Final Syllabus for
B.Tech (First year)
(2023 Admission Batch)

All Branches

(To be approved by Academic Council and Board of Studies)

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

1st Year Course Structure

First Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	BS	BTBS-T-BS-101	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**

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
PS	Project/Seminar/Internship

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

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First Year B.Tech

Curriculum Structure

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

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Evaluation process

1. Evaluation Process of Theory Subjects:

Components	Marks	Frequency	Assigned To
Quiz Test	5	2	Concerned Faculty
Surprise Test	5	2	Concerned Faculty
Assignment	5	2	Concerned Faculty
Attendance	5	Closing of Instruction	To be retrieved from CMS
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.

Syllabus for
B. Tech (2nd Year)
(2023 Admission Batch)

AGRICULTURE ENGINEERING

(Approved by Academic Council and Board of Studies)

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

2nd Year Course Structure

Third Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	BS	BTBS-T-BS-302	Applied Mathematics	**4-0-0**	**4**
2	PC	BTAG-T-PC-301	Farm Machinery and Equipment I	**4-0-0**	**3**
3	PE	BTAG-T-PE-301	Refrigeration and Air conditioning	**4-0-0**	**3**
4	PC	BTAG-T-PC-302	Agriculture for Engineering	**4-0-0**	**3**
5	PE	BTAG-T-PE-303	Soil and Water Conservation Engineering and Structures	**4-0-0**	**3**
6	HS	BTBS-T-HS-301/ BTBS-T-HS-302	OB/EEC	**3-0-0**	**3**
7	ES	BTCS-T-ES-301	OOPS JAVA	**4-0-0**	**2**
8	MC	BTMC-T-MC-301	Environmental Engineering	**2-0-0**	**0**
9	SC	BTSC-T-SC-301	EET-1	**2-0-0**	**1**
			Total Hours/ Credit**(Theory)**	**31**	**22**

Practical

1	PC	BTAG-P-PC-301	Farm Machinery and Equipment I Lab	**0-0-2**	**1**
2	PC	BTEC-P-PC-302	Agriculture For Engineering Lab	**0-0-2**	**1**
3	ES	BTCS-P-ES-301	OOPS LAB	**0-0-2**	**1**
4	PS	BTPS-P-PS-301	Seminar-1	**0-0-3**	**1**
5	SC	BTSC-P-SC-301	ESI-1	**0-0-3**	**1**
Total Hours/ Credit(Practical)				**12**	**5**
Grand Total Hours/ Credit(Practical)				**43**	**27**

Fourth Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	PC	BTAG-T-PE-401	Farm Machinery and Equipment II	**4-0-0**	**3**
2	PC	BTAG-T-PC-402	Engineering Properties of Agricultural Produce	**4-0-0**	**3**
3	PC	BTAG-T-PC-403	Mechanics and Open Channel Hydraulics	**3-0-0**	**3**
4	HS	BTBS-T-HS-301/ BTBS-T-HS-302	OB/EEC	**4-1-0**	**3**
5	PE	BTAG-T-PE-401	Agricultural Structural and precision farming	**3-1-0**	**3**
6	OO	BTAG-T-OO-401	NPTEL	**2-0-0**	**2**
7	SC	BTSC-T-SC-302	EET-2	**2-0-0**	**1**
Total Hours/ Credit**(Theory)**				**30**	**18**

Practical

1	PC	BTAG-P-PC-401	Farm Machinery and Equipment II Lab	**0-0-2**	**1**
2	PC	BTAG-P-PC-402	Engineering Properties of Agricultural Produce Lab	**0-0-2**	**1**
3	PC	BTAG-P-PC-403	Mechanics and Open Channel Hydraulics Lab	**0-0-2**	**1**
4	PS	BTPS-P-PS-401	Project 1	**0-0-3**	**1**
Total Hours/ Credit(Practical)				**9**	**4**
Grand Total Hours/ Credit(Practical)				**39**	**22**

SUMMER INTERNSHIP TRAINING for 30 Days

Program Outcomes (UG Engineering)

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

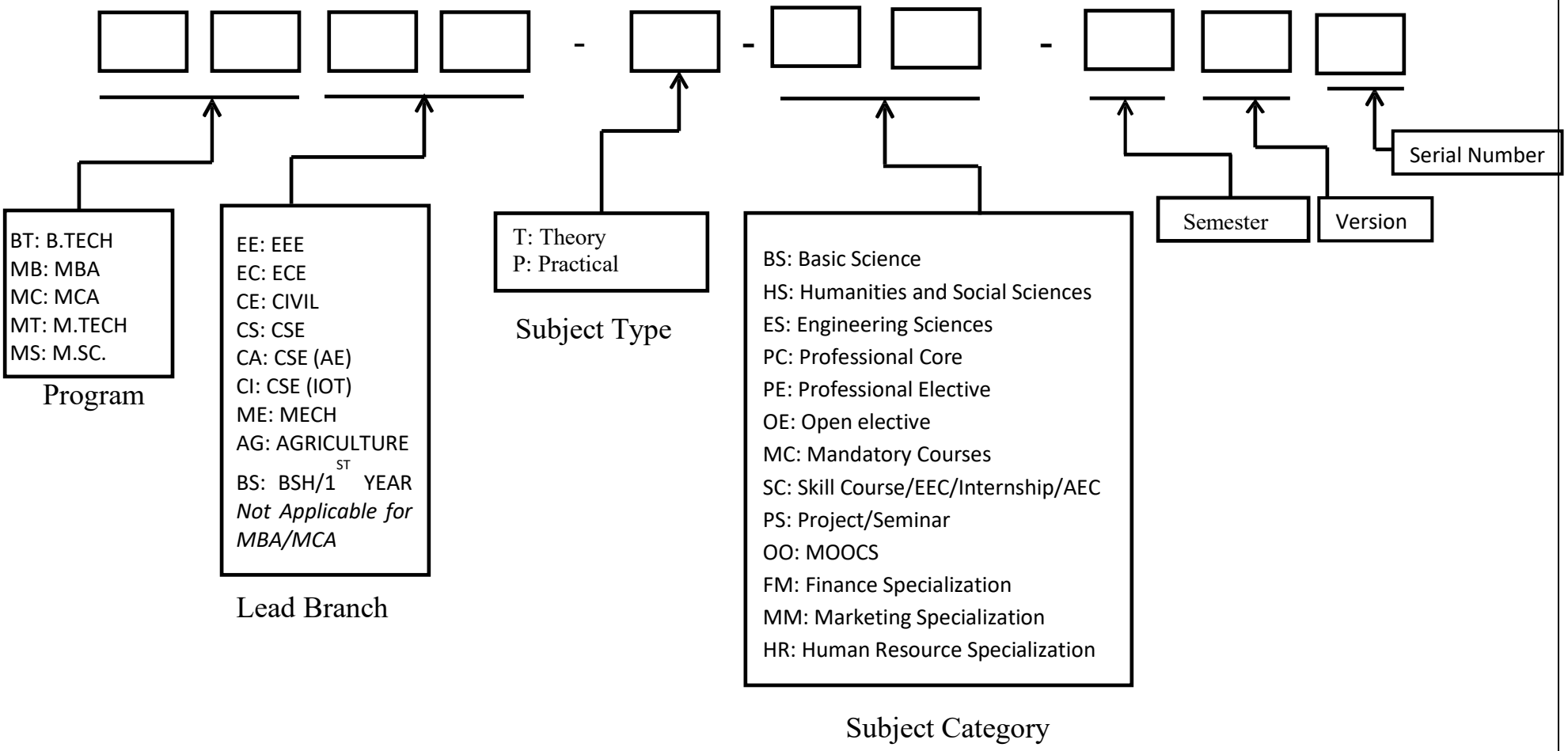
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Course Types & Definitions

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

Subject Code Format



Part 2
2nd Year B. Tech.
(AGRICULTURE ENGINEERING)

Evaluation process

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

Internal Examination (B. Tech, Autonomous)					
Sr No	**Type of Test**	**Mark**	**Frequency**	**Total Mark**	**Reduced Mark**
1	Modular Test	25	3	75	**50**
2	Online Quiz Test	10	6	60	**10**
3	Assignment	5	2	10	**10**
4	Subject Specific Project	100	1	100	**15**
5	Attendance	15	1	15	**15**
TOTAL				190	**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**

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	Applied Mathematics	L-T-P	Credits	Marks
BS	BTBS-T-BS-302		4-0-0	3	150

Objectives	The objective of this course is to familiarize the students with the knowledge and Concepts of Laplace and the Amplitude Transients; Fourier transformations, Partial Differential Equations, complex analysis and probability.
Pre-Requisites	A basic knowledge of calculus, and elementary probability theory.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned

Detailed Syllabus

Module-#	Topic	Hours
Module-1	Laplace transformation, Inverse Laplace transformation, Unit step function, Dirac's delta function, Convolution, applications in solving differential Equations and Integral Equations.	**10 Hours**
Module-2	Fourier series, Fourier expansion of functions of any period, Even and odd Functions, Half range Expansion, Fourier transform and Fourier Integral.	**12 Hours**
Module-3	Partial Differential Equation: Basic concepts, Solution of PDE by separating variables, Alembert's Solution of wave equation, Heat equation: Solution by Fourier series, Heat equation: Solution by Fourier Integrals and transforms.	**11 Hours**
Module-4	Complex analysis: Complex plane, polar form, power and roots, analytic Function, Cauchy Riemann equations, harmonic function, Laplace functions. Probability: Random variables, Probability distributions, Mean and variance of a distribution, Binomial, Poisson and Normal distributions.	**12 Hours**
Total		**45 Hours**

Text Books:

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

Reference Books:

R1. S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press. R2. P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.
R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.

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	Apply the knowledge of Laplace transform to solve the complex engineering problems.
CO2	Find the Fourier series and Fourier transforms of functions.
CO3	Illustrate the applications of Laplace & Fourier Transformations.
CO4	Understand the heat and wave equations.
CO5	Understand the concepts of Analytic function.
CO6	Understand the basic concept on probability and various distributions.

Type	Code	Farm Machinery and Equipment I	L-T-P	Credits	Marks
PC	BTAG-T-PC-301		4-0-0	3	150

Objectives	1. Educate the students about the various agricultural machines for seed bed preparation and land reclamation. 2. Understand the various agricultural machines for sowing, planting and hitching. 3. Develop knowledge about draft measurement and material of construction.
Pre-Requisites	Basic Mechanical Engineering
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	**Farm Mechanization** - Objectives, constraints and status, types and level of mechanization, needs and strategy; **Farm Machinery** - classifications of farm machinery as per unit operations in agricultural production, determination of field capacity, field efficiency, field machine index, factors affecting field capacities and field efficiencies; calculations of cost of operations: depreciation, fixed cost, variable cost, cost of operations, comparison of ownership with hiring of machines, solution of numerical problem, selection of optimum size of machines for different farm size. Selection of matching power source for optimum machine sizes.	**09 Hours**
Module-2	**Land Reclamation** - Methods of land reclamation, details of construction and working principles of earth moving equipment like bull dozer, trencher, elevator and laser land leveller; **Land Preparation Machinery -** objectives of tillage, types of tillage, advantage and disadvantages of tillage; requirement and type of seed bed preparation; classification of tillage tools for primary tillage, secondary tillage, rotary tillage, deep tillage and minimum tillage; types, operations, construction and performances of MB plough, factors affecting their performances, forces acting on MB plough; types, operations, construction and performances of disc plough, factors affecting their performances, forces acting on disc plough; types, operation, construction, performance of chisel plough and sub- soiler; types, operations, construction and performances of disc harrow, factors affecting their performances, forces acting on disc harrow; types, operations, construction and performances of puddler, factors affecting their performance; types, operations, construction and performances of cultivators, factors affecting performance.	**09 Hours**
Module - 3	**Types of sowing , planting and transplanting equipment, their components -** Types of seed drills, construction, functions, parameters affecting performance, types of no till drill and strip till drills, details of construction, function and parameters affecting performance; types of planters including cotton planter, vegetable planter and rice transplanter, their construction, operations and performance; different types of groundnut planter, sugarcane planter and potato planter , their construction, operations and performance; types of potato planter, their construction, operations and performance; **Types of furrow openers** - constructions and performances and suitability to different crops; types of metering mechanisms , constructions and performances and suitability to different crops; seed drills and planter calibration procedure, adjustment of seed drills during operations.	**07 Hours**

Module - 4	**Hitching System and Control** - Introduction to hitching; **vertical hitching***:* implements having hinged pull members and support wheels, implements having hinged pull members without gauge wheels, single axle implements with rigid pull member getting vertical support through wheels, Horizontal hitching of pull type implements: MB plough and disc plough, hitching for mounted implements, free link operation of 3-point hitch, restrained link operation of 3-point hitch, vertical effect of hitching on tractor,	**05 Hours**
Module 5	**Draft Measurement** - Draft measurement of animal drawn and tractor drawn implements and, determination of power. **Study of different attachment with tillage machines** like combination tools of plough and cultivator, tillage with seeding.	**08 Hours**
Module 6	**Materials used in farm machinery**- materials used in construction of farm machinery, engineering requirement of materials, stress strain relationship; properties of materials, **Types of materials -** ferrous and non–ferrous materials; heat treatment processes, procedure of achieving heat treatment, carbon iron phase diagram usefulness in farm machinery; ferrous metals: cast irons, wrought irons, their properties; steel, alloys of steel and non-metals used in agricultural machinery.	**07 Hours**
	Total	**45 hours**

Text Books:	
1	Principles of Farm Machinery by R.A. Kepner, Roy Bainer, and E. L. Berger , ISBN-10 : 8123909772, ISBN-13 : 978-8123909776
2	Elements of Agricultural Engineering by Dr Jagdiswar Sahay, ISBN : 9788195012022.
3	Farm Machinery and Equipment by H. P. Smith, ISBN-10 : 1446517403 ISBN-13 : 978-1446517406
Reference Books:	
1	Agril. Engineering through worked out examples by Dr. R. Lal and Dr. A.C. Dutta
2	Farm Power and Machinery Engineering by Dr.R. Suresh and Sanjay Kumar, **ISBN**-10. 8180142116 ; **ISBN**-13. 978-8180142116.

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

CO1	Insight to the objectives, constraints and status of farm mechanization.
CO2	Introduction to different farm equipment and knowledge about Tillage and land preparation
CO3	Techniques of seeding and planting method
CO4	Hands on knowledge on hitching of implements to the power sources
CO5	Study of draft measurement of tillage equipment
CO6	Materials used in construction of farm machinery and their crop

Type	Code	Agriculture for Engineering	L-T-P	Credits	Marks
PC	BTAG-T-PC-302		4-0-0	3	150

Objectives	1. Educate the students on various fundamental aspects f soil science, Agronomy and Horticulture. 2. Know the crop types and their seasons. 3. Develop knowledge on orchard
Pre-Requisites	Biology, Environmental Science
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Module-#	Topics	Hours
Module-1	**Nature and origin of soil -** soil forming rocks, minerals and their classification and composition, physical and chemical properties of soil, Soil formation, factors and processes, Soil **Profile, surface soil and sub soil, classification of soils, Soil Taxonomy - Soil orders, sub orders, grate** group and their characteristics; soil texture, soil structure, soil crusting, soil puddling and consistency, soil particle distribution, soil air and soil heat,	**5 Hours**
Module-2	**Soil colloids and their significance**, Soil Organic Matter, soil acidity, soil salinity, saline and sodic soil, reclamation of saline and Sodic soil, requirement of gypsum, Residual Sodium Carbonate, Essential Plant Nutrients, Deficiency Symptoms, types of inorganic fertilizers and their classification, Liquid Fertilizers, Quality of **Irrigation Water**: Analysis of irrigation water with respect to different parameters to study the quality of irrigation water; Interpretation of result and suitability criteria of irrigation water for different crops.	**8 Hours**
Module - 3	**Classification of crops based on their life cycle** , season of growing and commercial use, agronomic importance and special purpose; weather parameters, effect of solar radiation on crop, weather hazards and their mitigation, types of tillage and tillage implements; tilth, factors influencing tilth and modern concepts of tillage, package of practice of major kharif field crops– paddy, maize and **millets; rabi crops** – oilseeds and pulses, field crops-sugarcane, jute and cotton; fodder crops(both Kharif and Rabi season), integrated nutrient management .	**8 Hours**
Module – 4	**Organic Farming and Sustainable Agriculture**, Soil – water – plant relationship, evapo-transpiration methods, crop coefficients, water requirement of important field crops and their critical stages of irrigation, methods of irrigation, irrigation efficiencies, Weeds - weed ecology and classification; methods of weed management - Integrated Weed Management(IWM), Cropping System - crop rotation principles and advantages; cropping system, mixed and intercropping and relay cropping; integrated farming system	**9 Hours**

Module – 5	**Soil and climatic requirements for fruits**, vegetables, floriculture and plantation crops, different plant growing structures such as green house, lath house, hot bed, cold frame, other propagating frames etc. site selection, planning, lay out of different planting methods; **Types of propagation**, garden tools used in horticulture, their uses and maintenance, clean cultivation for orchard soil management, mulching, intercropping, cover cropping, filler cropping and weed management in orchards	**9 Hours**
Module – 6	**Fertilizer application -** fertigation and irrigation methods for horticultural crops, Maturity indices, estimation of maturity, types of harvesting, grading, packaging, Methods of extraction of seeds, different types of storage; Major pest and diseases of fruit crops(mango, banana, papaya, guava, litchi, citrus, ber, pomegranate etc.) and their management; Major pest and diseases of vegetable crops(tomato, brinjal, chilli, okra, potato, cole crops, cucurbits, peas and beans etc.) and their management; Major pest and diseases of ornamental plants(rose, gladiolus, marigold, tuberose, chrysanthemum etc.) and their management, Integrated Pest Management(IPM).	**6 Hours**
TOTAL		**45 Hours**

Text Books:	
1	Panda, P.K. and Swain, S.C. Practical Manual on Fundamentals of Horticulture- College of Horticulture, Chiplima, OUAT, Bhubaneswar, ISBN-10 : 9386283670 ISBN-13 : 978-9386283672
2	Fundamentals of Agronomy by G. C. Dey, ISBN-10 : 8120404165 ISBN-13 : 978-8120404168
Reference Books:	
1	• Soil pedology (1996) – J. L. Sehgal, Kalyani publication, Ludhiana, ISBN-10 : 9327284054 ISBN-13 : 978-9327284058
2	Horticultural crops ,New Madura Publishers, Madurai,Tamil Nadu
3	The nature and properties of soil (2002) - N.C. Brady and Ray, R. Weill; Pearson Education Inc. New Delhi., **ISBN**-10. 9332519102 · **ISBN**-13. 978-9332519107

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

CO1	To understand the basic & fundamental aspects of soil , its physical , chemical including physicochemical & biological properties .
CO2	To give knowledge regarding essential plant nutrients, deficiency symptoms
CO3	To acquaint students with agronomic importance of crops, tillage practices, package of practices of major crops and Integrated Nutrient Management (INM
CO4	To acquaint regarding organic farming & sustainable agriculture, different cropping system, Integrated Weed Management (IWM) and Integrated Farming System (IFS).
CO5	Knowledge regarding fertilizer application, fertigation and irrigation methods Training on regarding different growing procedure, propagation methods and orchard soil management
CO6	Acquaint students regarding pest and diseases of major fruits, vegetables and ornamental plants

Type	Code		L-T-P	Credits	Marks
PE	BTAG-T-PE-301	**Refrigeration and Air Conditioning**	3-1-0	3	150

Objectives	1. Learning the fundamental principles and different methods of refrigeration and air Conditioning 2. Comparative study of different refrigerants with respect to properties, applications And environmental issues. 3. Understanding the basic air conditioning processes on psychometric charts, calculation of cooling load for its applications in comfort and industrial air conditioning.
Pre-Requisites	**Basic Electronics, Mathematics**
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

	Topics	Hours
Module-1	Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Application of first law in heating and expansion of gases in non flow processes. First law applied to steady flow processes. Carnot cycle, Carnot theorem. Entropy, physical concept of entropy, change of entropy of gases in thermodynamics process.	**05 Hours**
Module-2	Principles of refrigeration, - units, terminology, production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. Vapour refrigeration-mechanism, P-V, T-S, P-H diagrams, vapor compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system. Common refrigerants and their properties. Thermodynamic properties of moist air, perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement.	**12Hours**
Module - 3	Air Refrigeration System : Introduction, Unit of refrigeration, Coefficient of performance, Reversed Carnot Cycle, Temperature limitations, maximum COP, Bell Coleman air cycle, Simple Air Cycle System for Air-craft with problems. Vapour Compression System : Analysis of theoretical vapour compression cycle, Simple saturation cycle, sub-cooled cycle and super-heated cycle, Effect of suction and discharge pressure on performance, Actual vapour compression cycle. Problem illustration and solution. Multi-stage compression and Multi-evaporator systems : Different arrangements of compressors and inter-cooling, Multi evaporator system, Dual compression system. Calculation of cooling load and design of cold storage.	**11 Hours**

Module - 4	**Design of evaporative cool chamber**. Design of solar refrigeration system. Vapour Absorption System : Simple Ammonia - absorption system, Improved absorption system, Analysis of vapour absorption system (Specifically of analyzing coloumn and rectifier), Electrolux / Three fluid system, Lithium-bromide-water vapour absorption system, comparison of absorption system with vapour compression system. Simple Problems and solution. Thermoelectric Refrigeration: Basics and Principle. Defining the figure of Merit. (No Problem) Refrigerants: Classification of refrigerants, Properties of refrigerants, comparison of common refrigerants, uses of important refrigerants	**6 Hours**
Module 5	**Psychrometrics :** Properties of air-vapour mixture, Law of water vapour-air mixture, Enthalpy of moisture, Psychrometric chart, simple heating and cooling, Humidification, Dehumidification, Mixture of air streams.	**05 Hours**
Module 6	Requirements of comfort air conditioning: Oxygen supply, Heat removal, moisture removal, air motion, purity of air, **Thermodynamics of human body**, comfort and comfort chart, effective temperature, factors governing optimum effective temperature. Air Conditioning System: Process in air conditioning : Summer air conditioning, Winter air conditioning and year round air conditioning, Cooling load calculations	**06 Hours**
	Total	**45 hours**

Text Books:	
1	Kothandaraman C P Khajuria P R and Arora S C. 1992. A Course in Thermodynamics, **ISBN** 10: 0132439360 **ISBN** 13: 9780132439367.
2	Engineering Thermodynamics. S Chand and Co. Ltd., Ram Nagar, New Delhi. 19 Mathur M L and Mehta F S. 1992. , **ISBN**-10. 8121942705 · **ISBN**-13. 978-8121942706
Reference Books:	
1	Engineering Thermodynamics. Tata McGraw Hill Publishing Co. Ltd., 12/4 Asaf Ali Raod, New Delhi., **ISBN**-10. 9789352606429 ; **ISBN**-13. 978-9352606429
2	New Delhi. Ballney P. L. 1994. Thermal Engineering. Khanna Publishers, New Delhi. Nag P K. 1995. , **ISBN**: 978-81-7409-031-7

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

CO1	Knowledge on unit of Refrigeration, COP, Reversed Carnot cycle, Temperature limitations, and Bell Coleman cycle
CO2	Knowledge on design of cool chambers and cold storage for agricultural commodities. Design of solar refrigeration system
CO3	Knowledge about working of Vapor Absorption Refrigeration systems.
CO4	Acquire knowledge about classification and properties of refrigerants and design of air conditioning system
CO5	Knowledge on different psychometric processes and comfort air conditioning
CO6	Knowledge on year round comfort air conditioning

Type	Code	Soil and Water Conservation Engineering and Structures	L-T-P	Credits	Marks
PC	BTAG-T-PC-303		4-0-0	3	150

Objectives	1. Know the different soil erosion control structures and their requirements for better soil and moisture conservation in different situations. 2. Understand the theory behind flow through soil conservation structures and use specific energy and momentum concepts to analyze flow problems. 3. Prepare plan and design permanent soil and water conservation engineering structures with cost estimation.
Pre-Requisites	Basic Civil Engineering
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

	Topics	Hours
Module-1	Soil and water erosion – introduction, causes and types, factors affecting and effects of erosion; Soil loss estimation – universal soil loss equation (USLE) and determination of their various parameters; application and limitations of USLE; Modified soil loss equation (MUSLE) and RUSLE; Rainfall erosivity – estimation of erosivity from rainfall data by KE>25 and EI30 methods; Soil erodibility - topography, crop management and conservation practice factors; Measurement of soil erosion by runoff plots and by soil samples; Water erosion – mechanics and factors affecting or erosion; forms of water erosion, Gullies and their classification, stages of gully development;	**12 Hours**
Module-2	Water erosion control measures– agronomical measures, tillage practices and conservation tillage; Mulching; Engineering measures and their planning and layout, Contour stonewall and trenching and their suitability for use;	**05 Hours**
Module - 3	Gully and ravine reclamation Principles of gully control - vegetative measures, brush wood dams, loose rock fill dams; Temporary structures of gully control, permanent gully control structures; Grassed waterway Wind erosion and control measures, Land use capability classification objectives of classification, capability, limitation, land capability unit, land capability sub-classes; Land use capability classification by United States Department of Soil Conservation Service, limitations of different LUCC;	**09 Hours**

Module - 4	Sedimentation in tanks and reservoirs Sedimentation, sources of sedimentation, factors responsible for sedimentation; effects of sedimentation, types of sediment load, sediment transportation, sediment delivery ratio, trap efficiency; Estimation of sedimentation, bed load estimation, suspended load sampling; Measurement of sedimentation - can type, bottle type, bed load sampling, box type, pan type, pit type; Sedimentation in reservoirs - factors affecting sedimentation, rate of reservoir sedimentation, silt monitoring and storage loss in tanks and reservoirs, reservoir sedimentation control	**06 Hours**
Module 5	Measurement of sedimentation - can type, bottle type, bed load sampling, box type, pan type, pit type; Sedimentation in reservoirs - factors affecting sedimentation, rate of reservoir sedimentation, silt monitoring and storage loss in tanks and reservoirs, reservoir sedimentation control	**06 Hours**
Module 6	Water Harvesting and Soil conservation Structures Water harvesting techniques and structures-farm ponds, percolation ponds, nala bunds, tanks and sub surface dykes; soil erosion control structures - check dams, drop, chute and drop inlet spillways - design requirements, planning for design and design procedures	**06 Hours**
	Total	**45 hours**

Text Books:	
1	Schwab, G.O., Frevert, R.K., Edministe, T.W. and Barnes, K.K. 1981. Soil & Water Conservation Engineering. John Willey and sons, New York.
2	Murthy,V.V.N. 1998. Land & Water management Engineering. Kalyani Publishers, Ludhiana, **ISBN**-10. 932721465X ; **ISBN**-13. 978-9327214659
Reference Books:	
1	Suresh , R.1997. Soil & water Conservation Engineering . Standard Publishers Distributors, Delhi., ISBN 8180140008, 9788180140006
2	Das, G.2000. Hydrology and Soil Conservation Engineering. Standard Publishers Distributors , Delhi, ISBN-10 8120335864 ISBN-13 978-8120335868

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

CO1	Understand water and wind erosion and their mechanisms.
CO2	Know various agronomical and mechanical measures for controlling soil erosion and moisture conservation
CO3	Develop analytical thinking and problem solving skills in soil and water conservation engineering problems.
CO4	To measure and estimate soil loss and sedimentation using different techniques

Type	Code	Organizational Behavior	L-T-P	Credits	Marks
HS	BTBS-T-HS-301		3-0-0	3	150

Objectives	To understand the human interactions in an organization find what is driving it and influence it for getting better results for attaining business goals
Pre-Requisites	Self-motivation and knowledge on human strategy
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	**Focus And Purpose**: Definition, need and importance of organizational behavior – Nature and scope –Evolution of Organizational behavior- Organizational behavior models.	**09 Hours**
Module-2	**Personality** – types – Factors influencing personality – Theories – Ice-burg Model **Learning** – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehavior – Types – Management Intervention. Emotions – Emotional Intelligence **Motivation** – importance – Types – Theories of Motivation- Effects on work behavior. **Attitudes** – Characteristics – Components – Formation – Measurement- Values. **Perceptions** – Importance – Factors influencing perception – Interpersonal perception- perceptual Process.	**13 Hours**
Module - 3	**Communication**: Importance, Types, Barriers to communication, Communication as a tool for improving Interpersonal Effectiveness **Groups In Organization**: Nature, Types, Why do people join groups, Group Cohesiveness & Group Decision Making- managerial Implications, Effective Team Building **Leadership**: Leadership & management, Theories of leadership- Trait theory, Behavioral Theory, Contingency Theory, Leadership & Followership, How to be an Effective Leader **Conflict**: Nature of Conflict & Conflict Resolution	**13 Hours**
Module - 4	**Dynamics Of Organizational Behavior** : **Organizational culture and climate** – Factors affecting organizational climate – Importance. **Organizational change** – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. **Stress** – Work Stressors – Prevention and Management of stress – Balancing work and Life. **Organizational development** – Characteristics – objectives –. Organizational effectiveness	**05 Hours**
Total		**40 Hours**

Text Books:	
1	Organizational Behavior : Allison Sheerest, Rachael Collinson, Louis Bevoc · 2017
2	A Textbook of Organizational Behavior with Text and Cases by Gupta C.B.
Reference Books:	
1	Organizational Behaviour by Stephen P. Robbins Authors: Stephen P. Robbins, Timothy A. Judge, Neharika Vohra Publisher: Pearson
2	Essentials of Organizational Behavior Book by Stephen Robbins Authors: Stephen P. Robbins, Timothy A. Judge Publisher: Pearson Edition: 2019
3	Organisational Behavior Book by K. Aswathappa Author(s): K. Aswathappa Publisher: Himalaya Publishing House Edition: 2018
4	Organizational Behavior Mcshane, S. L/ Glinow, M. A. V. TMH

Type	Code	Engineering Economics	L-T-P	Credits	Marks
HS	BTBS-T-HS-302		3-0-0	3	150

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

Detailed Syllabus

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

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

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

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

Type	Code	Object Oriented Programming using JAVA	L-T-P	Credits	Marks
ES	BTCS-T-ES-301		4-0-0	3	10

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

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Object oriented paradigm: Evolution of programming paradigm, structured versus object-oriented development, Introduction to Object oriented programming concepts: Objects, classes, encapsulation and abstraction, inheritance, polymorphism, dynamic binding, message passing. Executing the program, How Java program executes? What is JVM and its significance in executing a program? Architecture of JVM. Understanding First Program and a step forward, understanding every term of the program, Java Tokens, Data types, 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.	10 Hours
Module-2	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.	8 Hours
Module-3	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	8 Hours
Module-4	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.	8 Hours
Module-5	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.	6 Hours
	Total	**40 Hours**

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

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

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

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

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

Detailed Syllabus

Module	Topics	Hours
Module -1	Components of Earth System: Lithosphere, Cryosphere, Atmosphere, Hydrosphere, Biosphere and Outer space. Ecological concepts and natural Resources: Ecological perspective and value of environment, Environmental auditing, Biotic components, Levels of organizations in environment Ecosystem Process: Energy, Food chain, Environmental gradients, Tolerance levels of environmental factor.	**06 Hours**
Module -2	Environmental Pollution: Definition, Causes, effects and control measures of: Water pollution, Air pollution, Noise pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards Environmental Issues: Climate change, Global warming, Acid rain, Ozone layer depletion, Sustainable development, Bio gas, Natural gas, Biodiversity, Urban problems related to energy, water scarcity, Water conservation, rain water harvesting, artificial recharge, watershed management, carbon trading, carbon foot print National Ambient Air quality Standards, Noise standards, Vehicle emission standards	**10 Hours**
Module -3	Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative). Hydrological cycle, water balance, energy budget, precipitation, infiltration, evaporation and evapotranspiration.	**06 Hours**
Module -4	Drinking water standard (IS 10500), Water Quality Criteria and wastewater effluent standards Water treatment: Water sources and their quality, Lay out of a water treatment plant and working of each unit/ principles of each process i.e. Screening, Aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection..	**06 Hours**

Module- 5	Miscellaneous treatment: Removal of color, tastes and odour control, removal of iron and manganese, fluoridation and defoliation. Advanced water treatment: Ion exchange, electro-dialysis, RO, desalination Working principles of ready-made water filter/purification system commercially available Lay out of a wastewater treatment plant and working of each unit.	**6 Hours**
Module-6	Solid waste management: Source, classification and composition of Municipal Solid Waste (MSW), Storage and transport of MSW, MSW management, Waste minimization of MSW, Reuse and recycling, Biological & thermal treatment (principles only), land fill Biomedical Waste management – sources, treatment (principles only) and disposal Hazardous Waste Management- Introduction, Sources, Classification, treatment (principles only) Introduction to e-waste management. Environmental impact Assessment: Project screening for EIA, Scoping studies Environmental policies and acts (Air, Noise, Water, Forest, E-waste, Hazardous waste acts).	**10 Hours**
	Total	**44 Hours**

Text Book:

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

Reference Books:

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

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

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

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

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

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to pre- placement talk, Speed maths (speed & accuracy in Addition Subtraction, Multiplication, Fractions, Percentage, Squares, Cubes, Square Roots, Cube Roots, etc.), 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).	**5 Hours**
Module-2	Syllogism (Introduction to syllogisms, Statements of syllogisms, Application of Venn diagrams Logical deduction), Blood Relationship (Dialogue/ Conversation Based, Based on puzzles, coding-decoding), Age based problems (Ratio and Sum of Ages Given, Ratio &Product of Ages Given under Problems on Ages, Ratio of Present and Future Ages Given, Ratio of Past &Present Ages Given).Ratio Proportion(direct proportion, inverse proportion, continued proportion).	**5 Hours**
Module-3	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).	**5 Hours**
Module-4	Percentage(Basic, Comparison of two, Successive ,Product constancy ratio), Profit &Loss(Profit, Loss, Cost Price, Selling Price, Marked Price) , Simple Interest & compound interest, Puzzles(Floor, Scheduling, Double line up, Linear, Square*, Box)*	**5 Hours**
	Total	**20Hours**

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

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

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

Type	Code	Farm Machinery and Equipment I Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-301		0-0-2	1	10

Objectives	1.Practical knowledge on machinery used from land preparation 2. Acquire knowledge for seeding / planting 3. Know about hitching system
Pre-Requisites	Basic Mechanical Engineering
Teaching Pedagogy	Field demonstrations and operations on farm equipment and machine

Detailed Syllabus

Expt No	Topic
1	Familiarization with different farm implements and tools
2	Construction details, adjustments and working of M.B. plough
3	Construction details, adjustments and working of Disc plough
4	Construction details, adjustments and working of Disc harrow
5	Construction details, adjustments and working of cultivators and puddler
6	Construction and working of Rotavator and other rotary tillers
7	Field operation of paddy transplanter
8	Field operation of vegetable planter
9	Study of different weeders and their use
10	Study and field operation of seed-cum-fertilizer drills
11	Study and field operation of planters
12	Calibration of seed cum fertilizer drill and planters
13	Study of lawn mower
14	Study of hitching system

Text Books:	
1	Principles of Farm Machinery by R.A. Kepner, Roy Bainer, and E. L. Berger
2	Farm Machinery – an Approach by S. C Jain & Grace Phillips
3	Agril. Engineering through worked out examples by Dr. R. Lal and Dr. A.C. Dutta
4	Farm Power and Machinery Engineering by Dr.R. Suresh and Sanjay Kumar
5	Farm Machinery and Equipment by H. P. Smith

Type	Code	Agriculture for Engineering Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-302		0-0-2	1	100

Objectives	Know the crop types and their seasons, effect of weather parameters on crop production, different tillage practices in the crop field.
Pre-Requisites	Biology, Environmental Science
Teaching Pedagogy	Field demonstrations

Detailed Syllabus

Expt No	Topic
1	Collection of soil sample from the field, its processing and preservation in lab
2	Determination of moisture content, bulk density, particle density and pore space in soil
3	Determination of soil texture by feel method/Bouyoucos hydrometer method
4	Determination of organic carbon, nitrogen, phosphorus, potassium in soil
5	Determination of $CO_3^{=}$, HCO_3^{-} and Cl^{-}, Ca^{++} and Mg^{++}, $SO_4^{=}$ in irrigation water
6	Determination of Na^{+} and K^{+} content in irrigation water
7	Identification of major and minor nutrient deficiency symptoms of crops in the field
8	Identification of cereals, pulses and oil seed crops and their varieties
9	Identification of seeds, manures, fertilizers and herbicides
10	Study of fertilizer application methods
11	Practice of ploughing, sowing, puddling, intercultural operations, top dressing etc.
12	Judging maturity time for harvesting of crop

Text Books:	
1	Practical manual for Introduction to soil science-P. K. Das, A. K. Dash, and G. H. Santra, Department of Soil Science & Agricultural Chemistry, Orissa University of Agriculture & Technology, Bhubaneswar

Type	Code	OOPS using JAVA Lab	L-T-P	Credits	Marks
ES	BTCS-P-ES-301		0-0-2	1	100

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

Detailed Syllabus

Module-#	Name of the experiment	Hours
Experiment-1	Introduction, compiling and executing java program	2 Hours
Experiment-2	Data types, variables and design control structures	2 Hours
Experiment-3	Loop control structures	2 Hours
Experiment-4	Introduction to object and class	2 Hours
Experiment-5	Inheritance, polymorphism and abstract class	2 Hours
Experiment-6	Package	2 Hours
Experiment-7	Interfaces, Inner classes	2 Hours
Experiment-8	Exception handling and java threads	2 Hours
Experiment-9	Java applets	2 Hours
Experiment-10	AWT and swings	2 Hours
Experiment-11	Wrapper Class	2 Hours

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

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

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 and subject analysis.
Teaching Pedagogy	Regular seminar presentation and evaluation with record keeping.

METHOD OF EVALUATION:

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

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

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

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

Objectives	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 this course, the students will be able to:

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

Fourth Semester

Type	Code	Farm Machinery and Equipment II	L-T-P	Credits	Marks
PC	BTAG-T-PC-401		4-0-0	3	150

Objectives	1. Educate the students about the farm machineries used in agricultural production from intercultural to threshing 2. Know about construction and operation of different machines for hay harvesting and combine. 3. Understand the students about the operating parameters and performance of the machines for root crop harvesting and others.
Pre-Requisites	Farm Machinery and Equipment related to different field preparation method and procedures
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, and field visit to nearest farm and any agriculture mechanization fair.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Intercultural Equipment**- Study of Weeding and weed control equipment, types, components and functions; Fertilizer application equipment- Types, soil amendment, placement of fertilizers, dry commercial fertilizer, metering devices, factors affecting discharge rate and uniformity of distribution, liquid fertilizer, granular pesticides; Plant protection equipment; pest control equipment, their construction and operation, drift, factors affecting drift, types atomizing devices (nozzles) , pumps for sprayer, agitation of spray materials, safety precautions during spraying, duster: types, construction and operations; calibration of sprayer and numerical problems .	8 hours
Module-2	**Study of harvesting operations-** harvesting methods and terminologies; Types of mowers and their components: Cutter bar mower, Rotary mower, flail mower; Cutter-bar and its components, registration, alignment and lead of cutter-bar, knife drive system, cutter-bar balancing and vibration control, cutter-bar, inertial forces, counterbalancing, terminology, cutting pattern; Force analysis of pitman drive cutter-bar and numerical problems; Reaper: types, components of reaper- engine, power transmission unit, types of drive to cutter-bar mechanism, lifting and gathering unit, cutting and windrowing unit; Cutter-bar parameters affecting performance of reaper, cutting force, power requirement for cutting and total power requirement; Reaper binder and windrower: types, operation and performance and numerical problems	8 hours
Module-3	**Importance of hay conditioning**, methods and calculation of moisture content, Forage harvesters- types, their components; gathering unit, conveying and feeding unit, chopping and impelling unit, types of cutter head, performance parameters; Balers-Types, construction and operation and numerical problems; **Chaff cutters**- Manual and mechanical chaff cutter: components, operation, length of cut, capacity, location of flywheel; Shape of knife and power requirement and numerical problems; New developments and innovations for hay management in-situ for Indian conditions	08 hours

Module-4	**Threshing Systems and Combine Harvesters Threshing Systems** - Mechanics of threshing, power requirement in threshing, Types of threshing drums and their applications, determination of length of drum; Types of threshers- tangential and axial, performance characteristics of axial and tangential threshers; Machine factors affecting performance, threshing losses, performance index and numerical problems; Combine Harvesters- Grain Combine: Components and operation of combine harvester: **Header unit**: reel and its adjustment, cutter bar, adjustment and drive to cutter-bar; feeding unit; threshing unit; principle and types of threshing methods, performance criteria of threshing methods like axial and cross flow separating unit; straw walker, shoes, blower, factors affecting their performance; **Combine harvester losses and performances**; header, threshing, rack, shoe losses; factors affecting threshing performance and numerical problems; Straw combine: Types of straw combines; operation, performances, advantages and economics; combine troubles and troubleshooting	8 hours
Module 5	**Root crop harvesting equipment**- Potato harvester/digger: Methods of harvesting, Functions and components of different types of potato harvester, factors affecting performance of potato harvester; Groundnut: Types of groundnut diggers/harvester, components of groundnut digger, basic operations in groundnut digging, factors affecting performance of groundnut digger; Maize harvesting and shelling- Snapper, husker, sheller and combine	08 Hours
Module 6	**Cotton Harvesting**: cotton harvesting stage, pre-harvest treatments, harvesting requirement, types of harvesters: Cotton picker and stripper; Cotton picker: picking mechanism: drum type spindle mechanism and chain belt type; conveying and carrying; Cotton Stripper: Principles of stripping, types of cotton strippers and their working principles, effect and cost of mechanical harvesting of cotton and numerical problems; vegetables and fruits harvesters: Problems of mechanical harvesting, Harvesting functions, Methods and principles of vegetables and fruits harvesters: Uprooting, cutting, combing, stripping, vibration and threshing; Types of harvesters: Carrot, cabbage, strawberry, snap bean, tomato, harvesting of fruits: methods of harvesting, types of harvesting, tree shakers	05 Hours
	Total	**45 Hours**

Text Books:	
1	Principles of Farm Machinery by R.A. Kepner, Roy Bainer, and E. L. Berger , ISBN-10 : 8123909772, ISBN-13 : 978-8123909776
2	Elements of Agricultural Engineering by Dr Jagdiswar Sahay, ISBN : 9788195012022.
3	Farm Machinery and Equipment by H. P. Smith, ISBN-10 : 1446517403 ISBN-13 : 978-1446517406
Reference Books:	
1	Agril. Engineering through worked out examples by Dr. R. Lal and Dr. A.C. Dutta
2	Farm Power and Machinery Engineering by Dr.R. Suresh and Sanjay Kumar, **ISBN**-10. 8180142116 ; **ISBN**-13. 978-8180142116.

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

Type	Code	Engineering Properties of Agricultural Produce	L-T-P	Credits	Marks
PC	BTAG-T-PC-402		4-0-0	3	150

Objectives	1. Acquire knowledge on the physical and thermal properties of biomaterials. 2. Knowledge on frictional, aerodynamic and rheological properties of agricultural produce.. 3. Understanding on electromagnetic spectrum, electrical and dielectric properties
Pre-Requisites	Physics and Environmental science
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	General Introduction and Different Properties General Introduction- classification and importance of engineering properties of agricultural produce, Different Properties: Physical properties- size, shape, roundness, sphericity, particle and bulk volume, density, porosity, specific gravity and surface area of grains and fruits and vegetables, methods of their measurement,	**08 Hours**
Module-2	**Thermal properties**- basics of mode of heat transfer, heat capacity, specific heat, thermal conductivity, methods of their measurement, thermal diffusivity, surface heat transfer co-efficient, freezing point of depression and boiling point of elevation, heat of respiration, coefficient of thermal expansion, thermal emissivity.	**05 Hours**
Module- 3	**Friction in agricultural materials**- static friction, kinetic friction, internal friction, angle of repose, methods of their measurement, rolling resistance, flow of bulk granular materials. Aero Dynamics- concept and basics of aerodynamic properties drag coefficient and terminal velocity, methods of their measurement.	**08 Hours**
Module - 4	**Basic concepts of Rheology**- stress, strain, shear rate, analysis of force deformation curve, bio-yield point, rupture point, elasticity, plasticity, degree of elasticity, Rheological properties- classical ideal materials, ideal elastic behavior, elastic properties, **young's modulus**, shear modulus, bulk modulus, Poisson's ratio; ideal plastic behavior, ideal viscous behavior, viscosity (kinematic and absolute) and its measurement	**08 Hours**
Module - 5	**Visco-elasticity**, Electromagnetic, Electrical and Dielectric Properties - Visco-elasticity- Basic mechanical elements, spring and dashpot, Maxwell model, kelvin model, electrical equivalence of mechanical models; **Newtonian and non-Newtonian fluid**, pseudoplastic, dilatant, thixotropic, rheopectic and Bingham plastic foods, flow curves.	**08 Hours**
Module - 6	Electromagnetic spectrum- Details of electromagnetic spectrum and the use, principle of colour measurement, hue, chroma and value; Electrical and dielectric properties- Measurement methods of resistance, capacitance, dielectric loss factor, loss tangent, and dielectric constant; Application of engineering properties in handling processing machines and storage structure.	**08 Hours**
Total		**45 Hours**

Text Books:	
1	Suresh Chandra, Samsher, Suneet Kumar Goyal.2020. New India Publishing Agency
2	Singhal OP and Samuel DVK. 2003. Engineering Properties of Biological Materials. Saroj Prakasan.NewDelhi
3	Mohesin, N.N. 1980. Physical Properties of Plants & Animals. Gordon & Breach Science Publishers, New York.
Reference Books:	
1	Rao, M.A. and Rizvi,S.H., 1995. Engineering Properties of Foods. Marcel Dekker Inc. New York.
2	Stroshine, R. 1998. Physical Properties of Agricultural Materials and Food Products. Course Manual. Purdue University. USA
3	Serpil S and Servet G S.2005. Physical Properties of Foods. (Springer Science+Business Media, LLC, 233 Spring Street, New York,

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

CO1	Understanding the classification and importance of engineering properties of agricultural produce
CO2	Knowledge about the Physical properties of biomaterials
CO3	Knowledge about the Frictional properties of biomaterials
CO4	Acquire knowledge on Thermal and Frictional properties of biomaterials
CO5	Understanding the basics properties
CO6	Understanding on electromagnetic spectrum, electrical and dielectric properties

Type	Code	Mechanics & Open Channel Hydraulics	L-T-P	Credit	Marks
PC	BTAG-T-PC-403		4-2-0	3	100

Objectives	1. Know different engineering properties like moisture content, density, void ratio , porosity , grain size analysis etc. 2. Understand the properties of fluid. 3. To impart knowledge to the students on various principles of fluid mechanics and hydraulic machines.
Pre-Requisites	Basic mechanical and Civil Engineering
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	Index Properties and Soil Consistency: Index Properties – Introduction, phase diagram, definitions and relations, physical and index properties of soil, Particle size distribution, grain Size distribution curve, soil indices. Soil Consistency - Plastic limit, liquid limit, shrinkage limit; Soil Stress: Stress in Soils- Effective and neutral stress, stress in soil, Boussinesq and Westerguard's analysis, new mark's influence chart, stress distribution and diagrams; Shear Stress and Mohr's stress circle, direct shear stress, triaxial test and vane shear test, Numerical Examples on different tests.	**08 Hours**
Module 2	Compaction and Consolidation - Compaction of soils, standard and modified proctor test, abbot's compaction test, jodhpur mini compaction test, field compaction methods; Consolidation of soils, Terzaghi's theory of one dimensional consolidation, spring analogy, consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Cassagrande method; Earth Pressure and Stability of Slopes - Active and passive earth pressure, Rankine's theory of earth pressure for cohesive soils; Stability of slopes, stability analysis of infinite and finite slope, Taylor's stability number, friction circle method.	**08 Hours**
Module 3	Fluid Properties, Fluid Pressure and its Measurement - Ideal and real fluids, density, specific weight, specific volume, specific gravity, viscosity, units of measurements; pressure, intensity of pressure, pascal's law, pressure head, transmissibility of liquid pressure, Bramah's press or hydraulic press, atmospheric pressure, negative or vacuum pressure, absolute pressure, pressure gauges and manometers(barometer, piezometer, manometer, differential u-tube manometer, inverted manometer	**6 Hours**

Module 4	Hydrostatics, Equilibrium of Floating Bodies and Hydro-kinematics - Hydrostatics and its application - Pressure forces on plane and curved surfaces- total pressure, centre of pressure, pressure on curved surfaces, pressure on irregular shaped lamina, pressure on masonry dam: water pressure on one side and both side of dam, stability of a dam – rectangular and trapezoidal dam. Equilibrium of Floating Bodies - Buoyancy, Archimedes principle, centre of buoyancy, metacentre, metacentric height- determination of metacentric height by analytical and practical method, Condition of floatation and stability of submerged and floating bodies. Hydro-kinematics - Kinematics of fluid flow; methods of describing fluid motion- Langrangian and Eulerian description of fluid motion, path line, stream line, streak line, stream function, velocity potential and flow net, Types of fluid flow – steady and unsteady flows, uniform and non-uniform flows, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, rate of flow or discharge, control volume, continuity equation.	**08 Hours**
Module 5	Vortex Flow, Bernoulli's equation and its Applications -Vortex motion - free and forced vortex , Dynamics of fluid flow: energy possessed by a fluid body- Bernoulli's theorem, venturimeter, pitot tube, orifice meter; Flow through devices and pipes - Flow through orifices- types, jet, vena-contracta, hydraulic coefficients, discharge of orifice, Flow through mouth pieces- types, losses in pipes, discharge of mouthpiece; Flow through notches- types, discharge through rectangular notch; Discharge over triangular, trapezoidal and stepped notch; weirs and barrages, Cipoletti weir, end contraction of rectangular weirs; Ventilation of weirs, types of nappe- free, depressed and clinging nappe;	**7 Hours**
Module 6	**Flow through simple and compound pipes** - Pipe flow, minor and major hydraulic losses through pipes, fluid friction, Darcy Weisbach equation of loss of head in pipes, hydraulic gradient and total energy line; Pipes in series, pipes in parallel, flow through network of pipes- branching of pipes; Power transmission through pipes- efficiency of transmission, condition for maximum power transmission, siphon. Open channel flow, Dimensional analysis and fluid machinery Flow through open channel- Chezy's equation, manning's equation, most economical or best hydraulic section- rectangular and trapezoidal channel; Hydraulic jump- critical, sub-critical and super critical flow, Moody's diagram; Dimensional analysis and similitude- Rayleigh's method, Buckingham's pi theorem; Dimensionless numbers-Froude's no., Reynold's no., Euler's no., Mach's no., weber's number; Model analysis: types of similarities- geometric, kinematic and dynamic similarity, scale ratio; Introduction to fluid machinery - positive displacement and Variable displacement pump.	**08 Hours**
	Total	**45 Hours**

Text Books:

1. Punmia,B.C, Jain, A.K. Soil Mechanics and Foundations,Laxmi Publications (P) Ltd., **ISBN**-10. 8170087910; **ISBN**-13. 978-8170087915
2. RanjanGopal and Rao A S R. Basic and Applied Soil Mechanics, Welly Eastern Ltd.. **ISBN**-10. 9393159378 ; **ISBN**-13. 978-9393159373
3. Singh, Alam. Soil Engineering, Vol.1. CBS Publishers and Distributers, Delhi, **ISBN**-10. 812390276X · **ISBN**-13. 978-8123902760

Reference Books:

1. Bansal, R.K. A Text book of Fluid Mechanics, Laxmi Publications, New Delhi. ISBN-10. **8131808157 ;** ISBN-13.
2. Ramanuthan,S.Hydraulics, Fluid Mechanics & Hydraulic Machines, Dhanpatrai& Sons,
3. Khurmi, R.S. Hydraulics & Fluid Mechanics, S. Chand & Co. Ltd., New Delhi.
4. Modi, P.N. and Seth, S.M. Hydraulics & Fluid Mechanics, Standard Book House, Delhi
5. Paul, J. C. and Panigrahi, B. Practical Manual in Fluid Mechanics, CAET, OUAT, Bhubaneswar

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

CO1	Physical and index properties of soil, soil consistency, soil stress
CO2	Compaction and Consolidation of soil
CO3	Fluid properties, Fluid pressure and its measurement
CO4	Hydrostatics and Hydrodynamics
CO5	To learn about dynamics of fluid flow and flow through pipes
CO6	To acquire knowledge about flow through network of pipes, power requirements and efficiency

Type	Code	Organizational Behavior	L-T-P	Credits	Marks
HS	BTEC-T-HS-404		3-0-0	3	150

Objectives	To understand the human interactions in an organization find what is driving it and influence it for getting better results for attaining business goals
Pre-Requisites	Self-motivation and knowledge on human strategy
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	**Focus And Purpose**: Definition, need and importance of organizational behavior – Nature and scope –Evolution of Organizational behavior- Organizational behavior models.	**09 Hours**
Module-2	**Personality** – types – Factors influencing personality – Theories – Ice-burg Model **Learning** – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehavior – Types – Management Intervention. Emotions – Emotional Intelligence **Motivation** – importance – Types – Theories of Motivation- Effects on work behavior. **Attitudes** – Characteristics – Components – Formation – Measurement- Values. **Perceptions** – Importance – Factors influencing perception – Interpersonal perception- perceptual Process.	**13 Hours**
Module- 3	**Communication**: Importance, Types, Barriers to communication, Communication as a tool for improving Interpersonal Effectiveness **Groups In Organization**: Nature, Types, Why do people join groups, Group Cohesiveness & Group Decision Making- managerial Implications, Effective Team Building **Leadership**: Leadership & management, Theories of leadership- Trait theory, Behavioral Theory, Contingency Theory, Leadership & Followership, How to be an Effective Leader **Conflict**: Nature of Conflict & Conflict Resolution	**13 Hours**
Module- 4	Dynamics Of Organizational Behavior : **Organizational culture and climate** – Factors affecting organizational climate – Importance. **Organizational change** – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. **Stress** – Work Stressors – Prevention and Management of stress – Balancing work and Life. **Organizational development** – Characteristics – objectives –. Organizational effectiveness	**05 Hours**
Total		**40 Hours**

Text Books:	
1	Organizational Behavior : Allison Sheerest, Rachael Collinson, Louis Bevoc · 2017
2	A Textbook of Organizational Behavior with Text and Cases by Gupta C.B.
Reference Books:	
1	Organizational Behavior by Stephen P. Robbins Authors: Stephen P. Robbins, Timothy A. Judge, Neharika Vohra Publisher: Pearson
2	Essentials of Organizational Behavior Book by Stephen Robbins Authors: Stephen P. Robbins, Timothy A. Judge Publisher: Pearson Edition: 2019
3	Organizational Behavior Book by K. Aswathappa Author(s): K. Aswathappa Publisher: Himalaya Publishing House Edition: 2018
4	Organizational Behavior Mcshane, S. L/ Glinow, M. A. V. TMH

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

CO1	To understand the conceptual framework of the discipline of OB and its practical applications in the organizational set up.
CO2	To deeply understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently.
CO3	To critically evaluate and analyze various theories and models that contributes in the overall understanding of the discipline.
CO4	To develop creative and innovative ideas that could positively shape the organizations.
CO5	To accept and embrace in working with different people from different cultural and diverse background in the workplace.

Type	Code	Engineering Economics	L-T-P	Credits	Marks
HS	BTEC-T-HS-405		3-0-1	3	150

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

Detailed Syllabus:

Module-#	Topics	Hours
Module-1	Engineering Economics- Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics. Demand - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), Demand Forecasting – Meaning SupplyMeaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).	**09 Hours**
Module-2	Production - Production function, Laws of returns: Law of variable proportion, Law of returns to scale Cost and Revenue Concepts - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.	**09 Hours**
Module - 3	Market - Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).	**08 Hours**
Module - 4	Time Value of Money- Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence. Evaluation of Engineering Projects-Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects. Depreciation- Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project.	**09 Hours**
Module- 5	Inflation-Meaning of inflation, types, causes, measures to control inflation. National Income-Definition, Concepts of national income, Method of measuring national income. Banking -Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.	**05 Hours**
	Total	**40 Hours**

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

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

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

Type	Code	Agricultural Structural and Precision Farming	L-T-P	Credits	Marks
PE	BTAG-T-PC-401		3-0-0	3	150

Objectives	1. Knowledge on mechanical and grain storage structures. 2. Acquire skills on protected cultivation and basic components of green house. 3. Gaining knowledge on irrigation, cultivation in controlled environment cultivation using green house and poly house with irrigation, fogging and misting.
Pre-Requisites	Strength of material and Environmental Engineering
Teaching Pedagogy	Regular classroom lectures with use of equipment 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	Loads and use of BIS Codes.Design of Riveted joints, design of welded joints.Design of connections.Design of structural steel members in tension, compression and bending.Design of steel roof truss. Analysis and design of singly and doubly reinforced sections, Shear, Bond and Torsion. Design of Flanged Beams, Slabs, Columns, Foundations, Retaining walls.Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods,	**8 Hours**
Module-2	Grain Storage Structures - Grain storage, moisture and temperature change in grain bins; Traditional storage structures and their improvement; Improved storage structures (CAP, hermitage storage, Pusa bin, RCC ring bin); Design consideration for grain storage go-down, bag storage structure; Shallow and deep bins, calculation of pressure in bins; Storage of seeds; Estimate of domestic power requirement; Sources of power supply, electrification; Electrification for rural housing.	**10Hours**
Module- 3	Protected cultivation: Introduction, origin, development, National and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment.	**6 Hours**

Module- 4	Design and construction of green houses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc. Greenhouse heating – necessity, components, methods, design of heating system. Root media – types – soil and soil less media, composition, estimation, preparation and disinfection, bed preparation. Planting techniques in green house cultivation.	**9 Hours**
Module- 5	Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Maintenance of irrigation and fogging systems.. Greenhouse climate measurement, control and management. Insect and disease management in greenhouse and net houses Selection of crops for greenhouse cultivation, major crops in greenhouse – irrigation requirement, fertilizer management, cultivation, harvesting and post harvest techniques; Economic analysis.	**6 Hours**
Module-6	Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application.	**6 Hours**
Total		**45 Hours**

Text Books:	
1	Ray Choudhury K P. Engineering Materials, Oxford and IBH Pub. Co.New Delhi
2	Rangwala S C. Engineering Materials, Charotar Pub. House, Anand-1, Gujrat.
3	Ahuja T D and Birdi G S. Fundamentals of Building Construction, DhanpatRai and Sons,
4	Ramamrutham S and Narayanan R. Design of Reinforced Concrete Structures, DhanpatRai Pub. Co (P) Ltd., New Delhi.
Reference Books:	
1	Lehri R S and Leheri R S. Strength of Materials, S.K.Kataria& Sons, New Delhi.Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana
2	Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi

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

CO1	Design of steel structures
CO2	Study about RCC structures
CO3	Study about different Beams
CO4	Learn about different grain storage structures
CO5	Study about Greenhouse technology
CO6	Study about BIS standard and Fertilization

Type	Code	NPTEL	L-T-P	Credits	Marks
oo	BTAG-T-MC-401	MICRO IRRIGATION ENGINEERING	3-0-1	3	150

Objectives	Irrigation is the backbone of agriculture, and the efficient utilization of irrigation water is possible only by the adoption of highly efficient irrigation methods, such as micro irrigation. Micro-irrigation provides water to plant(s) in precise amount, at right time and at appropriate place
Pre-Requisites	Soil Science and Agronomical Principles and Practices for various crops
Teaching Pedagogy	Offered by IIT Madras through Massive Open Online Courses (MOOC),an asynchronous teaching-learning platform, pre-recorded lectures, resource video materials, lecture notes, assignments and quizzes, as content and self-assessment at regular intervals, through scheduling of fixed time duration with , participation of teachers and students , similar to a classroom, albeit on the Internet When offered with through supplementary DVDs and mobile delivered content.
Level :	
Start Date :	July 24, 2023
End Date :	October 13, 2023
Enrollment Ends	July 31, 2023
Exam Date :	October 29, 2023

Detailed Syllabus:

Module-#	Topics	Hours
	Week 1: Introduction and Scope, Fundamentals of Fluid Mechanics and its Application in Micro Irrigation , Soil Water Concept , Soil Water Constants and Infiltration , Numerical Examples on Fluid Mechanics and soil water	
	Week 2 : Evapotranspiration , Determination of Evapotranspiration , Crop Coefficients and Crop Water Requirement , Demonstration of Agro-Meteorological Instruments , Demonstration of Lysimeter , Numerical Examples on Crop Water Requirement	
	Week 3 : Irrigation Scheduling , Soil and Plant Water Monitoring Instruments , Measurement of Irrigation Water , Irrigation Efficiency ,Numerical Examples on Irrigation Water Management	
	Week 4: Introduction of Water Lifts and Pumps , Variable Displacement Pumps , : Irrigation Water Quality , Numerical Examples on Water Measurements and Pump, Irrigation Methods	
	Week 5: Micro Irrigation System: Concept and Types , Drip Irrigation, Introduction and Types , Drip Irrigation: Design Considerations & System Layout , Types and Selection of Emission Devices , Hydraulics of Drip Irrigation System Pipe Network	
	Week 6: Numerical Example on Design of Drip Irrigation System , Fertigation , Fertigation Application Methods , Drip Irrigation: Filtration System ,Numerical Examples on Emission Devices and Fertigation	
	Week 7: Installation and Operation of Drip Irrigation System , Maintenance of Drip Irrigation System , Demonstration of Drip Irrigation Components and Evaluation of	

	Drip Emitters , Soil Water Movement under a Drip Emitter , Design and Development of Drip Emitters	
	Week 8: Numerical Examples on Drip Irrigation System , Sprinkler Irrigation System , Bubbler Irrigation System , Sprinkler Irrigation System , Sprinkler Irrigation System Design	
	Week 9 : Performance Evaluation of Sprinkler Irrigation System , Numerical Examples on Sprinkler Irrigation System , Numerical Examples on Design of Sprinkler Irrigation System, Sprinkler Irrigation System: Layout, Installation, Operation and Maintenance	
	Week 10: Standards and Quality Assurance of Drip Irrigation System Components, ,Standards and Quality Assurance of Sprinkler Irrigation System Components , Solar PV System for Irrigation (Part 1) , Solar PV System for Irrigation (Part 2) Numerical Examples on Solar PV Irrigation System	
	Week 11: Automation of Micro Irrigation System (Part 1) ,Automation of Micro Irrigation System (Part 2), Automation of Micro Irrigation System (Part 3) Automation of Micro Irrigation System (Part 4)`, Economic Analysis of MIS (Part 1)	
	Week 12: Economic Analysis of MIS (Part 2), Economic Analysis of MIS (Part 3), Numerical Examples on Economics of MIS , Precision Agriculture , Micro Irrigation Engineering: Epilogue	
Total		**12 WEEKS**

Text Books:	
1	NPTEL
Reference Books:	
1	NPTEL

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

CO1	Basic fundamentals of fluid mechanics, flow through pump, filters, pipes and water dispensing from fine small orifices
CO2	Knowledge on design, installation, operation, automation and evaluation of micro-irrigation system.
CO3	Most efficient irrigation methods for agricultural field , commercial, vegetable and plantations crops
CO4	Knowledge to promote consultancy and entrepreneurship.
CO5	Useful to Engineers interested for working in Micro-Irrigation Industry and field practicing personnel

Type	Code	Employability Enhancement Training -2	L-T-P	Credits	Marks
SC	BTEC-T-SC-408		3-0-1	3	150

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

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Cubes and dices(Problem based on Single Dice, Two or more Dice), Number series(Constant difference series, Addition Series, Subtraction Series, Division Series, Multiplication Series, Odd or Even Number Series, Prime Number Series Squares or Cubes series, Alternate Pattern Series, Fibonacci Series, Arithmetic Series, Geometric Series, Triangular series, Mixed Pattern Series, Wrong number series),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)	**5 Hours**
Module-2	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),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).	**5 Hours**
Module-3	Data sufficiency(checking and testing a given set of information) Algebra(,Elementary Algebra, Advanced Algebra, Abstract Algebra, Linear Algebra) Mensuration(2D&3D) Height and distance, HCF & LCM, Clocks, Probability	**5 Hours**
Module-4	Calenders (Counting odd day, counting with reference date, without reference date, Repetition) Simplification and approximation (missing numbers , simplifying equation),Train problems(length, speed, distance, relative speed, direction),Average, Partnership, Progression (Arithematic, Geometric, Harmonic).	**5 Hours**
	Total	**20Hours**

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

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

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

Type	Code	Farm Machinery and Equipment II Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-501		0-0-2	1	100

Objectives	1. Practical knowledge on machinery and farm implements related to intercultural, harvesting and post-harvest operation 2. Study the adjustments of different components to enhance performance 3. Know the material construction of different equipment
Pre-Requisites	Knowledge on Farm machinery
Teaching Pedagogy	field practical with use of machines and equipment through interaction and discussion

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Expt No	Topic
1	Study of sprayer and functional components
2	Study of duster and functional components.
3	Study of potato planter and components
4	Familiarization with manual weeding equipment and identification of
5	Functional components.
6	Study of fertilizer application equipment
7	Study of fertilizer broadcaster
8	Familiarization with combine harvester. Study on construction and function of Different parts of combine harvester
9	Study of potato digger/harvester, constructional details, materials and working
10	Study of groundnut harvester, constructional details, materials and working

Type	Code	Engineering Properties of Agricultural Produce Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-402		0-0-3	1	100

Objectives	Knowledge on determination of various properties of grains, fruits, vegetables etc.
Pre-Requisites	Knowledge on soils science, agronomical practices for field and crops
Teaching Scheme	Practical with use of devices, tools and equipment through interaction and discussion

Evaluation Scheme

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

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Module-#	Topics	Hours
Experiment-1	Determine the size of grains, fruits and vegetables using measuring instruments	**2Hours**
Experiment-2	Determine the size of grains, fruits and vegetables using projector	**2Hours**
Experiment-3	Determine the shape (sphericity and roundness) of grains and fruits and	**2Hours**
Experiment-4	Determine the bulk and particle volume, bulk and particle density and porosity of grains	**2Hours**
Experiment-5	Determine the volume, density and specific gravity of large individual objects (F &V)	**2Hours**
Experiment-6	Determine the surface area of the fruits and vegetables	**2 Hours**
Experiment-7	Determine angle of repose of grain	**2 Hours**
Experiment-8	Determine specific heat of some food grains	**2 Hours**
Experiment-9	Find out the co-efficient of friction of different grains with different surface	**2 Hours**
Experiment-10	Find out the co-efficient of internal friction of different grains	**2 Hours**
Experiment-11	Study the separating behavior of grains in a vertical wind tunnel	
Experiment-12	Determine hardness of food materials.	**2 Hours**
	Total	24 Hours

Type	Code	Mechanics & Open Channel Hydraulics Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-403		0-0-3	1	10

Objectives	Acquire knowledge on soil mechanics and fluid mechanics and flow behavior of fluid in channels and pipes for field application in crop production with efficient irrigation purpose
Pre-Requisites	Basic Mechanical and Civil Engineering
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Expt No	Topic	Hours
1	Determination of specific gravity, bulk density, dry density by sand replacement method	2 Hours
2	Determination of grain size distribution of coarse grained soil by sieving	2 Hours
3	Determination of grain size by hydrometer method	2 Hours
4	Determination of liquid limit by Cassagrande apparatus/cone penetrometer	2 Hours
5	Determination of plastic limit of soil specimen	2 Hours
6	Determination of shrinkage limit of soil	2 Hours
7	Optimum mc of saturated soil by Abbot's compaction test/Proctor's mould method	2 Hours
8	Hydraulic conductivity by falling head/constant head method	2 Hours
9	Consolidation characteristics of soil	2 Hours
10	Shear strength of soil by direct shear test/ tri-axial shear test	2 Hours
11	Study of manometers and pressure gauges	2 hours
12	Determination of co-efficient of discharge of venture meter, rectangular / triangular notch	2 Hours

Type	Code	Project-III	L-T-P	Credits	Marks
PS	BTAG-P-PS-401		3-0-1	2	150

Objectives	To analyze the designing process of equipment for Harvesting and processing and value addition of agricultural produce
Pre-Requisites	Knowledge of farm machinery and equipment and Engineering properties of agricultural produce
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples and monitoring of progress from time to time.

Detailed Syllabus

Projects

1. Fabrication of Solar power grass cutter (prototype model)
2. Agricultural Paddy Cleaning System by using Solar Power
3. Portable vegetable Cutter and Slicer
4. Fabrication of low cost harvesting machine
5. Fabrication of solar seed dryer
6. Fabrication of tomato grader
7. Sensor based Automatic Fault Egg Sorting Machine
8. Automatic soil Moisture Controlling System for Garden
9. Fabrication of solar operated spray pump
10. Fabrication of solar operated automatic bird repellent device
11. Fabrication of composite grain separator
12. Fabrication of Beans Sheller machine
13. Design and fabrication of chili seeds extractor.
14. Design and fabrication of a tomato seed extractor.
15. Design and fabrication of a brinjal seed extractor.
16. Study on Moringa leaf powder.
17. Study on extruded vegetables.
18. Use of IOT for measuring flow velocity in channel.
19. Study on egg yolk and egg White powder
20. Study on egg shell powder

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

CO1	Utilization of solar power in agricultural operation for drudgery reduction
CO2	Quality improvement of agricultural produce
CO3	Efficient utilization of irrigation of water
CO4	Development of cost saving devices for agricultural operation
CO5	Utilization of food waste for useful purpose