :

1. Understand: Explain the principles and significance of material testing and mix design in civil engineering projects.
2. Apply: Perform standard tests on aggregates, bitumen, and soil to evaluate their properties and suitability.
3. Analyze: Interpret test results to assess material performance under specific construction conditions.
4. Evaluate: Compare alternative materials and methods to optimize construction practices.
5. Create: Develop mix designs using the Marshall Method to meet project specifications.
6. Demonstrate: Present findings and practical insights from material testing and mix design processes effectively.

5th SEMESTER

Sl. No	Course	Course Code	Course Title	L - T - P	Duration in hours	Examination			Credits
						IE Marks	ESE Marks	Total Marks	
1	PC	BTCE-T-PC-501	Design of Concrete Structures	3-0-0	5	100	100	200	3
2	PC	BTCE-T-PC-502	Water and Waste water Engineering	3-0-0	4	100	100	200	3
3	PC	BTCE-T-PC-503	Structural Analysis-II	3-0-0	5	100	100	200	3
4	PE	BTCE-T-PE-501	Foundation Engineering/Ground Improvement Technique	3-0-0	5	100	100	200	3
5	OE	BTCE-T-OE-501	Green Technology	3-0-0	4	100	100	200	3
6	MC	BTMC-T-MC-501	Universal Human Values	3-0-0	2	0	100	100	0
7	AEC	BTSC-T-AE-501	Ability Enhancement Training - D	0-0-3	2	100	0	100	1
8	PC	BTCE-P-PC-502	Water and Waste Water Engineering Lab	0-0-3	2	100	0	100	1
9	PC	BTCE-P-PC-503	Geotechnical Engineering Lab	0-0-3	2	100	0	100	1
10	PC	BTCE-P-PC-501	Design of Concrete Structures Lab	0-0-3	2	100	0	100	1
11	PS	BTCE-P-PS-501	Seminar -II	0-0-3	2	100	0	100	1
12	PS	BTCE-P-PS-502	Evaluation of Summer Internship - II	0-0-3	2	100	0	100	2
			TOTAL						**22**

6th SEMESTER

Sl. No	Course	Course Code	Course Title	L - T - P	Duration in hours	Examination			Credits
						IE Marks	ESE Marks	Total Marks	
1	BS	BTBS-T-BS-601	Optimization Engineering	3-0-0	5	100	100	200	3
2	PC	BTCE-T-PC-601	Irrigation Engineering	3-0-0	4	100	100	200	3
3	PC	BTCE-T-PC-602	Design of Steel Structures	3-0-0	5	100	100	200	3
4	PC	BTCE-T-PC-603	Survey -II	3-0-0	5	100	100	200	3
5	PE	BTCE-T-PE-601	Architecture and Town Planning/ Intellectual Property Rights	3-0-0	4	100	100	200	3
6	OO	BTCE-T-OO-601	NPTEL	3-0-0	2	--	0	100	3
7	HS	BTHS-T-OE-601	Entrepreneurship Development	3-0-0	4	100	100	200	3
8	AEC	BTSC-T-AE-601	Ability Enhancement Training - E	0-0-3	2	100	0	100	1
9	MC	BTMC-T-MC-601	Essence of Indian Knowledge Tradition - II	3-0-0	2	--	100	100	0
10	PC	BTCE-P-PC-601	Design of Steel Structures Lab	0-0-3	2	1	0	100	1
11	PC	BTCE-P-PC-602	Irrigation Engineering Lab	0-0-3	2	1	0	100	1
12	PS	BTCE-P-PS-601	PROJECT -II	0-0-3	2	1	0	100	2
			TOTAL						**26**

SEMESTER - 5

Design of Concrete Structures

Course Code	**BTCE-T-PC-501**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Understand concrete and steel properties, and reinforced concrete design methods.
2. Analyze and design various beams using Working Stress and Limit State Methods.
3. Design slabs, columns, footings, staircases, retaining walls, and water tanks.

Module-1 – (8 Hours)

Concrete and steel design fundamentals:

Properties of concrete and reinforcing steel, philosophy, concept and methods of reinforced concrete design, Introdution to Working Stress method Concept of under reinforced, over reinforced and balanced section , Constants in balanced section, Grades of concrete and steel. Permissible stress, assumptions in W.S.M, analysis of singly reinforced beams.

Module -2 – (8 Hours)

Limit state method: collapse, serviceability, beam design :

Introduction to limit state method, limit state of collapse and limit state of serviceability, application of limit state method to rectangular beams for flexure, shear, bond and torsion, and design of singly and doubly reinforced beams.

Module -3 –(6 Hours)

Flanged beams: (T Beam and L Beam)

Calculation of Ultimate moment of resistance when A_{st} is not given,

Calculation of Ultimate moment of resistance when A_{st} is given .

Design Procedure for T beam and L beam.

Module -4 – (10 Hours)

One-way and two-way slab design :

Design of Slab: design of one way and two way slabs.

Design of rectangular column

Design of square column.

Design of circular column with helical reinforcement.

Module -5 – (6 Hours)

Footing types and staircase design :

Footings: Different types of footings – Design of isolated, Design of square footing,

Design of rectangular footing and design of combined footings.

Design of dog legged stair case.

Module -6 - (8 Hours)

Retaining wall and water tank design :

Retaining walls, various forces acting on retaining wall, stability requirement, design of cantilever and counterfort retaining walls.

Design of Water Tank.

Course outcomes:

At the end of the course the student will be able to:

1. Identify the properties of concrete and reinforcing steel, including grades and permissible stresses.
2. Explain the philosophy, concepts, and methods of reinforced concrete design, focusing on Working Stress Method and Limit State Method.
3. Analyze singly reinforced beams using the Working Stress Method, considering under-reinforced, over-reinforced, and balanced sections.
4. Evaluate rectangular beams for flexure, shear, bond, and torsion using the Limit State Method, and design singly and doubly reinforced beams, T-beams, and L-beams.
5. Design one-way and two-way slabs, as well as short and long columns under axial and eccentric loadings, ensuring they meet specified requirements.
6. Develop designs for various types of footings, dog-legged staircases, cantilever and counterfort retaining walls, and water tanks, incorporating stability and functional considerations.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Design of concrete structures,	B C Punmia.		
2	Reinforced Concrete	H.J Shah, Vol-1&2	Charotar Publication	
Reference Books				
1	Design of Reinforced Concrete Structure	N. Subramanian	Oxford University Press.	
2	Reinforced Concrete Design	S U Pillai & D. Menon	McGraw Hill.	
3	Limit State Design	A.K.Jain	Neemchand & Bros.	

SEMESTER - 5

Water and Waste Water Engineering

Course Code	**BTCE-T-PC-502**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Recall general requirements for water supply and understand water characteristics, quality criteria, and purification methods.
2. Address water quality issues using treatment systems and analyze different wastewater collection systems.
3. Evaluate wastewater treatment processes and solve design problems for water and sewerage systems.

Module-1 – (8 Hours)

Water Supply: Requirements ,Quality & Characteristics :
General requirement for water supply, sources, quality of water, intake, Water Demand, Population Forecasting, Design Periods, Objectives of water pumping and transportation of water. Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases, natural purification of water sources.

Module -2 – (8 Hours)

Water Treatment: Methods & Theory :
Engineered systems for water treatment : aeration, sedimentation, softening coagulation, filtration, adsorption, ion exchange, and disinfection theory of chlorination, chlorine demand.

Module -3 –(6 Hours)

Wastewater Management: Collection and Treatment:
Generation and collection of waste water, sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water, design of sewerage systemPrimary, secondary and tertiary treatment of wastewater.

Module -4 – (10 Hours)

Sewage Characteristics & Collection: Design Basics :
Characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials.

Module -5 – (6 Hours)

Wastewater: Aerobic & Anaerobic Treatment :
Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications, trickling filter, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors, Sludge digestion and handling, Disposal of effluent and sludge.

Module -6 - (8 Hours)

Water & Wastewater Design Challenges :
Design problems on water distribution, sewerage, water treatment units,
wastewater treatment units and sludge digestion.

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

1. Recall general requirements for water supply, including sources, quality, intake, and demand forecasting.
2. Understand the physical, chemical, and biological characteristics of water, as well as water quality criteria and purification methods.
3. Apply knowledge of water treatment systems, including aeration, sedimentation, filtration, and disinfection, to address water quality issues.
4. Analyze waste water generation and collection systems, distinguishing between sanitary, storm, and combined sewerage systems.
5. Evaluate primary, secondary, and tertiary treatment processes for wastewater, including characteristics of sewage and design considerations for sewers.
6. Solve design problems related to water distribution, sewerage, water treatment, and wastewater treatment, integrating knowledge of system components and principles.

Textbooks				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Year**
1	Water Supply Engineering-	Vol- 1. by S.K.Garg,	Khanna Publishers	
2	Sewage Disposal and Air Pollution Engineering	Vol- 2. by S.K.Garg	Khanna Publishers	
3	Water Supply Engineering	B. C. Punmia and A.K.Jain	Laxmi Publications	
Reference Books				
1	Water and Wastewater Technology,	M.J.Hammer	PHI	
2	Water and Waste Water Engineering	Fair Geyer and Okun,	Wiley	2011
3	Water and Waste Water Technology	Steel,	Wiley	

SEMESTER - 5

Foundation Engineering

Course Code	**BTCE-T-PE-501**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Understand lateral earth pressure principles and bearing capacity concepts for retaining structures and soil analysis.
2. Apply field methods for soil assessment and analyze settlement in shallow and deep foundations.
3. Evaluate pile foundation capacity and create soil exploration plans using diverse sampling and testing methods.

Module-1 – (8 Hours)

Retaining Walls: Earth Pressure Analysis :

Lateral Earth Pressure and Retaining Structures: Concept of earth Pressure, Earth pressure at rest, active and passive earth pressure for both cohesionless and cohesive soils, Earth pressure theories: Rankine's theory, Coulomb's Wedge theory, Graphical methods: Rebhan's and Culmann's graphical solutions, Stability conditions for retaining walls.

Module -2 – (8 Hours)

Bearing Capacity Analysis & Field Methods :

Bearing Capacity: Definitions, Rankine's analysis, Types of failures: General and local shear failure, Terzaghi's Analysis, Brinch-Hansen analysis, Meyerhof's analysis, Vesics's bearing capacity equation, Effect of water table on bearing capacity, IS code method for computing bearing capacity,

Field Methods: Plate load test and its limitations, Standard penetration test.

Module -3 –(7 Hours)

Foundation Types: Shallow & Deep :

Shallow Foundations: Types of foundations: Spread footing, combined and strap footing, mat or raft footing, Settlement of footings.

Deep Foundations: Difference between shallow and deep foundations, Types of deep foundations.

Module -4 – (7 Hours)

Pile Foundations: Types & Analysis :

Pile Foundations: Types of piles, pile driving, load carrying capacity of piles-static and dynamic formulae, Pile load test and its limitations, correlation with penetration tests, Group action in pile settlement and efficiency of pile groups in clay, negative skin friction, Under reamed pile foundation.

Module -5 – (6 Hours)

Well Foundations & Subsoil Exploration :

Basics of well foundation - types, component parts, and ideas about the forces acting on a well foundation.

Subsoil Exploration: Necessity and planning for subsoil exploration, Methods - direct (test pits and trenches), indirect (sounding, penetration tests, and geophysical methods).

Module -6 - (6 Hours)

Soil Sampling & Machine Foundations :

Soil sampling – types of samples, standard penetration test, static and dynamic cone penetration test, in-situ vane shear test, Rock coring, soil exploration report.

Machine foundation- Types of machine foundation, General requirements.

Course outcomes:

At the end of the course the student will be able to:

1. Remember principles of lateral earth pressure, including theories and graphical methods for retaining structures.
2. Understand bearing capacity concepts and methods, analyzing various failure types and effects of water table.
3. Apply field methods like plate load and standard penetration tests for soil assessment.
4. Analyze settlement in shallow foundations and differentiate between shallow and deep foundation types.
5. Evaluate load-carrying capacity and limitations of pile foundations, considering soil behavior.
6. Create comprehensive soil exploration plans, utilizing various sampling and testing methods for foundation design.

Textbooks				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Year**
1	Principles of Foundation Engineering	B. M. Das,	Cenage Learning	
2	Soil Mechanics and Foundations	B. C. Punmia	Laxmi Publications	
3	Geotechnical Engineering	S. K. Gulati & Manoj Gupta,	Mc Graw Hill	
Reference Books				
1	Soil Mechanics & Foundation Engineering	B.N.D. Narasinga Rao,	Wiley	
2	Geotechnical Engineering by	C. Venkatramiah	New Age International	
3	Basic and Applied Soil Mechanics	Gopal Ranjan and A. S. R. Rao	New Age International	

SEMESTER - 5

Green Technology

Course Code	**BTCE-T-OE-501**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course 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.

Module-1 – (5 Hours)

Global warming and its effect

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,

Module -2 – (6 Hours)

Climate change

Effect of climate change and its impact. Steps taken to Control Carbon Emissions 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

Module -3 –(9 Hours)

Control of Carbon Emissions: Technical approach

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.

Module -4 – (7 Hours)

Green Technologies for Personal and local Application

Measures to be taken for Green city, Carbon Emission Reduction at Personal Level, Carbon Emission Reduction at Local Authority Level, Carbon Emissions from Imports. Promotion of 'Green' Buildings, Guidelines, The Energy Conservation Building Code (ECBC), Green Hotels and Hospitals,

Module -5 – (7 Hours)

Green Technologies for Citywide Application

Green Technologies for Transport, Green Roads, Ports and Harbours, Industries, Carbon, Carbon Emission Reduction at Citywide Level. Carbon Emissions from a Few Selected Industries in India, Area Re-Development Projects, 'Green' Infrastructure for Municipal Services, Bringing up Indian Villages, Green Services for Crematoria, Spreading Message to all Stakeholders.

Module -6 - (6 Hours)

High-tech Measures for Reducing Carbon Emissions

Use of Solar Power with Satellite Based Systems, Use of Carbon Capture and Storage (Sequestration), Microorganisms, 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.

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

1. Define global warming and identify key concepts such as carbon accumulation, long half-life, and heating potential.
2. Explain the global carbon emission situation and its specific effects on India, including the implications of international protocols like the Kyoto Protocol.
3. Illustrate steps taken universally to control carbon emissions, utilizing promotional and punitive mechanisms to reduce atmospheric carbon.
4. Compare green and traditional power sources in India, evaluating the benefits and challenges of each for effective carbon reduction.
5. Assess the effectiveness of measures for creating green cities and reducing carbon emissions at personal, local authority, and citywide levels.
6. Develop a comprehensive plan for promoting green technologies and infrastructure in India, including energy production, transport, and municipal services.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Green Technologies	Soli J. Arceivala	McGraw Hill	2017
2	Green Technologies and Environmental Sustainability	Ritu Singh, Sanjeev Kumar	Springer	2017

SEMESTER - 5

Universal Human Values

Course Code	**BTMC-T-MC-501**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0		
Credits	0		

Course 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.

Prerequisites:

The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence

It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.

Teaching Pedagogy:

Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in
understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts.

Module-1 – (3 Hours)

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.

Module -2 – (3 Hours)

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.

Module -3 –(4 Hours)

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.

Module -4 – (3 Hours)

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.

Module -5 – (3 Hours)

Harmony in the Nature/Existence & Professional Ethics-A

Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature;
Realizing Existence as Co-existence at All Levels.

Module -6 – (4 Hours)

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.

Course outcomes:

At the end of the course the student will be able to:

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

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria,	2nd Revised Edition, Excel Books, New Delhi,	2019. ISBN 978-93-87034- 47-1
2	Human Values	A.N. Tripathi,	New Age Intl. Publishers,	New Delhi, 2004.
3	Indian Ethos and Modern Management,	B L Bajpai	New Royal Book Co., Lucknow. Reprinted	2008

SEMESTER - 5

Water and Waste Water Engineering Lab

Course Code	**BTCE-P-PC-502**	IE Marks	100
Teaching Hours/Week (L:T:P)	0:0:3		
Credits	01		

Course Objectives:

1. Determine and interpret water pH and turbidity measurements.
2. Determine and analyze water hardness and total dissolved solids.
3. Optimize coagulant dosage and evaluate residual chlorine and SVI in water samples.

Sl.NO	Experiments
1	Determination of pH of water sample to identify the intensity of acidic or basic characteristics.
2	Determination of turbidity of given water sample to study the amount of suspended material present in the water.
3	Determination of the Hardness of water to measure the soap-consuming capacity to produce foam or lather.
4	Determination of Total Dissolved Solids to measure the percentage of dissolved substance in Water.
5	Determination of Optimum Coagulant dosage in given sample to precipitate turbid particles present in the water.
6	Determination of the Presence of Chloride in the given water sample.
7	Determination of the amount of Sulphates present in the given water sample.
8	Determination of the amount of residual chlorine present in the given water sample by titration.
9	Determine the available amount of chlorine in the given sample of bleaching powder.
10	Determination of SVI of Biological sludge and microscopic examination.

Course outcomes:

At the end of the course, the student will be able to:

1. Recall methods for determining the pH of water samples and interpret the results.
2. Apply techniques to measure turbidity in water samples and analyze the obtained values.
3. Understand the principles behind hardness determination in water and perform accurate measurements.
4. Analyze the process of determining total dissolved solids in water samples and interpret the obtained data.
5. Apply experimental procedures to determine the optimum coagulant dosage in water samples.
6. Evaluate techniques for determining residual chlorine in treated water and SVI index for waste water.

Online Learning materials :

1. **Course Name Environmental Engineering - 1**
2. **Course Link https://ee1-nitk.vlabs.ac.in/**

SEMESTER - 5

Geotechnical Engineering Lab

Course Code	**BTCE-P-PC-503**	IE Marks	100
Teaching Hours/Week (L:T:P)	0:0:3		
Credits	01		

Course Objectives:

1. Classify soil visually and determine soil grain specific gravity.
2. Analyze soil grain size distribution and determine Atterberg limits.
3. Measure soil compaction and evaluate density-water content relationships.

Sl.NO	Experiments
1	Visual-Manual classification of soil and its description.
2	Determination of specific gravity of soil grains.
3	Determination of grain size distribution of soil by using methods of (a)Sieve test (b) Hydrometer/ pipette test
4	Determination of Atterberg limits of soil using methods of Liquid limit (b) plastic limit (c) shrinkage limit
5	Measurement of soil compaction in the field Core cutter method (b) Sand replacement method
6	Determination of Density – Water content relationship of soil. Proctor compaction test (ii) Modified Proctor compaction test (c) Use of Proctor penetration needle.
7	Determination of relative density of granular soil.
8	Determination of shear strength parameters of soil (a)Shear Box test (b) Tri-axial compression test (c) Unconfined compression test (d) Vane shear test.
9	Determination of consolidation characteristics of soil using fixed ring Oedometer.
10	Determination of coefficient of permeability of soil (a)Constant head permeability (b) Falling head permeability

Course outcomes:

At the end of the course the student will be able to:

1. Recall visual-manual soil classification methods and effectively describe soil characteristics.
2. Apply techniques to determine the specific gravity of soil grains, interpreting results accurately.
3. Analyze grain size distribution using sieve and hydrometer/pipette tests, interpreting data to understand soil composition.
4. Determine Atterberg limits of soil including liquid, plastic, and shrinkage limits, employing appropriate testing methods.
5. Measure soil compaction in the field using core cutter and sand replacement methods, interpreting results for engineering applications.
6. Evaluate soil density-water content relationships through Proctor compaction tests, understanding variations in compaction methods and their implications for soil behavior.

Online Learning materials :

Course Name - Soil Mechanics
Lab Course Link http://smfe-iiith.vlabs.ac.in/ Course Instructor
IIT Hyderabad.

SEMESTER - 5

Design of Concrete Structure Lab

Course Code	**BTCE-P-PC-501**	IE Marks	100
Teaching Hours/Week (L:T:P)	0:0:3		
Credits	01		

Course Objectives:

1. Conduct and interpret concrete workability and compressive strength tests.
2. Interpret compressive strength tests and apply various concrete testing methods.
3. Analyze load-bearing residential building design, including structural elements and reinforcement detailing.

Sl.NO	Experiments
1	Workability test of concrete: Slump cone, flow table test.
2	Workability test of concrete: Compaction factor test .
3	Compressive Strength test of Concrete Cube Specimen – Nominal Mix.
4	Split Tensile Strength test of Concrete Cylindrical Specimen – Nominal mix.
5	Prism test for determining Modulus of Rupture of Concrete.
6	Determine the passing ability using L- Box test for Self Compacting Concrete.
7	Determine the flowing ability using V- Funnel Test for Self Compacting Concrete.
8	Performing NDT test for determining the Compressive Strength of Concrete.
9	Complete design of a simple load bearing residential building comprising of beams, slab, column, footing, staircases, etc. and the detailing of steel reinforcement.
10	M30 Mix Design with reference to a particular slump value.

Course outcomes:

At the end of the course the student will be able to:

1. Understand principles and procedures of concrete workability tests, including Slump cone, flow table, and compaction factor tests.
2. Interpret results from compressive strength tests on concrete cube specimens for both nominal mix and M30 design mix, recognizing factors affecting strength.
3. Apply testing methods to perform split tensile strength tests on cylindrical specimens, prism tests for modulus of rupture, and L-Box and V-Funnel tests for Self Compacting Concrete.
4. Analyze and evaluate the design of a load-bearing residential building, including beams, slabs, columns, footings, staircases, and steel reinforcement detailing.

Online Learning materials :

Course Name Design of Concrete Structures Lab

Course Link https://nptel.ac.in/courses/105/107/105107067/

SEMESTER - 5

Seminar - II

Course Code	BTCE-P-PS-501	IE Marks	100
Teaching Hours/Week (L:T:P)	0:0:3		
Credits	01		

Course Objectives:

1. To enhance students' knowledge on contemporary topics and advancements in engineering through collaborative learning and expert insights.
2. To develop critical thinking and problem-solving skills by engaging students in research-based discussions and presentations.
3. It provides a platform for students to explore interdisciplinary concepts and innovative solutions.
4. It encourages self-directed learning and the ability to synthesize complex technical information.
5. To prepare students for professional challenges and lifelong learning.

Pre – requisites:

1. Basic understanding of core engineering concepts related to the student's specialization.
2. Familiarity with technical writing and report preparation.
3. Proficiency in using presentation tools like PowerPoint or other visualization software.
4. Ability to perform literature reviews and access academic journals, research papers, and industry reports.
5. Strong communication skills for effective presentation and discussion.
6. Willingness to engage in independent research and collaborative learning activities.

Teaching Pedagogy:

1. Student-Centered Learning: Encourage students to take ownership of their learning by selecting seminar topics relevant to their interests and specialization.

2. Research-Based Approach: Guide students to conduct in-depth research using credible academic and industry sources, emphasizing critical thinking and data analysis.

3. Collaborative Learning: Foster peer discussions, group activities, and feedback sessions to enhance idea sharing and teamwork.

Course outcomes:

At the end of the course the student will be able to:

1. Identify and select relevant engineering problems or emerging topics for research and presentation using comprehensive literature review.
2. Analyze and interpret data from credible sources to draw meaningful insights and conclusions.
3. Apply effective communication and presentation techniques to deliver professional and impactful seminar sessions.
4. Evaluate technical information and arguments presented by peers, providing constructive feedback and critical suggestions.
5. Design and structure a well-organized seminar report and presentation using clear, concise, and visually appealing formats.
6. Develop teamwork and leadership skills by collaborating with peers in group discussions and activities.

SEMESTER - 5

Evaluation of Summer Internship - II

Course Code	BTCE-P-PS-502	IE Marks	100
Teaching Hours/Week (L:T:P)	0:0:3		
Credits	02		

Course Objectives:

1. To encourage the students to study advanced engineering developments
2. To prepare and present technical reports.
3. To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

Pre – requisites:

Knowledge of Speaking with globally accepted language, subject analysis, practical implementation.

Teaching Pedagogy:

Regular contact with interns and evaluation with record keeping.

Method Of Evaluation:

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

Course outcomes:

At the end of the course the student will be able to:

1. State the functioning of organization and observe changes for self-improvement.
2. Explain how the internship placement site fits into a broader career field.
3. Apply appropriate workplace behaviors in a professional setting.
4. Solve real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course.
5. Evaluate the internship experience in terms of personal, educational and career needs.
6. Develop ideas for suitable startups to become successful entrepreneur.

6TH Semester

SEMESTER - 6

Optimization Engineering

Course Code	**BTBS-T-BS-601**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Understand engineering optimization concepts and methods, including linear programming formulations and solution techniques.
2. Implement and evaluate transportation problem solutions, including initial solution techniques and optimality evaluation methods.
3. Explore and apply optimization methods in non-linear programming and inventory management.

Module-1 – (5 Hours)

Engineering Optimization: Modeling and LP :
Idea of engineering optimization problems, modeling of problems and principle of modeling, Linear Programming: Formulation of LPP, Graphical solution,

Module -2 – (7 Hours)

LP Methods: Simplex, Big-M, Duality :
Simplex method, Big-M method, Dual simplex method, Duality theory.

Module -3 –(9 Hours)

Transportation & Assignment: Methods :
Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Assignment problems: Hungarian method for solution of Assignment problems. Travel Salesman problem.

Module -4 – (7 Hours)

Non-linear Programming: Basics & Methods:
Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search
method.

Module -5 – (7 Hours)

Constrained Non-linear Optimization: Methods :
Non-linear programming problem: Constrained optimization with equality constraint: Lagrange multiplier method. Constrained optimization with inequality constraint: Kuhn-Tucker condition.

Module -6 - (6 Hours)

Inventory Theory: EOQ and EPQ Models :
Inventory Theory: General characteristics, Deterministic Inventory models: EOQ model with constant rate of demand, different rates
of demand, EPQ Model.

Course outcomes:

At the end of the course the student will be able to:

1. Define key concepts in engineering optimization problems and the principles of problem modeling.
2. Explain the formulation and solution methods for linear programming problems, including the Simplex, Big-M, and Dual Simplex methods.
3. Implement techniques such as the Northwest Corner rule, Least Cost rule, and Vogel's approximation method to find initial solutions for transportation problems.
4. Evaluate the optimality of solutions in transportation problems using the MODI method and solve assignment problems using the Hungarian method.
5. Assess various unconstraint and constraint optimization methods in non-linear programming, such as Fibonacci and Golden Section Search methods, Lagrange multipliers, and Kuhn-Tucker conditions.
6. Develop and apply inventory models, including EOQ and EPQ, to optimize inventory management under different demand rates.

Question paper pattern:

The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Operation Research:	J K Sharma	Macmillan India Ltd.	
2	Operation Research,	Prabhakar Pai ,	Oxford University Press	
3	Operations Research	H.A.Taha, A.M.Natarajan, P.Balasubramanie,	Pearson Education, Eighth Edition.	
4	Engineering Optimization	A.Ravindran, K.M.Ragsdell, G.V.Reklaitis,	Wiley India Pvt. Ltd, Second edition.	
5	Operations Research Edition	F.S.Hiller, G.J.Lieberman,	Tata McGraw Hill, Eighth	2005
6	Operations Research	P.K.Gupta, D.S.Hira,	S.Chand and Company Ltd,	2014

SEMESTER - 6

Irrigation Engineering

Course Code	**BTCE-T-PC-601**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Understand hydrological processes and apply mathematical methods for precipitation analysis.
2. Analyze extreme precipitation events and evaluate methods for measuring and estimating streamflow characteristics.
3. Analyze hydrograph components and critique irrigation techniques and water management in agriculture.

Module-1 – (8 Hours)

Hydrology: Precipitation, Evapotranspiration, Infiltration :
Hydrologic cycle, World water balance; Forms, types & measurement of precipitation; Mean precipitation over an area; Curves of precipitation: Depth-area-duration, Intensity-duration-frequency & Depth-duration-frequency; Probable maximum precipitation; Abstractions of precipitation: Measurement of evaporation; Evapotranspiration & its equations; Infiltration: measurement & indices.

Module -2 – (6 Hours)

Hydrology: Precipitation, Evapotranspiration, Infiltration :
Hydrologic cycle, World water balance; Forms, types & measurement of precipitation; Mean precipitation over an area; Curves of precipitation: Depth-area-duration, Intensity-duration-frequency & Depth-duration-frequency; Probable maximum precipitation; Abstractions of precipitation: Measurement of evaporation; Evapotranspiration & its equations; Infiltration: measurement & indices.

Module -3 –(6 Hours)

Hydrograph Analysis & Irrigation Techniques :
Unit hydrographs (UHs): derivation, use & limitations; UHs of different durations; Peak flood estimation by Superposition and s-curve method, Rational method, empirical formulae.
Irrigation: necessity, advantages & disadvantages; Water distribution techniques in farms: free flooding, border flooding, check flooding, basin flooding, furrow irrigation, sprinkler irrigation & drip irrigation;

Module -4 – (8 Hours)

Irrigation: Requirements, Channels, Efficiency :
Crop water requirement: duty, delta, base period & crop period; Irrigation efficiencies; Soil moisture - irrigation frequency relationship. Irrigation channels: classification & alignment; Distribution system, water losses in irrigation channels; Stable & regime channel design: comparison of Kennedy's & Lacey's Theories; Irrigation canal lining: types, advantages, economics & preliminary design.

Module -5 – (8 Hours)

Cross-Drainage & Diversion Head Works Design :
Types of Cross-Drainage (CD) Works, Design considerations for CD works; Diversion Head works: Types of weirs and barrages, Layout of a diversion head works.
Design of weirs and barrages: Comparison among Bligh's creep theory, Lane's weighted creep theory and Khosla's method of independent
variables, Exit gradient.

Module -6 - (8 Hours)

Canal Falls, Gravity & Earth Dams, Spillways :
Canal Falls: Necessity, Proper location, Types, Gravity Dams: Typical cross section, Various forces acting on gravity dam, Combination of forces for design, Modes of failure and criteria for structural stability, High and low gravity dams, Typical section of low gravity dam; Earth Dams: Types, Causes of failure, Preliminary section, Seepage control. Spillways: Brief study of various types.

Course outcomes:
At the end of the course, the student will be able to:

1. Understanding of Hydrological Processes and Precipitation Analysis.
2. Apply mathematical methods to calculate mean precipitation over an area and construct precipitation curves such as depth- area-duration and intensity-duration-frequency.
3. Analyze probable maximum precipitation events and understand the abstractions of precipitation, including evaporation, evapotranspiration, and infiltration.
4. Evaluate major methods for measuring stage, velocity, and streamflow, establishing stage-discharge relationships and estimating reservoir capacity.
5. Assess the components of hydrographs, including base flow separation methods and the derivation and limitations of unit hydrographs for different durations.
6. Critically analyze irrigation techniques, crop water requirements, and irrigation efficiencies, comparing and contrasting different methods and systems for water distribution and management in agriculture.

Question paper pattern:
The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Text books

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Irrigation Engineering and Hydraulic Structures.	S. K. Garg,	Khanna Publication, New Delhi.	
2	Irrigation Engg.	B.C. Punmia and Pande,	Laxmi Publication, New Delhi	
3	Engineering Hydrology	K Subramanya	McGraw Hill Education, New Delhi.	
4	Hydrology Principles Analysis Design	H M Raghunath,	New Age International	

SEMESTER - 6

Design of Steel Structures

Course Code	**BTCE-T-PC-602**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Understand steel structure design principles and apply design codes effectively for safe and sustainable structures.
2. Analyze, design, and select structural elements and systems for integrity, stability, and sustainability.
3. Utilize CAD and structural analysis software proficiently for steel structure design and communicate effectively with stakeholders.

Module-1 – (8 Hours)

Steel Structure Essentials:
Introduction, advantages/disadvantages of steel, structural steel, rolled steel section, various types of loads, design philosophy. Limit state design method, limit states of strength and serviceability, probabilistic basis for design Riveted, bolted and pinned connections.

Module -2 – (6 Hours)

Welded Connections: Types and Design:
Welded connections-assumptions, types, design of fillet welds, intermittent fillet weld, plug and slot weld, failure of welded joints, welded joints vs bolted and riveted joints.

Module -3 –(6 Hours)

Tension Members: Analysis and Design:
Tension members, types, net cross-sectional area, types of failure, slenderness ratio, Analysis and Design of tension member, gusset plate. Design of purlin.

Module -4 – (8 Hours)

Designing Compression Members:
Compression members, effective length, slenderness ratio, types of cross-section, classification of cross section, Design of axially loaded compression members, lacing, battening, design of column bases (Slab base and Gusseted base) and foundation bolts.

Module -5 – (8 Hours)

Beam Design: Stability, Strength, and Deflection:
Design of beams, types of c/s, lateral stability of beams, lateral torsional buckling, web buckling and crippling, bending and shear strength,
, deflection, design procedure

Module -6 - (8 Hours)

Design of plate girders and trusses.

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

1. Understand principles of steel structure design, including material properties, loadings, and behavior.
2. Apply design codes to create safe, economical, and sustainable steel structures.
3. Analyze and design structural elements like beams, columns, and connections for stability.
4. Select structural systems and materials considering efficiency, aesthetics, and sustainability.
5. Use CAD and analysis software to model and optimize steel structures.
6. Communicate design concepts effectively through reports, presentations, and documentation.

Question paper pattern:

The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Design of Steel Structures- Limit State	N. Subramanian	Oxford University Press	
2	Limit State Design of Steel structures	S.K. Duggal	Mc-Graw Hill	
3	Design of steel structures	S.S. Bhavikatti	I.K. International Publishing house	
Reference Books				
1	Steel Design	William T. Segui	Cengage Learning	
2	Fundamentals of Structural Steel Design	M.L. Gambhir	Mc Graw Hill	
3	Steel Structures-Design and Practice	N. Subramanian	Oxford University Press	

SEMESTER - 6

Survey - II

Course Code	**BTCE-T-PC-603**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Recall tacheometry principles and apply circular curve elements effectively.
2. Apply circular curve setting-out techniques and explain aerial photography fundamentals.
3. Apply GPS/DGPS systems for accurate positioning and utilize ETS for precise measurements, considering errors and accuracy.

Module-1 – (8 Hours)

TACHEOMETRY:

Principles, stadia constants determination, Stadia tachometry with staff held vertical and with a line of collimation horizontal or inclined, numerical problems, Elevations and distances of staff stations – numerical problems.

Module -2 – (10 Hours)

CURVES:

compound, reverse, and transition curve, Purpose & use of different types of curves in field, Elements of circular curves, numerical problems, Preparation of curve table for setting out, Setting out of circular curve by chain and tape and by instrument angular methods

(i) offsets from long chord, (ii) successive bisection of arc, (iii) offsets from tangents, (iv) offsets from chord produced, (v) Rankine's

method of tangent angles (No derivation) Obstacles in curve ranging – point of intersection inaccessible.

Module -3 –(7 Hours)

BASICS OF AERIAL PHOTOGRAPHY, PHOTOGRAMMETRY, DEM AND ORTHO IMAGE GENERATION:

Aerial Photography, Film, Focal Length, Scale, Types of Aerial Photographs (Oblique, Straight).

Module -4 – (7 Hours)

Photogrammetry:

Classification of Photogrammetry, Aerial Photogrammetry Terrestrial Photogrammetry, Photogrammetry Process: Acquisition of Imagery using aerial and satellite platform, Control Survey, Geometric Distortion in Imagery, Application of Imagery and its support data Orientation and Triangulation, Stereoscopic Measurement, X-parallax-, Y-parallax.

Module -5 – (6 Hours)

BASICS ON GPS & DGPS AND ETS: GPS: -

Global Positioning, Working Principle of GPS, GPS Signals, Errors of GPS, Positioning Methods, DGPS: - Differential Global Positioning System, Base Station Setup, Rover GPS Set up, Download, Post-Process, and Export GPS data, Sequence to download GPS data from flashcards, Sequence to Post-Process GPS data, Sequence to export post process GPS data, Sequence to export GPS Time tags to file.

Module -6 - (5 Hours)

ETS: - Electronic Total Station :

Distance Measurement, Angle Measurement, Leveling, Determining position, Reference networks, Errors and Accuracy.

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

1. Recall principles of tacheometry, including stadia constants determination and stadia tachometry methods, through numerical problem-solving.
2. Understand the purpose and use of compound, reverse, and transition curves in fieldwork, and apply elements of circular curves to solve numerical problems.
3. Apply techniques for setting out circular curves using both chain and tape and instrument angular methods, considering obstacles in curve ranging.
4. Explain the basics of aerial photography and photogrammetry, including acquisition, control survey, geometric distortion, and application of imagery.
5. Apply knowledge of GPS and DGPS systems, including working principles, error sources, and data processing sequences, to obtain accurate positioning data.
6. Utilize electronic total stations (ETS) for distance and angle measurement, leveling, and position determination, while considering errors and accuracy requirements.

Question paper pattern:
The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Advanced Surveying	D. Gaikwad	(S.Chand publication)	
2	Surveying Vol. I, II, III	B. C. Punmia	(LaxmiPublication, Delhi – 06)	
3	A textbook of surveying and leveling	R. Agor	(Khanna Publishers, Delhi-6)	
Reference Books				
1	Surveying and leveling by	N. N. Basak	(Tata Mcgraw Hill)	

SEMESTER - 6

Architecture and Town Planning

Course Code	**BTCE-T-PE-601**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Identify architectural design elements and understand building planning and construction principles.
2. Implement town planning principles and evaluate new concepts in urban development.
3. Assess city planning elements and develop comprehensive zoning plans for urban development.

Module-1 – (6 Hours)

Principles of architectural design –
primary elements, form, space, organization, circulation, proportion and scale, ordering principles.

Module -2 – (6 Hours)

Functional planning of buildings:
Planning, designing and construction, General building requirements, Permit and Inspection (as per the National building Code).

Module -3 –(7 Hours)

Town Planning ; Evolution of towns :
History and trends in town planning:-origin and growth, Historical development of town planning in ancient valley civilizations; Objects and necessary of town planning.

Module -4 – (7 Hours)

Surveys and analysis of a town ;
New Concepts in town planning : Garden city movement, Linear city and Satellite city concepts, Neighborhood Planning.

Module -5 – (8 Hours)

Planning Principles, Practice and Techniques:
Elements of City plan, Estimating future needs, Planning standards.

Module -6 - (8 Hours)

Zoning:- its definition, procedure and districts, height and bulk zoning, F.A.R., Master Plan; Concepts of urban planning , design and landscaping.

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

1. Identify the primary elements, form, space, organization, circulation, proportion, and scale in architectural design.
2. Explain the functional planning, designing, and construction of buildings, including general building requirements and the National Building Code.
3. Implement the principles of town planning, incorporating historical trends and the development of ancient valley civilizations.
4. Evaluate new concepts in town planning such as the Garden City movement, Linear City, and Satellite City concepts.
5. Assess elements of city planning, estimating future needs, and applying planning standards to urban development projects.
6. Develop zoning plans, including height and bulk zoning, Floor Area Ratio (F.A.R.), and master plans, integrating concepts of urban planning, design, and landscaping.

Question paper pattern:
The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	The Urban Pattern: City planning and Design.	B. Gallion and S. Eisner	C B S publishers.	
2	Architectures: Form, Space and Order	D. K. Francis Ching	John Wiley.	
3	The Urban Pattern: City planning and Design.	S. Eisner, A. B. Gallion and S. Eisner	John Wiley.	
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SEMESTER - 6					
Type	**Code**	**NPTEL**	**L-T-P**	**Credits**	**Marks**
OO	BTCE-T-OO-601		2-0-0	2	100

Objectives	Enhance their learning experience by providing access to high-quality educational content.
Pre-Requisites	Knowledge of Technical Papers in Secondary Education
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module -1	As given in NPTEL portal.	06 Hours
Module -2	As given in NPTEL portal.	06 Hours
Module -3	As given in NPTEL portal.	06 Hours
Module -4	As given in NPTEL portal.	06 Hours
Module- 5	As given in NPTEL portal.	06 Hours
Module- 6	As given in NPTEL portal.	06 Hours
	Total	36 Hours

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

CO1	Access to Quality Education: Provide access to lectures and materials from top educators across premier institutions like IITs and IISc.
CO2	Skill Enhancement: Improve technical and analytical skills in core engineering and interdisciplinary subjects.
CO3	Standardization: Offer a uniform curriculum across institutions, ensuring consistent educational quality.
CO4	Flexibility in Learning: Allow students to learn at their own pace through online courses and video lectures.
CO5	Certification Opportunities: Enable students to earn certificates for completing courses, which can improve employability.
CO6	Research and Industry Linkage: Bridge gaps between academic learning and industry requirements.

SEMESTER - 6

Entrepreneurship Development

Course Code	**BTHS-T-OE-601**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	ESE Marks	100
Credits	03	Exam Hours	03

Course Objectives:

To raise awareness among students about the importance of entrepreneurship as a career and the necessary skills. To provide information on the entrepreneurial environment and related issues. Encourage learners to pursue entrepreneurship as a career and to participate in business incubation. To give them knowledge that will induce in them an entrepreneurial culture and help them to look at the bigger picture.

Pre-requisites

Students should develop an Entrepreneurship bent of mind through motivational speech and attending an Entrepreneurship program.

Teaching Schemes

Regular classroom lectures with the use of ICT as needed. Each session is planned to be interactive with a focus on real-world problem solving through case lets.

Module-1 – (7 Hours)

Introduction: Concept of Entrepreneur, Entrepreneurship and Enterprise, Definition of Entrepreneurship, Objectives of Entrepreneurship Development, Nature and importance of Entrepreneurship, Entrepreneurial Personality, Types of Entrepreneurs, Role of Entrepreneurship in Economic Development **Case let.**

Module -2 – (8 Hours)

Entrepreneurship Environment: Entrepreneurship Environment in India and Odisha, Phases of Entrepreneurship Development, Identification of Opportunities, Converting Business Opportunities into Reality. Make in India, Atma Nirvar Bharat, Atal Incubation Centre (AIC), MSME, National Small Industries Corporation, MUDRA, and other related programs. Case Let.

Module -3 –(7 Hours)

Entrepreneurial Motivation: Why to become entrepreneur, Entrepreneurship as a career: Role of family, Entrepreneurship and the role of Odisha government: IPR 2022, Make in- Odisha, Startup policy: Startup ecosystem, Startup Odisha Yatra 2.0. Case Let.

Module -4 – (8 Hours)

Startup: Make in India, Atma Nirvar Bharat, Atal Incubation Centre (AIC), MSME, National Small Industries Corporation, MUDRA, and other related programs. Sickness of Small-Scale Industries, Causes and symptoms of Sickness, cures of Sickness. Case Let.

Module -5 – (6 Hours)

Entrepreneurship skills: Meaning of Entrepreneurship skills, Types of Entrepreneurship Skills (Management skills, leadership skills, financial skills, Analytical skills, Critical thinking skills, Strategic thinking skills, planning skills, technical skills, Time management skills, marketing and networking skills, Entrepreneurial skills in the workplace. Case Let.

Module -6 - (6 Hours)

Small-Scale Industries: Procedure for setting up a small enterprise. Role of Banks and Governments in reviving industries. Case Let.

Course outcomes:

At the end of the course the student 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.

Question paper pattern:

The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Text Books :

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	Entrepreneurship Development and Management,	Vasant Desai,	HPH	
2	Entrepreneurship Management	Bholanath Dutta,	Excel Books	
3	Entrepreneurial Development,	Sangeeta Sharma	, PHI	
4	Entrepreneurship Development and Management	R.K Singhal,	Katson Books., New Delhi	
5	Entrepreneurship Development and Management.	U Saroj and V Mahendiratta,	Abhishek Publications, Chandigarh	

SEMESTER - 6

Essence of Indian Knowledge Tradition - II

Course Code	**BTMC-T-MC-601**	IE Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Credits	0	Exam Hours	03

Course 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.

Module-1 – (3 Hours)

Introduction to Traditional Knowledge
(Definition TK its Nature, characteristics and scope)

Module -2 – (3 Hours)

Protection and significance of Traditional knowledge.
(Significance of TK Protection, Value of TK , role of Govt.to harness TK)

Module -3 –(3 Hours)

Legal Frame work and TK.
(Forest Dwellers Forest right act 2001, 2002, 2006.)

Module -4 – (3 Hours)

Traditional knowledge and Intellectual property.
(Systems & Legal concepts for the protection of traditional knowledge)

Module -5 – (4 Hours)

Traditional knowledge and Engineering.
(Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge)

Module -6 – (4 Hours)

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)

Course outcomes:

At the end of the course the student will be able to:

1. Identify the concept of Traditional knowledge and its importance.
2. Explain the need and importance of protecting traditional knowledge.
3. Illustrate the various enactments related to the protection of traditional knowledge.
4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
5. Explain the importance of Traditional knowledge in Agriculture and Medicine.

Question paper pattern:

The SEE question paper will be set for 100 marks.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer five full questions, selecting one full question from each module.

Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Year
1	"Traditional Knowledge System in India"	Kapil Kapoor, Michel Danino	Prentice Hall India	2017
2	"Traditional Knowledge Protection: A Global Perspective"	Evanson C. Kamau, Gerd Winter	Springer	2013
3	"Forest Rights Act: Securing the Rights of Forest Dwellers"	Madhu Sarin	Oxford University Press	2008
4	"Intellectual Property and Traditional Knowledge"	Suman Sahai	Allied Publishers	2007

SEMESTER - 6

Design of Steel Structure Lab

Course Code	**BTCE-P-PC-601**	IE Marks	40
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	60
Credits	01	Exam Hours	03

Course Objectives:

1. Design and illustrate secure rivet/bolted connections with understanding of joint configurations.
2. Design detailed plans and elevations of slab and gusset bases, ensuring structural integrity and stability.
3. Apply design principles to develop detailed plans of grillage foundations and plate girders for optimal performance.

Sl.NO	Experiments
1	Design and draw the layout of different types of Rivet/bolted connections.
2	Design and draw the neat sketch of staggered joints and show pitch, gauge and edge distance.
3	Design and detailing the plan and elevation of slab base.
4	Design and detailing the plan and elevation of Gusset base.
5	Design and detailing the plan and elevation of Grillage foundation.
6	Design and detailing the plan and elevation of plate girder.
7	Draw the neat sketch of column made by channel section with necessary arrangement of lacing and battening.
8	Draw the neat sketch of column made by angle section with necessary arrangement of lacing and battening
9	Designing and detailing of steel roof truss or industrial building using Staad Pro.
10	Design and detailing of steel connection, seated and framed connection.

Course outcomes:

At the end of the course, the student will be able to:

1. Apply principles to design and draw layouts for different types of rivet/bolted connections, ensuring structural integrity and safety.
2. Analyze and illustrate staggered joints, demonstrating understanding of pitch, gauge, and edge distance in the sketch.
3. Design and detail plans and elevations of slab bases, integrating structural requirements with architectural considerations.
4. Develop detailed plans and elevations of gusset bases, ensuring stability and load distribution in the structure.
5. Apply design principles to develop detailed plans and elevations of grillage foundations, considering soil conditions and load-bearing capacity.
6. Design and detail plate girders, incorporating structural analysis and design considerations for optimal performance.

Online Learning materials :

Course Name Design of steel Structures Lab

Course Link https://nptel.ac.in/courses/105/105/105105162/

Course Instructor PROF. DAMODAR MAITY

SEMESTER - 6

Irrigation Engineering Lab

Course Code	**BTCE-P-PC-602**	IE Marks	40
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	60
Credits	01	Exam Hours	03

Course Objectives:

1. Understand canal dimensions and design effective canal falls.
2. Apply hydraulics for optimal tile drain design and analyze gravity dam design for structural integrity.

Sl.NO	Experiments
1	Canal design: a.Canal Dimension study
2	Canal design: b.Canal Fall: Design of any one fall
3	Land drainage: Depth and spacing of Tile drains.
4	Design of Cross Drainage Works
5	Gravity Dam Design a.Profile of the dam, Forces on Dam, Safety of Dam
6	Gravity Dam Design b.Shear stress, Principal Stress on Dam
7	Earthen Dam: a.Seepage line determination
8	Earthen Dam: b.Slope stability design
9	Design and detailing of any one type of fall.
10	Spillway: design of any one type of spillway

Course outcomes:

At the end of the course the student will be able to:

1. Understand the principles and factors influencing canal dimensions through Canal Dimension study.
2. Interpret and apply design principles to create effective Canal Falls.
3. Apply knowledge of hydraulics to determine optimal depth and spacing of Tile drains for land drainage.
4. Analyze and evaluate Gravity Dam design, including profile, forces, safety, shear stress, and principal stress, to ensure structural integrity and stability.

Online Learning materials :

Course Name Irrigation and drainage

Course Link https:// https://onlinecourses.nptel.ac.in/noc20_ag04

Course Instructor PROF. DAMODAR RAO MAILAPALLLI

SEMESTER - 6					
Type	**Code**	**Project - II**	**L-T-P**	**Credits**	**Marks**
PS	BTCE-P-PS-601		0-0-3	2	100

Course Outcome :

1. Understand: Explain the principles and significance of material testing and mix design in civil engineering projects.
2. Apply: Perform standard tests on aggregates, bitumen, and soil to evaluate their properties and suitability.
3. Analyze: Interpret test results to assess material performance under specific construction conditions.
4. Evaluate: Compare alternative materials and methods to optimize construction practices.
5. Create: Develop mix designs using the Marshall Method to meet project specifications.
6. Demonstrate: Present findings and practical insights from material testing and mix design processes effectively.