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

All Branches

(Approved by Academic Council and Board of Studies)

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

1st Year Course Structure

First Semester

Theory

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

Practical

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

Second Semester

Theory

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

Practical

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

SUMMER INTERNSHIP TRAINING for 30 Days

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

Program Outcomes (UG Engineering)

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

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

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

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

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

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

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

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

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

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

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

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

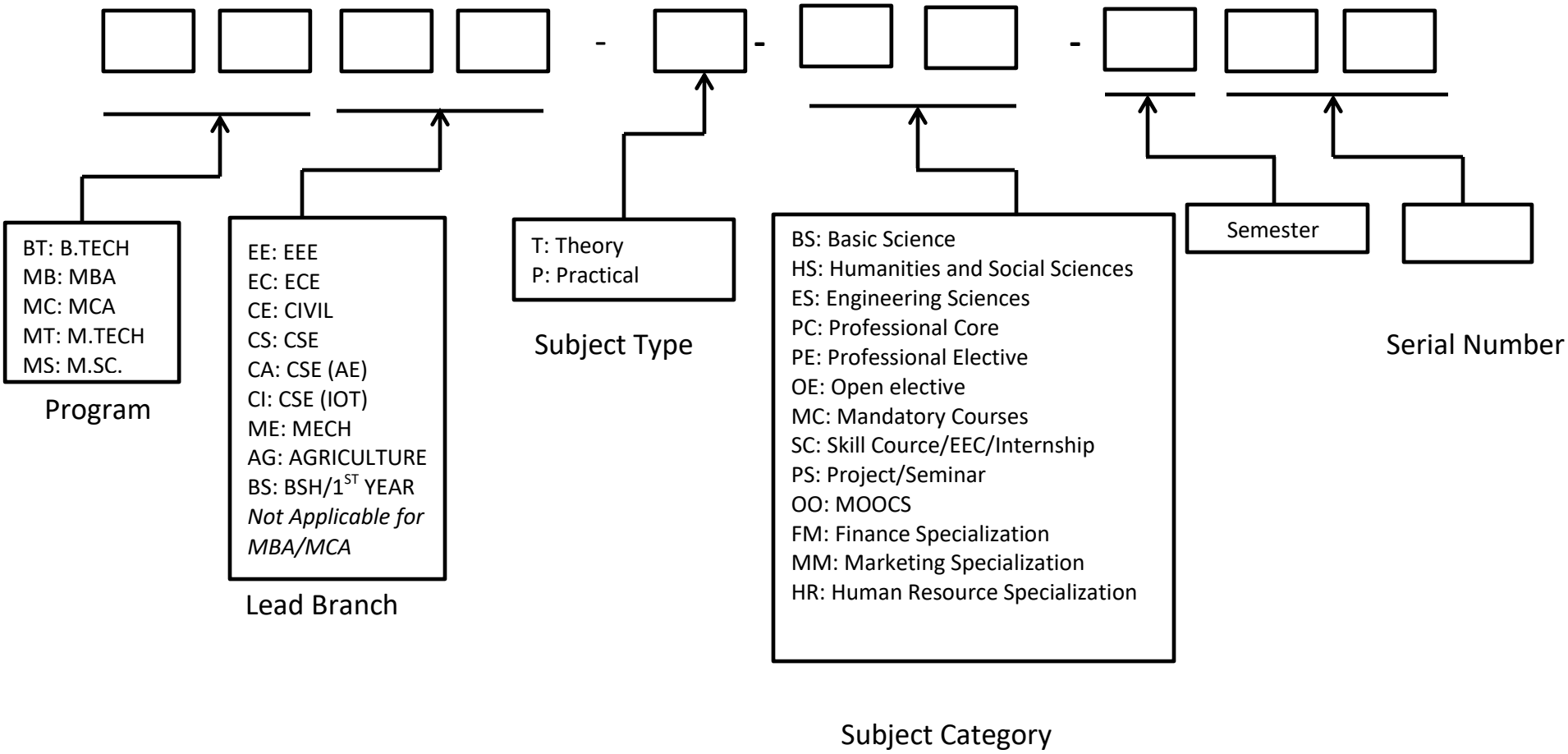
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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

Course Types & Definitions

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

Subject Code Format



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

Contents

First Year B.Tech

Curriculum Structure

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

Evaluation process

1. Evaluation Process of Theory Subjects:

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

2. Evaluation Process of Practical Subjects:

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

3. Evaluation Process of Skill Courses:

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

4. Evaluation Process of Mandatory Courses:

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

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

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

Detailed Syllabus

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

Text Books:

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

Reference Books:

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

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

Online Resources:

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

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

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

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

Objectives	1. To expose students to the fundamental principles and laws of mechanics in Physics to understand the types of motion. 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 12^{th} level Physics course
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

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

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

Text Books:

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

Reference Books:

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

Online Resources:

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

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

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

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

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

Detailed Syllabus

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

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

Text Books:

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

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

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

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

Reference Books:

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

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

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

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

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

Online Resources:

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

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

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

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

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

Detailed Syllabus

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

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

Text Books:

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

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

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

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

Reference Books:

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

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

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

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

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

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

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

Dhanpat Rai & Co. (P) Limited

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

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

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

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

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

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

Online Resources:

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

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

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

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

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

Detailed Syllabus

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

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

TextBooks:

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

ReferenceBooks:

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

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

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

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

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

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

Detailed Syllabus

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

Text Books:

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

Reference Books:

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

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

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

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

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

Detailed Syllabus

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

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

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

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

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

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

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

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

Detailed Syllabus

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

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

R2. Personality Development by Swami Vivekananda

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

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

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

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

Detailed Syllabus

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

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

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

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

Indicative Projects

MS WORD

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

MS Excel

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

Power Point

1. Poster Design
2. Banner Design

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

MS Access

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

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

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

Evaluation Scheme

Detailed Syllabus

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

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

Text Books:

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

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

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

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

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

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

Detailed Syllabus

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

Text Books:

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

Reference Books:

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

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

Online Resources:

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

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

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

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

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

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Basic Terminologies: Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Asymptotic Notations, classification of data structure. Basic data st ructure:1d-Array and 2d-Array Data Structure Operations: insertion, deletion, traversal Sparse matrix, address calculation of Array , ADT(Abstract Data type),DMA(Dynamic memory allocation),pointer, Self-referential structure. A comparison between DMA and SMA. De-allocation Strategy, Buddy System, Compaction.	**10 Hours**
Module-2	**Stacks and Queues**: ADT Stack array representation and its operations: Algorithms Applications of Stacks: Expression Conversion and evaluation of expression and corresponding algorithms, application of stack. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Array representation and Operations on each types of Queues: Algorithms and their analysis, application of queue.(Simulation, CPU Scheduling in Multiprogramming Environment, Round Robin Algorithm).. Priority Queues.	**8 Hours**
Module-3	**Linked Lists**: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**8 Hours**
Module-4	**Sorting and searching:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix sort; Performance and Comparison among all the methods, Searching: Linear search, Binary search and time complexity and space complexity analysis, Hashing: Hash function and technics of hashing, External sorting.	**8 Hours**

Module-5	**Trees**: Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree, Tree Traversing, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis, Red black trees: definition and operation, Applications of all trees. **Graph**: Basic Terminologies and Representations (Adjacency matrix and linked list representation), Graph search and traversal algorithms and complexity analysis, classification of graph Minimum spanning tree (Kruskal and prims algorithm), Shortest path algorithm: Dijkstra's algorithm, topological sorting.	**6 Hours**
Total		**40 Hours**

Text Books:

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

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

Reference Books:

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

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

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

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

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

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

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

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

DetailedSyllabus

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

TextBooks:

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

ReferenceBooks:

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

Online Resources:

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

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

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

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

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

Detailed Syllabus

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

Text Books:

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

Reference Books:

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

Online Resources:

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

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

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

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

Objectives	The laboratory should help students to understand the role of direct observation in physics and to distinguish between inferences based on theory and on the outcomes of experiments.
Pre-Requisites	Knowledge of Physics in Secondary Education
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	Determination of rate constant for saponification of ester with an alkali-titrimetric	**2 Hours**
Experiment-4	Determination of turbidity of different samples of water by	**2 Hours**
Experiment-5	Estimation of Ca^{2+} ion in a sample of limestone	**2 Hours**
Experiment-6	Determination of partition coefficient of I_2 between benzene and water.	**2 Hours**
Experiment-7	Determination of flash and fire point of an oil by Pensky Martine's apparatus.	**2 Hours**
Experiment-8	Determination of viscosity of lubricating oil by Redwood viscometer.	**2 Hours**
Experiment-9	Determination of available chlorine in a sample of bleaching powder	**2 Hours**
Experiment-10	Determination of TH value of water by EDTA method.	**2 Hours**
	BEYOND SYLLABUS	
Experiment-11	Preparation of soap and detergent.	**2 Hours**
	Total	**22 Hours**

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

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

Indicative Projects

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

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

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

Detailed Syllabus

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

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

Online Resources:

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

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

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

Indicative Projects

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

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

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

Detailed Syllabus

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

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

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

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

Indicative Projects (Mechanical)

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

Indicative Projects (Civil)

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

17. Various field test of cement.

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

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

Detailed Syllabus

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

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

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

Projects using C Programing

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

Arduino based Project

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

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

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

Detailed Syllabus

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

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

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

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

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

Detailed Syllabus

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

After completing this course the students should be able to:

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

CO6	Apply the knowledge to create building drawings

Indicative Projects

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

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

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

Detailed Syllabus

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

After completing this course the students should be able to:

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

CO6	Discuss the application of Sheet metal Operation.

Indicative Projects

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

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

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

Detailed Syllabus

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

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

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

Indicative Projects

Arduino based Project

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

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

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

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

DetailedSyllabus

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

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

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

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

AGRICULTURE ENGINEERING

(Approved by Academic Council and Board of Studies)

GIFT Autonomous , Bhubaneswar
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)
Recognized under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, 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	Organisational Behaviour/ Engineering Economics	3-0-0	3
7	ES	BTCS-T-ES-301	Object Oriented Programmins using JAVA	4-0-0	2
8	MC	BTMC-T-MC-301	Environmental Engineering	2-0-0	0
9	SC	BTSC-T-SC-301	Employability Enhancement Training-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	Object Oriented Programmins using JAVA Lab	0-0-2	1
4	PS	BTPS-P-PS-301	Seminar-1 (1)	0-0-3	1
5	SC	BTSC-P-SC-301	ESI-1 (2)	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	Organisational Behaviour/ Engineering Economics	3-0-0	3
5	PE	BTAG-T-PE-401	Agricultural Structural and precision farming	3-0-0	3
6	OO	BTAG-T-OO-401	NPTEL	2-0-0	2
7	SC	BTSC-T-SC-302	Employability Enhancement Training-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

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**	**4**	**100**	**50**
2	**Online Quiz Test**	**10**	**4**	**40**	**10**
3	**Assignment**	**10**	**2**	**20**	**10**
4	**Subject Specific Project**	**15**	**1**	**15**	**15**
5	**Attendance**	**15**	**1**	**15**	**15**
TOTAL				**190**	**100**
Pass Mark					**45**

Proposed External Examination (B. Tech, Autonomous)				
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	Refrigeration and Air Conditioning	L-T-P	Credits	Marks
PE	BTAG-T-PE-301		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	100

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		L-T-P	Credits	Marks
SC	BTSC-T-SC-301	**Employability Enhancement Training-1**	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	100

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	Object Oriented Programming 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 papers.
CO3	Sketch the application of the technology for the use of the mankind.
CO4	Analyse and correlate the new technology with the subject of interest for further study.
CO5	Evaluate, plan and reframe the technology with the communication skills for a better explanation and presentation.
CO6	Modify and design the concept into the realistic world.

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

Objectives	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.

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,

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**

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 throughout their career.
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Cubes and dices(Problem based on Single Dice, Two or more Dice), Number series(Constant difference series, Addition Series, Subtraction Series, Division Series, Multiplication Series, Odd or Even Number Series, Prime Number Series Squares or Cubes series, Alternate Pattern Series, Fibonacci Series, Arithmetic Series, Geometric Series, Triangular series, Mixed Pattern Series, Wrong number series),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

Detailed Syllabus

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		L-T-P	Credits	Marks
P	BTAG-P-PC-402	**Engineering Properties of Agricultural Produce Lab**	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	

Detailed Syllabus

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	100

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

Syllabus for
B. Tech (3rd Year)
(2022 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

3rd Year Course Structure

Fifth Semester					
Theory					
Sl. No.	**Category**	**Course Code**	**Course Title**	**WCH L-T-P**	**Credit**
1	PC	BTAG-T-PC-501	Tractor Engines, Systems and Controls	4-0-0	3
2	PC	BTAG-T-PC-502	Watershed Hydrology, planning and management	4-0-0	3
3	PE	BTAG-T-PE-501	Structural design, estimation & costing	4-0-0	3
4	PE	BTAG-T-PE-502	GIS &Remote Sensing	4-0-0	3
5	OE	BTAG-T-OE-501	Sensor and Transducers	3-0-0	3
6	PC	BTAG-T-PC-503	Post-harvest Engineering of cereals, pulses & oil seeds	4-0-0	3
7	MC	BTMC-T-MC-501	Universal Human Value (UHV)	2-0-0	0
8	SC	BTSC-T-SC-501	EET-3	2-0-0	1
			Total Hours/ Credit**(Theory)**	27	19
Practical					
1	PC	BTAG-P-PC-501	Tractor Engines, Systems and Controls Lab	0-0-2	1
2	PC	BTAG-P-PC-502	Watershed Hydrology, planning and management Lab	0-0-2	1
3	PC	BTAG-P-PC-503	Post-harvest Engineering of cereals, pulses & oil seeds Lab	0-0-2	1
4	PS	BTPS-P-PS-501	Seminar-2	0-0-3	1
5	SC	BTSC-P-SC-501	ESI-2	0-0-3	2
Total Hours/ Credit(Practical)				12	6
Grand Total Hours/ Credit				**39**	**25**

Sixth Semester					
Theory					
Sl. No.	**Category**	**Course Code**	**Course Title**	**WCH L-T-P**	**Credit**
1	BS	BTAG-T-PE-601	Optimization Engineering	4-0-0	4
2	PC	BTAG-T-PC-601	Dairy and Food Engineering	4-0-0	3
3	PE	BTAG-T-PE-602	Tractor and Farm Machinery Operation and Maintenance	2-0-0	2
4	PC	BTAG-T-PC-602	Irrigation and Drainage Engineering	4-0-0	3
5	OE	BTAG-T-OE-602	Instrumentation and Control Engineering	3-0-0	3
5	OE	BTAG-T-OE-601	Artificial Intelligence and Machine learning	3-0-0	3
6	OO	BTAG-T-OO-601	NPTEL	2-0-0	2
7	SC	BTSC-T-SC-601	EET-4	2-0-0	1
Total Hours/ Credit**(Theory)**				25	21
Practical					
1	PC	BTAG-P-PC-601	Dairy and Food Engineering Lab	0-0-2	1
2	PC	BTAG-P-PC-602	Irrigation and Drainage Engineering Lab	0-0-2	1
3	PF	BTAG-T-PE-602	Tractor and Farm Machinery Operation and Maintenance Lab	0-0-2	1
3	PS	BTPS-P-PS-601	Project 1	0-0-3	2
Total Hours/ Credit(Practical)				7	5
Grand Total Hours/ Credit(Practical)				**32**	**26**
SUMMER INTERNSHIP TRAINING for 30/45 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 to engage in independent and life-long learning in the broadest context of technological change.

Course Types & Definitions

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

3rd Year B. Tech.
(AGRICULTURE ENGINEERING)

Contents

3rd Year B.Tech.
Agriculture Engineering

Curriculum Structure

(5th Semester)

(6th Semester)

Evaluation process

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

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

Proposed External Examination (B. Tech, Autonomous)				
Sr No	**Type of Test**	**Mark**	**Frequency**	**Total Mark**
1	End Semester Examination	100	1	**100**
Pass Marks				**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	Tractor Engines, Systems and Controls	L-T-P	Credits	Marks
PC	BTAG-T-PC-501		3-0-0	2	1

Objectives	1. Know about the sources of farm power and different types of engines 2. Understand different system of tractor like lubrication, cooling, governing, testing and power transmission system 3. Acquire knowledge about tractor testing and power outlet
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 real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Sources of Farm Power and Classification of Tractors and IC Engines.** Farm Power- Conventional and non-conventional sources, merits and demerits; Tractors and IC Engines – classifications, working principle, fuel used and different design criteria. Review of thermodynamic principles of engines and deviation from ideal cycle- thermal efficiency of Otto, Diesel and Dual cycle, problems; Components of IC Engine and Strokes and Valve System – engine components, construction, operating principles and functions; comparison of 2/4 stroke and SI and CI engines; valve mechanism in 4-stroke engines, valve timing diagram, valve clearance Adjustment; cam profile, valve lift and valve opening area.	8 hours
Module-2	**Air Cleaning System**, Fuel Supply System/ Fuel Injection System and Ignition of SI Engines Air cleaners and their performance characteristics; Fuels, their properties, detonation and knocking, air-fuel ratio, tests on fuel for SI and CI engines, carburetion system and carburetors; Injection pump – types, working principles; fuel injector nozzles, types and working principle; ignition system of SI engines, electrical system including battery, starting motor, battery charging, cut-out etc. and comparison of dynamo and alternator.	8 hours
Module-3	**Engine Lubrication, Cooling, Governing and Testing.** Lubrication system, lubricants – physical properties, additives and their application; cooling need and methods and main functional components, thermostat valves, additives in the coolant, radiator efficiency; governors, types and governor characteristics	08 hours
Module-4	**Power transmission system and function**; Clutch types ; operation of gear box and their components; Types of gear box – sliding mesh, Constant mesh, synchromesh type; Differential and Final drive system; Calculation of gear reduction. Brake system- brake system of tractor, braking torque, brake fade; Steering System- Pure rolling/ true rolling condition for steering system; Components of steering mechanism, lock angles and steering geometry; Ackerman steering mechanism; Steering systems in track type tractors; Hydraulic System- Familiarization of hydraulic system and ADDC.	8 hours

Module 5	**Power Outlet** PTO drive, types and standards; traction, terminologies of traction; Shear force and rolling resistance calculation; wheels, tyres construction and specifications; Stability of Tractor- Tractor chassis mechanics, forces acting on tractor; Weight transfer; Longitudinal stability and drawbar pull; Lateral stability; Effect of speed on lateral stability during turning of tractor; Location of CG of tractor, various methods of determination of cg of tractor. Ergonomics- Ergonomically considerations for tractor; Noise and vibration in tractor; Safety- Operational safety requirements,ROPS	08 Hours
Module 6	**Tractor testing**- Purpose of testing, BIS test codes for tractor and engine and familiarization with the basics of engine testing	05 Hours
	Total	**45 Hours**

Text Book	
1.	Liljedahl J B, Turnquist P K , Smith, D W and Hoki M. "Tractors and Their Power Units.
2.	Rodichev V and G Rodicheva. "Tractors and Automobiles."
Reference Books	
1	Farm Tractor, Maintenance and Repair, by SC Jain and C R Rai Standard Publisher and Distributers, Delhi-6
2	Engineering Principles of Agricultural Machines, by A. K. Srivastav, C.E. Goering and r. p.

Course Outcomes

CO1	Knowledge on different sources of farm power and details on working of IC Engines
CO2	Knowledge on different systems of IC engine with their working components
CO3	Detailed knowledge on properties of lubricants, working of governor and basics of testing
CO4	Knowledge on power transmission system and Hydraulic system of tractor
CO5	Knowledge on different power outlet of tractor and methods of CG determination
CO6	Acquire knowledge about tractor testing

Type	Code	Watershed Hydrology, Planning and Management	L-T-P	Credits	Marks
PC	BTAG-T-PC-502		4-0-0	3	150

Objectives	1. Study about watershed and hydrology cycle. 2. Acquire knowledge about watershed planning and allied agriculture. 3. Knowledge on preparation of techno-economically effective project proposal.
Pre-Requisites	Basic civil engineering

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth- area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-interception, infiltration -factors influencing, measurement and indices. Evaporation - estimation and measurement. Runoff - factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, rational method, Cook's method and SCS curve number method, problem solving.	**10 Hours**
Module-2	Watershed - introduction and characteristics, Watershed development - problems and prospects, Delineation and prioritization of watersheds; Investigation, topographical survey, soil characteristics, vegetative cover, present land use practices and socio- economic factors; Watershed management – concept, objectives; factors affecting, watershed planning based on land capability classes	**09 Hours**
Module - 3	Hydrologic data for watershed planning, watershed codification; Sediment yield index. Water budgeting in a watershed; Management measures – rainwater conservation technologies - in-situ and ex-situ storage; Water harvesting and recycling; Dry farming techniques - inter-terrace and inter-bund land management.	**05 Hours**
Module – 4	Integrated watershed management - concept, components, arable lands – agriculture and horticulture, non-arable lands - forestry, fishery and animal husbandry. Effect of cropping systems, land management and cultural practices on watershed hydrology. Watershed programme - execution, follow-up practices; Maintenance, monitoring and evaluation; Participatory watershed management - role of watershed associations, user groups and self-help groups management	**09 Hours**
Module – 5	Planning and formulation of project proposal for watershed management programme including cost-benefit analysis. Delineation of watersheds using top sheets; preparation of watershed map, Quantitative analysis of watershed characteristics and parameters; Analysis of hydrologic data for planning watershed	**06 Hours**
Module – 6	Water budgeting of watersheds; Prioritization of watersheds based on sediment yield index; functional requirement of watershed development structures; role of various functionaries in watershed development programmes. Software use for analysis of hydrologic parameters of watershed; Techno-economic viability analysis of watershed project	**06 Hours**
TOTAL		**45 Hours**

Text Books:	
1	Singh, G.D. and T.C. Poonia. 2003. Fundamentals of Watershed Management Technology. Yash Publishing House, Bikaner.
2	Sharda, V.N., A.K. Sikka and G.P. Juyal. 2006. Participatory Integrated Watershed Management: A Field Manual. Central Soil and Water Conservation Research and Training Institute, Dehradun.
Reference Books:	
1	Ghanshyam Das. 2008. Hydrology and Soil Conservation Engineering: Including Watershed Management. 2nd Edition, Prentice-Hall of India Learning Pvt. Ltd., New Delhi.
2	Katyal, J.C., R.P. Singh, Shriniwas Sharma, S.K. Das, M.V. Padmanabhan and P.K. Mishra. 1995. Field Manual on Watershed Management. CRIDA, Hyderabad.
3	Mahnot, S.C. 2014. Soil and Water Conservation and Watershed Management. International Books and Periodicals Supply Service. New Delhi.

Course Outcome

CO1:Underatand about watershed problems and prospects
CO2:Able to design of the earthen embankment, diversion structures and water harvesting structures
CO3: Evaluating and monitoring of watershed programme
CO4: Planning and formulation of project proposal
CO5:Understand the relevance of various components of hydrologic cycle
CO6: Acquire knowledge about watershed budgeting

Type	Code	Structural Design , Estimation and Costing	L-T-P	Credits	Marks
PE	BTAG-T-PE-501		3-1-0	3	150

Objectives	1. Gain knowledge on basics of cement storage structures and silos. 2. Analyze various loads experienced in dam and steel structure. 3. Finally apply this knowledge in estimate and costing for setting new structure.
Pre-Requisites	Civil Engineering, Mathematics
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

	Topics	Hours
Module-1	Design of RCC – loads and use of BIS codes, analysis and design of singly reinforced sections – under reinforced and over reinforced concrete – significance of design; design of beam, column and slab; design of retaining walls - load analysis – reinforcement arrangement – use of BIS code;	**10 Hours**
Module-2	Design of silos – load analysis – reinforcement arrangement. Slope and deflection of Beam – using integration techniques , moment area Theorems , conjugate beam method, problems of slope and deflection .	**08 Hours**
Module - 3	Masonry dam – stability analysis & problems on masonry dam, statically independent beams – analysis of continuous beams using superimposition and solving problems.	**06 Hours**
Module - 4	Design of Steel structures – loads and use of BIS codes, rivet connections, specifications, use of code; welded connections, specifications, use of code; design of structural steel members in tension and compression .	**06 Hours**

Module-5	Identification of tension members in a structure – specification of maximum stresses – use of code for design; design of steel roof truss – analysis of roof truss – structural components roof truss – use of BIS code.	**06 Hours**
Module-6	Estimating and costing – types of estimates , rough cost , detailed and supplementary estimate preparation of cost estimate , cost analysis , schedule of rates, analysis of rates; cost economics – measurement and pricing , economic methods for evaluation of buildings , benefit cost calculation , payback period	**09 Hours**
TOTAL		**45 Hours**

Text Books:	
1	Ray Choudhury K.P. engineering materials, oxford & IBH Pub.Co.New Delhi.
2	Sushil Kumar . Treasure of R.C.C Designs , standard Book House , New delhi-6.
Reference Books:	
1	P.H Pandey Principles and pratices of agricultural structures and environmental control, kalyani Publishers, New Delhi.
2	Ahuja T D and Birdi G. S Fundamentals of building construction , Dhanpat Rai & sons , New Delhi.

Course Outcomes

CO1	Design of RCC
CO2	Knowledge on the slope and deflection of Structures
CO3	Design of Masonry dam
CO4	Design of steel structures
CO5	Acquire knowledge about Roof truss
CO6	Knowledge on the estimation and costing of structures

Type	Code	GIS and Remote Sensing	L-T-P	Credits	Marks
PE	BTAG-T-PE-502		3-0-0	3	150

Objectives	1. To know about Remote sensing and its application in real world. 2. To know about GIS and its application 3. To know about data model and structures
Pre-Requisites	Basic computer knowledge
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, Types, Application and importance of Remote Sensing; Physics of Remote Sensing; The Electromagnetic spectrum; Spectral Reflectance Curves; Spectral signatures; Resolution.	**05 Hours**
Module-2	Remote Sensing Platforms: Ground, airborne and satellite-based platforms; Some important Remote Sensing Satellites. Sensors: Passive and Active Sensors; Major Remote Sensing Sensors; Satellite band designations and principal applications; Colour / False Colour; Aerial Photography/ Aerial Photo Interpretation.	**08 Hours**
Module - 3	Digital Image Processing: Pixels and Digital Number; Digital Image Structure; Format of Remote Sensing Data; Image Processing functions: Image Restoration, Image Enhancement.	**05 Hours**
Module - 4	Geographic Information System: Introduction; Preparation of thematic map from remote sensing data; Co-ordinate systems; GIS components: Hardware, software and infrastructures; GIS data types: Data Input and Data Processing; DEM/ DTM Generation.	**09 Hours**
Module - 5	Integration of GIS and Remote Sensing - Application of Remote Sensing and GIS – Water resources –Urban Analysis – Watershed Management – Resources Information Systems. Spatial planning approach. Global Positioning System – an introduction. **Practcal use of ARC GIS for different purpose.**	**09 Hours**
Module - 6	Data Models and Structures: Data Models - Spatial Data, Attributes and Measurement scale; Data models classification - Raster data, vector data; Data structures - conversion between data models and structures, Different uses of data in GIS	**09 Hours**
Total		**45 Hours**

Text Books:	
1	Remote Sensing and GIS - Anji Reddy M., The Book Syndicate, Hyderabad, 2000.
2	Principles of Geographical Information Systems - P A Burrough and R. A. McDonnell, OUP, Oxford, 1998.
Reference Books:	
1	Geographic Information System- Kang Tsung Chang, Tata Mc Graw Hill, Publication Edition, 2002.
2	Remote Sensing for Earth Resource- Rao, D.P., AEG Publication, Hyderabad, 1987.

Course Outcomes

CO1	To know about remote sensing and its applications
CO2	Acquire knowledge about components of remote sensing
CO3	To Know about digital image and its processing
CO4	To know about GIS and its Components
CO5	To know about GPS
CO6	To know about data models and data structures

Type	Code	Sensor and Transducers	L-T-P	Credits	Marks
OE	BTAG-T-OE-501		3-0-0	3	150

Detailed Syllabus

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

Module-#	Topics	Hours
Module-1	Definition of sensor and transducer, classification of transducers, Advantages and Disadvantages of Electrical Transducers, performance characteristics, selection criteria, transducer specification, test and operating conditions, Classification of Errors, Role of sensors in industry..	**09 Hours**
Module-2	Resistance Vs Temperature characteristics for different materials, Thermistors, Thermocouples - thermoelectric effects for thermocouples, thermocouple tables, RTD, Other Thermal Sensors. Radiation temperature sensors, Pyro-electric type Temperature Sensor.	**09 Hours**
Module - 3	Operational amplifiers-ideal and non-ideal performances, inverting, non-inverting and differential amplifiers. DC Signal conditioning and AC Signal conditioning, Single channel and multi-channel data acquisition system. **Use of sensors in soil, water , plant and environmental engineering**	**08 Hours**
Module - 4	Capacitive and inductive transducers, Piezo-electric sensors, Magnetic and ultrasonic flow meter, IR sensor, LDR, Fiber optic sensor, Photo conductive cell, photo voltaic transducers, Velocity Transducer, Accelerometer, Smart Sensor, Difference between Normal Sensor & Smart Sensor, Applications of sensors in drone.	**14 Hours**
Total		**40 Hours**

Text Books:	
1	Curtis D. Johnson, “Process Control Instrumentation Technology”, Prentice Hall India.
2	D.V.S. Murty, “Transducers and Instrumentation”, Prentice Hall India
3	Introduction to Measurement and Instrumentation, A.K. Ghosh , PHI Learning, 3rd
Reference Books:	
1	Helfrick Albert D. and Cooper W. D., "Modern Electronic Instrumentation and Measurement Techniques;, Prentice Hall India
2	Kalsi H. S. "Electronic Instrumentation", Tata McGraw-Hill Education
3	Shawhney A. K. "A Course In Electrical and Electronics Measurements and Instrumentation”, DhanpatRai&Sons, 11th Ed., 1999..

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

CO1	Understand the principles of various sensors and transducers for measurement and instrumentation.
CO2	To study about different temperature Sensors
CO3	To understand working principles of different Sensors
CO4	Evaluate various measurements techniques for industrial applications
CO5	To understand working principles of optical Sensors
CO6	To understand working principles of smart Sensors

Type	Code	Post-harvest Engineering of Cereals, Pulses and Oil seeds	L-T-P	Credits	Marks
PC	BTAG-T-PC-503		4-0-0	3	100

Objectives	1. Understand basic principles of cleaning and grading. 2. Utilization of the principles of drying in the design of dryer for various agricultural produces like cereal, pulses and oil seeds. 3. Knowledge on various size reduction, material handling machines used in post-harvest technology.
Pre-Requisites	Basis food processing, thermodynamics, heating and cooling etc.
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	Cleaning and Grading Importance of different unit operations in processing of cereals, pulses and oilseeds; Cleaning and grading: Screening, type of screens, grizzly, revolving screen, shaking screen, rotary screen, vibratory screen, horizontal screen, perforated metal screen, wire mesh screen, scalping, size separators; Ideal and actual screen, effectiveness of screens, aspiration; Various types of separators (specific gravity, magnetic, disc, spiral, pneumatic, inclined belt draper, velvet roll separator, colour sorters, cyclone separator) and their capacity, shape graders, destoner.	**08 Hours**
Module-2	Drying: Objective of drying, physic thermal properties of food grains important in drying: Moisture content on dry basis and wet basis, water activity, specific heat, thermal conductivity, enthalpy, thermal diffusion, surface heat transfer coefficient; Moisture content determination, direct methods, hot air oven method, vacuum oven method, indirect methods, electrical resistance method, Unbound and bound moisture, free moisture, equilibrium moisture content, isotherm, hysteresis effect, EMC determination: static method, dynamic methods, desorption method, isotenoscopic method; EMC models: Kelvin equation, Harkins-Jura equation, Chung-Pfost equation, Handerson equation, importance of EMC; Drying theory, thin layer and deep bed drying, drying rate periods, constant rate period, falling rate period, maximum and decreasing drying rate period;	**08 Hours**
Module-3	Drying equations, mass and energy balance, Shedd's equation, different methods of drying (batch, continuous, mixing, non-mixing), dryer performance; Sun drying, mechanical drying methods, contact drying, convective drying, freeze drying, radiation drying, superheated steam drying, osmotic drying, fluidized bed drying, desiccated air drying, tempering during drying, types of air flow in mechanical drying system.	**08 Hours**

Module-4	Milling of rice- conditioning and parboiling, advantages and disadvantages, traditional methods, CFTRI and Jadavpur methods of parboiling, pressure parboiling method; Principles of operation of huller, under runner disk sheller, centrifugal sheller; Modern rice milling, different unit operations and equipment (polishing, bran removal, grading, colour sorting, glazing); Milling of pulses- traditional milling methods, commercial methods, pre-conditioning, dry milling and wet milling methods, CFTRI and Pantnagar methods and milling machines; Milling of oilseeds- Mechanical expression, screw press, hydraulic press, solvent extraction methods; Preconditioning of oilseeds, refining of oil, stabilization of rice bran .	**08 Hours**
Module-5	Size Reduction- grain shape, average size of particle in a ground product, Principle of size reduction, crushing efficiency, Bond's law, Kick's law, Rittinger's law, procedure (crushing, impact, cutting and shearing), hulling/milling efficiency; Size reduction machinery (jaw crusher, hammer mill, attrition mill, ball mill), Mixing- Theory of mixing of solids and pastes, mixing index; Types of mixers for solids, liquid foods and pastes (tumbling mixer, ribbon mixer, impeller type mixer, sigma blade mixer) Extrusion Cooking, By-product utilization.	**08 hours**
Module-6	Utilization and Material Handling, Extrusion cooking-Principle, factors affecting extrusion cooking, single and twin screw extruders; By-products utilization of grain processing industries; Material handling equipment- Types of conveyors (belt, roller and flight); Chain and screw conveyor, Elevators (bucket, cranes & hoists); Trucks (refrigerated/ unrefrigerated), pneumatic conveying	**05 hours**
TOTAL		**45 Hours**

Text Books:	
1	Chakraverty, A. 1999. Post Harvest Technology of cereals, pulses and oilseeds. Oxford & IBH publishing Co. Ltd., New Delhi.
2	Dash, S.K., Bebartta, J.P. and Kar, 2012. A. Rice Processing and Allied Operations. Kalyani Publishers, New Delhi.
Reference Books:	
1	Sahay, K.M. and Singh, K.K. 1994. Unit operations of Agricultural Processing.
2	Vikas Publishing house Pvt. Ltd. New Delhi.
3	Geankoplis C. J. 2002. Transport processes and unit operations, Prentice Hall of India Pvt. Ltd, New Delhi

Course outcomes

CO-1 Knowledge on the importance of food processing and different unit operations
CO-2 Knowledge on cleaning and grading of crops/grains
CO-3 Understand the drying characteristics of food grains
CO-4 Understand the concept of mixing , milling and size reduction of cerelas,pulses and oilseeds
CO-5 Knowledge on extrusion cooking and by products utilization of crops
CO-6 Knowledge on the different operations in material handling and transportation

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-501	**Universal Human Value**	2-0-0	0	150

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

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Foundations of Value Education-A** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education); Understanding Value Education; Self-exploration as the Process for Value Education	**3 Hours**
Module-2	**Foundations of Value Education-B** Continuous Happiness and Prosperity - the Basic Human Aspiration; Happiness and Prosperity-Current Scenario; Method to Fulfill the Basic Human Aspirations.	**3 Hours**
Module-3	**Harmony in the Human Life, Relationships and Society-A** Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; Achieving Harmony: Integrating Self and the Body; Harmony in the Family and Society	**4 Hours**
Module-4	**Harmony in the Human Life, Relationships and Society-B** 'Trust'& 'Respect'–as Foundational Values in Relationship; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society & Universal Human Order.	**3 Hours**
Module-5	**Harmony in the Nature/Existence & Professional Ethics-A** Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature; Realizing Existence as Co-existence at All Levels	**3 Hours**
Module-6	**Harmony in the Nature/Existence & Professional Ethics-**B The Holistic Perception of Harmony in Existence; Natural Acceptance of Human Values; Humanistic Education, Humanistic Constitution and Universal Human Order ; Competence in Professional Ethics – Ethical Decision Making&Transition towards Value-based Life and Profession.	**4 Hours**

Total: 20 Hours

References:

Books:

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

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

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

Type	Code		L-T-P	Credits	Marks
SC	BTSC-T-SC-501	**EET-III**	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	The 21st-century engineer must have the capacity to: Understand the Physical constructs and Contextual base of the economic, industrial, social, political, and international dimensions within which engineering is practiced; Design, in order to meet safety, reliability, environmental, cost, operational and maintenance objectives; Realize, products; Create, operate, and sustain complex systems; Participate in the process of research; and Gain the intellectual skills needed for lifelong learning	**5 Hours**
Module-2	**Conservation tillage** Conservation tillage, or minimum tillage, is a broadly defined practice that includes no-till, strip till, ridge till, and mulch till system to maintain plant residues on the soil surface after tillage activities. **Precision farming** A new concept adopted throughout the world to increase production, reduce labor time, and ensure the effective management of fertilizers and irrigation processes Farm Mechanization The development and use of machines that can take the place of human and animal power in agricultural processes.	**5 Hours**
Module-3	Secondary Agriculture Income generating activities that use crop residues i. e paddy straw, fodder blocks and crop residue briquettes to help the growth of primary agriculture. Food Safety A scientific way of handling, preparation and storage of food to prevent food borne diseases to protect any harm to consumers	**5 Hours**

Module-4	Integrated Farming System (IFS) A mix and positive interaction between two or more components, such as horticulture crops, livestock, aquaculture, poultry, apiculture, mushroom cultivation Agriculture Market Intelligence Intended to help the government in the formulation, implementation, review of the agricultural price policy relating to procurement, marketing, storage, transportation, import, export and credit, furnish regular reports on market arrivals, off-takes, stocks, crop prospects, and outlook of market prices, to give appraisal of production of various kharif and rabi crops at regular intervals to help preparation of crop forecasts.	**5 Hours**
	Total	**20 Hours**

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

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

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

Type	Code	Tractor Engines, Systems and Controls Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-401		0-0-2	1	100

Objectives	1. Practical knowledge on tractor and power tiller and its application in agriculture 2. Practical knowledge about engine parts 3. To know various control systems in different makes of tractors in relation to anthropometric measurements
Pre-Requisites	Knowledge on Farm machinery, mechanical engineering
Teaching Pedagogy	Visit for cut section model of tractor and power tiller.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Detail study of engine parts and functions	2 Hours
Experiment-2	Study of 4 and 2 stroke CI engine	
Experiment-2	Study of valve system in 4-stroke cycle engine and valve adjustment	2 Hours
Experiment-3	Air cleaning system and working principle of air cleaners	2 Hours
Experiment-4	Fuel system of SI engine and details of a carburetor, SI engine ignition system	2 Hours
Experiment-5	Details of diesel fuel system and timing of injection in diesel engine	2 Hours
Experiment-6	Details and working principle and types of cooling system	2 Hours
Experiment-7	Study of power transmission system and components of tractor	2 Hours
Experiment-8	Lubrication system and properties of lubricants	2 Hours
Experiment-9	Starting and electrical system of tractor	2 Hours
Experiment-10	Study on transmission system and components	2 Hours
Experiment-11	Study of hydraulic control and three point hitch system	2 Hours
Experiment-12	Study of differential unit and final drive in a tractor	2 Hours
Experiment-13	Study of tractor tyre and front axle(tyre size , components in tractor)	2 Hours
Experiment-14	Starting and operating a tractor (Checks before starting, method of starting, precautions)	2 Hours
Experiment-15	Tractor driving practice	2 Hours

Type	Code	Watershed hydrology, planning and management Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-502		0-0-2	1	100

Objectives	To impact knowledge to the students on principles of watershed hydrology. Enhance their capabilities of comprehension, analysis and application of watershed hydrology subject in practical field.
Pre-Requisites	Basic civil engineering
Teaching Pedagogy	Field demonstrations, visit to meterological observatory.

Detailed Syllabus

Expt No	Topic
1	Visit to meteorological observatory
2	Study of different types of rain gauges
3	Exercise on analysis of rainfall data
4	Determination of average depth of rainfall
5	Frequency analysis of rainfall data
6	Study of stage recorders and current meters
7	Exercise on estimation of peak runoff rate by rational method
8	Exercise on estimation of runoff by Cooks method
9	Exercise on estimation of peak runoff by CN method
10	Exercise on hydrographs
11	Unit hydrograph derivation
12	Double mass curve techniques for test of consistency of rainfall data
13	Exercise on flood routing problems using Modified Pul's method

Text Books:	
1	Dhruvanarayan, Sastry & Patnaik. Watershed Management , ICAR Publication

Type	Code	Post-harvest Engineering of cereals, pulses & oil seeds Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-503		0-0-2	1	100

Objectives	1. Understand basic principles of cleaning and grading. 2. Utilize the principles of drying in the design of dryer for various agricultural produces like cereal, pulses and oil seeds. 3. Knowledge on various size reduction, material handling machines used in post-harvest technology
Pre-Requisites	Basic food processing, heating , cooling, thermodynamics
Teaching Pedagogy	Practical experiment on cereals, pulses, oilseeds for value addition

Detailed Syllabus

Module-#	Name of the experiment	Hours
Experiment-1	Study of different types of cleaners and separators	2 Hours
Experiment-2	Determination of separation efficiency	2 Hours
Experiment-3	Measurement of moisture content: dry basis and wet basis	2 Hours
Experiment-4	Study of psychrometric chart and psychrometric processes	2 Hours
Experiment-5	Study on drying characteristics of grains and determination of drying constant	2 Hours
Experiment-6	Determination of EMC (Static and dynamic method)	2 Hours
Experiment-7	Study of dryer(deep bed dryers, flat bed dryers, bin dryers, continuous flow dryer, mixing and non-mixing type), re-circulatory dryer, LSU dryer, RPEC dryer	2 Hours

Experiment -8	Study of dryer(Fluidized bed dryer, rotary dryer, spouted bed dryer, tunnel dryer and tray dryer)	2 Hours
Experiment-9	Study of rice milling equipment	2 Hours
Experiment-10	Study of pulse milling equipment	2 Hours
Experiment-11	Development of process flow charts with examples relating to processing of Cereals, pulses and oil seeds	2 Hours

Type	Code	SEMINAR-III	L-T-P	Credits	Marks
PS	BTPS-P-PS-501		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 papers.
CO3	Sketch the application of the technology for the use of the mankind.
CO4	Analyse and correlate the new technology with the subject of interest for further study.
CO5	Evaluate, plan and reframe the technology with the communication skills for a better explanation and presentation.
CO6	Modify and design the concept into the realistic world.

Type	Code	Evaluation of Summer Internship(ESI)-I	L-T-P	Credits	Marks
SC	BTSC-P-SC-501		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.

Sixth Semester

Type	Code	Optimization Engineering	L-T-P	Credits	Marks
PE	BTAG-T-PE-601		4-0-0	3	150

Objectives	1. Know the LPP and simplex model 2. Know about the transportation problems 3. Know about nonlinear programme
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	Idea of engineering optimization problems, modeling of problems and principle of modeling, Linear Programming: Formulation of LPP, Graphical solution,	**05 hours**
Module-2	Simplex method, Big-M method, Dual simplex method, Duality theory.	**07 hours**
Module-3	Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Assignment problems: Hungarian method for solution of Assignment problems. Travel Salesman problem	**10 hours**
Module-4	Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method.	**05 hours**
Module-5	Non-linear programming problem: Constrained optimization with equality constraint: Lagrange multiplier method. Constrained optimization with inequality constraint: Kuhn-Tucker condition.	**05 hours**
Module-6	Inventory Theory: General characteristics, Deterministic Inventory models: EOQ model with constant rate of demand, different rates of demand, EPQ Model.	**08 hours**
	Total	**40 Hours**

Text Book
3. Operation Research: J K Sharma Macmillan India Ltd.
4. Operation Research, Prabhakar Pai ,Oxford University Press
5. Operations Research, H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, Pearson Education, Eighth Edition.
Reference Books
Operations Research, P.K.Gupta, D.S.Hira, S.Chand and Company Ltd, 2014.
Operations Research, F.S.Hiller, G.J.Lieberman, Tata McGraw Hill, Eighth Edition, 2005.

Type	Code	Dairy and Food Engineering	L-T-P	Credits	Marks
PC	BTAG-T-PC-601		4-0-0	3	150

Objectives	1. Understanding the basic unit operation of dairy and food processing engineering including homogenization. 2. Study of the dairy operations like pasteurization, sterilization , cream separation and packaging of milk. 3. Study of evaporation, drying, boilers and knowledge on plant design and layout.
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.

Details Syllabus

Module	Topic	Hours
Module- 1	General introduction, dairy development in India; Deterioration in food products, major spoilage agents, physical, chemical and biological methods of food preservation;Growth phases (Log phase,Log-exponential phase, stationary phase and death phase) andfactors (temp ,pH,Water Activity, oxygen level)affecting growth of micro-organism.Microbial control. Different constituents of milk, factors affecting composition of milk, acidity, pH, density and specific gravity, lactometer, total solids and SNF, freezing point, boiling point; Changes of milk due to boiling, expansion of milk, viscosity, surface tension, flavor, colour, fouling of milk, effect of metals on milk, selection of metals for dairy industry;	**08 Hours**
Module- 2	Unit operations in various dairy and food processing systems; Process flow charts for product manufacture: pasteurised and sterilised milk, butter, yoghurt, cheese, flavoured milk, ice cream. Working principles of equipment for receiving: Milk reception in cans, receiving of bulk milk, milk transport tanks, important considerations during unloading of milk transport tanks, milk storage tanks, storage tank accessories, milk silos; Homogenization: advantages of homogenization, different forms of fat globules, homogenization principle and method, homogeniser and its parts, factors influencing homogenization.	**08 Hours**
Module -3	Pasteurisation: difference between pasteurisation, sterilisation and blanching, Long hold batch type pasteurisation, its advantages and disadvantages; HTST method- flow chart, advantages and disadvantages, important accessories and controls in HTST pasteurisation systems; Sterilization: difference between conventional sterilisation and aseptic processing, In-bottle sterilisation, Hydrostatic retort, Continuous rotary retort, UHT processing flow chart and system controls, Fouling in UHT systems and its control; Centrifugation: major processes for separation of food, principle of centrifugation, classification of centrifuges, brief description of tubular bowl centrifuge and disk bowl centrifuge.	**08 Hours**

Module-4	Butter manufacture: principal constituents of butter, unit operations in butter making and importance of ripening, ageing, churning, etc. in the butter making process; Preparation methods and equipment for cheese, paneer and ice cream; Filling and packaging: factors causing deterioration during milk storage, different types of packaging materials for milk and products, brief descriptions about the filling and metering of liquids and pastes, filling by gravity flow, Form Fill Seal system; Piston type filling system, aseptic filling of pouches.	**08 Hours**
Module -5	Evaporation: objectives of evaporation, basic components of evaporators, different types of evaporators; Single and multiple effect evaporaters, Steam economy ;Mass and energy balance in evaporation; Drying of liquid and perishable foods: principles of drying, drum dryer,Principle of drum dryer; spray dryer; Principle and components of spray drying freeze drying. Agglomeration of dried powder.	**08 Hours**
Module -6	Dairy plant design and layout, plant utilities;Different types of steam;Simple vertical Boiler, water tube, fire tube, selection of boiler for dairy and food processing plant, , multiple effect evaporation, vapor recompression; Thermal processing:; Thermal death time, D and z value, Process time calculations; Thermal processing equipment including the complete canning process.	**05 Hours**
TOTAL		**45 Hours**

Text Books:	
1	Ahmed, T. 1997. Dairy Plant Engineering and Management. 4th Ed. Kitab Mahal.
2	Rao, D.G. Fundamentals of Food Engineering. PHI learning Pvt. Ltd. New Delhi.
3	Dash, S K, Rayaguru K, Khan, M K. 2012. Concepts in Dairy and Food Engineering. OUAT, Bhubaneswar, 114 p.
Reference Books:	
1	McCabe, W.L. and Smith, J. C. 1999. Unit Operations of Chemical Engineering. McGraw Hill.
2	Singh, R.P. & Heldman, D.R. 1993. Introduction to Food Engineering. Academic Press.
3	Toledo, R. T. 1997. Fundamentals of Food Process Engineering. CBS Publisher.

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

CO1	To know about Dairy development in India and deterioration in food products, major spoilage agents, physical, chemical and biological methods of food preservation
CO2	To know about the working principles of equipment for reception and homogenization of milk.
CO3	To know about pasteurization and sterilization of milk.
CO4	Knowledge on value added product from the milk and packaging of milk and milk

	product.
CO5	To know about evaporation , drying and thermal processing of food products
CO6	To know about filtration, membrane separation and nano-materials

Type	Code	Tractor and Farm Machinery Operation and Maintenance	L-T-P	Credit	Marks
PE	BTAG-T-PC-602		4-2-0	3	100

Objectives	1. Knowledge on operation and maintenance procedures of tractors along with implements 2. Dissemble and assemble components of farm machines 3. Operate with proper adjustments of machines in the field
Pre-Requisites	Basic mechanical 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	Introduction to tractor maintenance procedure, Familiarization with tractor controls and learning procedure of tractor starting and stopping, Familiarization with different makes and models of 4-wheeled tractors	**5 Hours**
Module 2	Identification of different tractor systems including fuel system, cooling system, transmission system, steering and hydraulic systems; Familiarization with tools for general and special maintenance	**8 Hours**
Module 3	Familiarization with service schedule, periodical service, 10 hours/daily service schedule, Maintenance after 50 hours(weekly) of tractor operation, Maintenance after 150 hours / 3 month of tractor operation, Maintenance after 500 hours/6 months of tractor operation, Maintenance after 1000 hours/one year of tractor operation, Break-down maintenance-Precautionary and break-down maintenance. Trouble shooting in tractors; Driving safety rules, Road signs, traffic rules, road safety	**8 Hours**
Module 4	Forward and reverse gear in tractors; problems associated with driving under forward and backward gears; parking of tractor: Tractor driving with two wheeled tractor trailer forward and reverse; Study and practicing the hitching and detaching of implements; Study operation and field adjustments of MB plough and disk plough; Field operation of trailing & mounted disk harrow.	**8 Hours**
Module 5	Fuel saving tips; Adjustment and maintenance of mould board plough and disk plough; Adjustment and maintenance of disk harrows; Adjustment and maintenance of seeding and planting equipment; Adjustment, operation and maintenance of harvesting equipment ; Adjustment, operation and maintenance of threshing equipment with tractor; Field operation and adjustments of seed drill/planter/sprayer.	8 Hours
Module 6	Steering geometry, wheel track adjustment; Fuel injection pumps–time setting, pressure Adjustment (nozzle opening); Maintenance of electrical system of tractor. Electrical system (including starting motor, alternator and battery); off-season maintenance - Care and Maintenance procedure of agricultural machinery during operation and off-season; Preparing the tractor for off-season storage.	**08 Hours**
TOTAL		**45 Hours**

Text Books:

1. Jain SC and CR Rai. Farm Tractor Maintenance and Repair.
2. Ghosh RK and S Swain. Practical Agricultural Engineering.

Reference Books:

1. Operators' manuals of tractors.
2. Service manuals provided by manufacturers.
3. Relevant BIS codes.

Course Outcomes

CO1	Importance of tractor maintenance
CO2	Preventive maintenance practices for tractors
CO3	Standard procedures for periodic maintenance
CO4	Standard maintenance of agricultural machinery during operation.
CO5	Off season maintenance of farm machines
CO6	Safety factors involved in operation of farm machines

Type	Code	Irrigation and Drainage Engineering	L-T-P	Credits	Marks
PC	BTAG-T-PC-602		3-0-0	3	150

Objectives	1. Know the different methods to measure the soil moisture content in the field. 2. Understand the different methodologies to compute the water requirements of crops. 3. Analyze the economic aspects of drainage projects.
Pre-Requisites	knowledge on water cycle
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	Irrigation and its importance; Irrigation potential and actually used from different sources, means to enhance the potential; Soil moisture content – Determination of soil moisture content by gravimetric method. Neutron probe, Tensiometer and gypsum block method; measurement of discharge/irrigation water by weirs, notches, orifices, mouth pieces, Parshall flume and cutthroat flume	**08 Hours**
Module -2	Conveyance of Irrigation Water Canals- classifications of canals and terminologies used in canal sections; design of economical channels section, design of unlined channels in non-alluvial soil, Kennedy's and Lacey's theory for design of unlined channel in alluvial soil , comparison between Kennedy's and Lacey's theory, numerical problem on design of unlined channels in alluvial and non-alluvial soil; Underground water conveyance system in pipes- irrigation structures used in fields, Study of canal lining and economic feasibility of lining of channels	**08 Hours**
Module -3	Soil-Water-Plant Relationship and Water Requirement of Crops Study of soil-water-plant relationship, soil water movement in crop root zone, Water requirement of crops- computation and measurement of crop water requirement by various methods, evapotranspiration of crops and methods employed to measure it; Irrigation scheduling – determination of frequency of irrigation for different crops, determination of quantity of irrigation for each crop in the field; adaptability, characteristics and types of border, check-basin and furrow irrigation; micro irrigation; design of border, check-basin and furrow irrigation methods, micro irrigation, Land grading and leveling – study of different methods of land grading, smoothing and leveling.	**08 Hours**

Module-4	Irrigation scheduling – determination of frequency of irrigation for different crops, determination of quantity of irrigation for each crop in the field; adaptability, characteristics and types of border, check-basin and furrow irrigation; micro irrigation; design of border, check-basin and furrow irrigation methods, micro irrigation, Land grading and leveling – study of different methods of land grading, smoothing and leveling.	**08 Hours**
Module-5	Water logging and Drainage Introduction, forms of excess water, causes and impacts; objectives of drainage, extent of drainage problems in the state; definition, classification of drainage systems, types of surface drainage methods and their application, drainage coefficient and its importance in drainage design; various methods to determine drainage coefficient, (GW and vadose zone) design of surface drainage system; purpose and benefits of sub-surface drainage, classification of sub-surface drainage systems; Drainage investigation- Reconnaissance survey, detailed survey of drainage basin, Investigations on hydraulic conductivity, drainable porosity, groundwater hydrology;	**08 Hours**
Module-6	Design of sub-surface drainage system for (i) Steady state condition (ii) Unsteady state condition- Dupuit-Forchhemeir assumptions and their applicability, derivation of Hooghoudt's equation (Ellipse equation) for spacing between drains, solution of drain spacing using equivalent depth concept; Derivation of Ernst equation for spacing between drains in heterogeneous soil profile; unsteady state drainage equations; Design of tile drainage system, ancillary components of sub-surface drainage system; Layout, construction and installation of drain pipes, drainage outlet	**05 hours**
Total		**45 Hours**

Text Books:	
1	Michael A.M. 2012. Irrigation: Theory and Practice. Vikas Publishing House New Delhi
2	Majumdar D. K. 2013. Irrigation Water Management Principles. PHI learning Private Limited New Delhi 2nd Edition
3	Bhattacharya A K and Michael AM. 2013. Land Drainage, Principles, Methods and Applications. Vikas Publication House, Noida (UP).
Reference Books:	
1	Panigrahi, B. 2013. A Handbook on Irrigation and Drainage. New India Publishing Agency, New Delhi
2	Murthy V V N. 2013. Land and water Management Engineering. Kalyani Publishers, New Delhi.
3	Israelsen O W. and Hansen V. E and Stringham G. E. 1980. Irrigation Principles and Practices, John Wiley & Sons, Inc. USA.

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

CO1	Introduction to irrigation methods and designing irrigation systems
CO2	Conveyance of Irrigation Water and associated losses
CO3	Knowledge on requirement of water for Plants
CO4	Introduction to Drainage methods and designing drainage systems
CO5	Land reclamation methods
CO6	Acquire knowledge about sub surface drainage system

Type	Code	Instrumentation and control Engineering	L-T-P	Credits	Marks
PE	BTAG-T-PE-602		3-0-0	3	150

Objectives	1. Design, develop, and implement systems for accurate measurement 2. Monitoring of various physical parameters such as temperature, pressure, flow, and level in industrial processes. 3. Understand the control system
Pre-Requisites	Basic Mathematics, Physics
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Text Books:	
1	Principles of Instrumentation" by D. Patranabis: This book covers the basic principles of instrumentation, making it suitable for beginners and those looking for a solid foundation

Detailed Syllabus

Module-#	Topics	Hours
Module -1	Measurement system and error analysis, measurement of level, flow, temperature, strain pressure, vacuum, force, torque, power, displacement, vibration, acceleration, pH, colour viscosity, surface tension and composition.	**08 Hours**
Module -2	Indicating recording instruments, digital displays, transmitting and telemetering devices	**08 Hours**
Module -3	Industrial Instrumentation Overview of Industrial Processes,Process Variables and Control Loops , Control Valves and Actuators , SCADA and PLC Systems	**08 Hours**
Module-4	Introduction to control system- Feedback and feed forward control strategies, block diagrams, Laplace and inverse Laplace transforms mathematics models of physical systems, transfer functions steady state analysis, dynamics of first and second order systems	**08 Hours**
Module-5	Mode of control and generation of control action; P. PI and PID control elements and value positioners, frequency response and root locus analysis. Stability and quality of overall control	**08 Hours**
Module-6	Electronic, pneumatic and hydraulic control systems and their application in farm machinery, food processing industry, aquaculture and their applications milk processing plants..	**05 hours**
Total		**45 Hours**

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

CO1	Understand the basic concepts and importance of instrumentation and control systems in engineering applications
CO2	Identify various components and their functions in a control system.
CO3	Analyze the different types of control systems and their applications.
CO4	Understand the principles of measurement and calibration.
CO5	Design measurement systems for various engineering parameters.
CO6	Acquire knowledge about hydraulic control system

Type	Code	Artificial Intelligence and Machine learning Engineering	L-T-P	Credits	Marks
OE	BTAG-T-OE-601		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	INTRODUCTION –The Foundations of Artificial Intelligence; - INTELLIGENT AGENTS – Agents and Environments, Good Behaviour: The Concept of Rationality, the Nature of Environments, the Structure of Agents, SOLVING PROBLEMS BY SEARCH – Problem-Solving Agents, Formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information, Informed (Heuristic) Search Strategies, Greedy best-first search, A* Search, CSP, Means-End-Analysis.	**09 Hours**
Module-2	ADVERSARIAL SEARCH – Games, The Mini-Max algorithm, optimal decisions in multiplayer games, Alpha-Beta Pruning, Evaluation functions, Cutting off search, LOGICAL AGENTS – Knowledge-Based agents, Logic, Propositional Logic, Reasoning Patterns in Propositional Logic, Resolution, Forward and Backward chaining - FIRST ORDER LOGIC – Syntax and Semantics of First- Order Logic, Using First-Order Logic , Knowledge Engineering in First-Order Logic – INFERENCE IN FIRST ORDER LOGIC – Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution	**09 Hours**
Module - 3	UNCERTAINTY – Acting under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and its Use, PROBABILISTIC REASONING – Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distribution, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks	**08 Hours**
Module - 4	LEARNING METHODS – Statistical Learning, Learning with Complete Data, Learning with Hidden Variables, Rote Learning, Learning by Taking Advice, Learning in Problem-solving, learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning. Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.	**09 Hours**
Total		**40 Hours**

Text Books:	
1	Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, Mc Graw Hill,3rd ed.,2009
2	Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 4/e, Pearson, 2003.
Reference Books:	
1	Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010. S. Park,
2	S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011

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

CO1	Ability to comprehend AI & ES to analyze and map real world activities to digital world
CO2	Ability to identify problems that are amenably solved by AI methods
CO3	Ability to design and carry out an empirical evaluation of different AI algorithms
CO4	Ability to comprehend AI & ES to analyze and map real world activities to digital world

Type	Code	NPTEL	L-T-P	Credits	Marks
oo	BTAG-T-MC-601		3-0-1	3	150

Objectives	**Introduction to Human Factors and Ergonomics(HFE)**
Pre-Requisites	Holistic understanding and basic sensitivity towards HFE. This course will have a practical and positive effect on the manner in which HFE is engaged by professional sectors in India.
Teaching Pedagogy	Human Factors and Ergonomics (HFE) is central to supporting the design, evaluation, operation and maintenance of human-centric systems in a variety of disciplines ranging from and not limited to design, engineering and management. As a realm of knowledge, HFE transcends disciplinary boundaries. However, in its current practice in India, HFE has remained highly fractured in academic settings. HFE's multifaceted nature is displayed in myriad instances in various silos of individual disciplines of design, engineering, psychology and physiology. The fractured state of HFE is also partly due to the manner in which it is institutionalized in various academic disciplines in India.
Level :	
Start Date :	
End Date :	
Enrollment Ends	
Exam Date :	

Detailed Syllabus:

Module-#	Topics	Hours
1	Key theme: Designing for people, technologies, organizations and environments as systems Introduction to the various aspects of HFE What constitutes essential aspects of HFE?	
2	Key theme: Human Knowing in technological contexts • Vision and Perception • Cognition • Information processing approach • Attention and memory • Lapses in attention and memory, Types of memory • Human decision making	
3	Key theme: Human Acting in technological contexts	

	• Challenges of different demographics • Anthropometrics • How does anthropometrics help in design? • Attention and memory • Body and activity systems • Lifting, grasping, pushing and pulling • Occupational challenges and muscoskeletal disorders • Workplace injuries	
4	Key theme: The physical context of human knowing and acting • Varieties of work environments • Issues related to lighting and sound • HFE outside in everyday world • Everyday environment and risks • Social environment • Safety-critical environments • Work Space design based on HFE principles	
5	Key theme: The sociocultural context of HFE (Organizational dimension) • Organizational culture • Groups and teams dynamics • Personality and management styles • Leadership styles • Job Characteristics and design	
6	Key theme: HFE and large scale systems (safety, risk and accidents) • HFE and large scale systems • Complexity and systems: dynamism, complexity, uncertainty • Uncertainty as a fundamental challenge in human performance; coping with the unexpected • Dynamic Challenges in large-scale systems not typically present in simple systems • Challenges of human behavior in large scale systems, complex interlinkages with technology. • Human errors in complex systems • Moving beyond human error: beyond the blame game? • HFE in relation to safety, risks and accidents	
7	Key theme: HFE Integration • Recap of the last 6 modules: Cognitive; Physical (and physiological); Organizational • HFE integration with design, systems and management – the road ahead • Step-by-step integration • Worker involvement • Catering to operators, managers and end users • Building an organizational culture for Human factors improvement	

	• Understanding work from a human perspective • Systems approach + Design-driven + Performance and well-being • Reinforcing key themes from each session of the course	
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:

Type	Code	EET-1	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 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	Specialty agriculture, Sustainable, high yielding agriculture that can be economically viable in hilly and small land. Renewable Energy Sources Solar energy from the sun, Geothermal energy from heat inside the earth, Wind energy, Biomass from plants and Hydropower from flowing water for use in agriculture.	**5 Hours**
Module-2	Food Processing and value addition Value-added food products are raw or pre-processed commodities whose value has been increased through the addition of ingredients or processes that make them more attractive to the buyer and/or more readily usable by the consumer. It is a production/ marketing strategy driven by customer needs and perceptions.	**5 Hours**
Module-3	Hi-tech /Protected Cultivation Protected cultivation under green house together with solar and photovoltaic systems,Pumps, UV filters and lighting to be sustainable and environment friendly through the use of modern solar technology and be supported and operated independently.	**5 Hours**
Module-4	Drone in Agriculture Drones equipped with special imaging equipment called Normalized Difference Vegetation Index (NDVI) use detailed color information to indicate plant health. This allows farmers to monitor crops as they grow so any problems can be dealt with fast enough to save the plants	**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		L-T-P	Credits	Marks
P	BTAG-P-PC-601	Tractor and Farm Machinery Operation and Maintenance Lab	0-0-2	1	100

Objectives	1. Knowledge on operation and maintenance procedures of tractors along with implements 2. Dissemble and assemble components of farm machines 3. Operate with proper adjustments of machines in the field
Pre-Requisites	Mechanical Engineering
Teaching Pedagogy	Experiment in laboratory and by visiting to dairy plants

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Familiarization with tools and equipment used for maintaining and servicing of tractors and farm machines	2 Hours
Experiment-2	Doing the 10 hours service job and maintenance procedure after 50 hours, 100 hours, 250 hours, 500 hours and 1000 hours of operation	2 Hours
Experiment-3	Adjustment and maintenance of primary tillage equipment i.e. mould board plough, disc plough etc.	2 Hours
Experiment-4	Adjustment and maintenance of secondary tillage equipment disc harrow etc.	2 Hours
Experiment-5	Adjustment and maintenance of seeding and planting and transplanting machines	2 Hours
Experiment-6	Adjustment and maintenance of plant protection equipment	2 Hours
Experiment-7	Adjustment and maintenance of reapers	2 Hours
Experiment-8	Adjustment and maintenance of thresher	2 Hours
Experiment-9	Dismantling and assembling of major engine parts	2 Hours
Experiment-10	Visit to tractor / engine repair workshop, injection pump injector repair shop	2 Hours

Type	Code	Dairy and Food Engineering Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-601		0-0-2	1	100

Objectives	4. Understanding the basic unit operation of dairy and food processing engineering including homogenization. 5. Study of the dairy operations like pasteurization, sterilization, cream separation and packaging of milk. 6. Study of evaporation, drying , boilers and knowledge on plant design and layout.
Pre-Requisites	Physics and Environmental Science.
Teaching Pedagogy	Experiment in laboratory and by visiting to dairy plants

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Determination of specific gravity of milk	2 Hours
Experiment-2	Determination of fat content of milk	2 Hours
Experiment-3	Study of pasteurizer	2 Hours
Experiment-4	Study of sterilizer and canning process	2 Hours
Experiment-5	Study of homogenizer	2 Hours
Experiment-6	Study of cream separator	2 Hours
Experiment-7	Study of butter churn	2 Hours
Experiment-8	Study of evaporators	2 Hours
Experiment-9	Study of milk dryers	2 Hours
Experiment-10	Study of freezers	2 Hours

Type	Code	Irrigation and Drainage Engineering Lab	L-T-P	Credits	Marks
P	BTAG-P-PC-602		0-0-3	1	100

Objectives	1. Know the different methods to measure the soil moisture content in the field. 2. Understand the different methodologies to compute the water requirements of crops. 3. Analyze the economic aspects of drainage projects.
Pre-Requisites	knowledge on water cycle
Teaching Pedagogy	Practical visit to dam, and do experiment in laboratory

Evaluation Scheme

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Measurement of soil moisture content by gravimetric method / tensiometer	**2Hours**
Experiment-2	Measurement of soil moisture content by double ring infiltrometer / Pan evaporation method	**2Hours**
Experiment-3	Computation of evapotranspiration by modified Penman method	**2Hours**
Experiment-4	Measurement of irrigation water by velocity-area method / different weirs/ circular orifice	**2Hours**
Experiment-5	Measurement of irrigation water by parshall and cut throat flume	**2Hours**
Experiment-6	Study of advance and recession of irrigation water in borders / furrows/ check basin	**2 Hours**
Experiment-7	Estimation of drainage coefficient	**2 Hours**
Experiment-8	Determination of pH of soil and water	**2 Hours**
Experiment-9	Determination of electrical conductivity of soil and water	**2 Hours**
Experiment-10	Design of surface drainage system / sub-surface drainage system	**2 Hours**
Experiment-11	Measurement of in situ hydraulic conductivity of two layered soil by Ernst method	
Experiment-12	Estimation of gypsum requirement for reclaiming alkali soils	**2 Hours**
	Total	24 Hours

Type	Code	Project-IV	L-T-P	Credits	Marks
PS	BTAG-P-PS-601		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
CO6	Value addition of agriculture produce