GIFT Autonomous, Bhubaneswar



1st Year Course Structure and Syllabus
for
B. Tech (2026 Admission Batch)

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 - Khordha, Pin code: 752 054.

Vision and Mission of GIFT Autonomous

Vision	
"To suffice for educational demand of the globe, by achieving excellence through a systematic edifice of performance and service revolving around intellectual, personal and professional growth by encouraging innovation and research build upon tradition of unparalleled quality."	
Mission	
M1:	To advance knowledge in major paradigm of technology and to create a distinctive culture of research and innovation among the budding engineer with collaboration of faculties, technocrats, funding agencies and experts from other premier institute for regenerating a pool of professionals.
M2:	To generate a pool of eco-preneurs with the ability to address the industry and social issues of highest standard with inherent concern for environment.
M3:	To meet the expectation of our society by equipping our students to stride forth as resourceful citizens and conscious of the immense responsibilities to make the world a better place to live in.
M4:	To create at least one center of excellence within upcoming two academic years in one of the specialized engineering domains.

NBA Program Outcomes (POs)	
PO1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals, and an engineering specialization to develop solutions to complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems, reaching substantiated conclusions with consideration for sustainable development.
PO3	**Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems, components, or processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society, and the environment.
PO4	**Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge, including design of experiments, modelling, analysis, and interpretation of data to provide valid conclusions.
PO5	**Engineering Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems.
PO6	**The Engineer and the World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for their impact on sustainability with reference to economy, health, safety, legal framework, culture, and the environment.
PO7	**Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity, and inclusion; adhere to national and international laws.
PO8	**Individual and Collaborative Team Work:** Function effectively as an individual and as a member or leader in diverse and multidisciplinary teams.
PO9	**Communication:** Communicate effectively and inclusively within the engineering community and society at large by preparing effective reports, design documentation, and presentations, considering cultural, language, and learning differences.
PO10	**Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making to one's own work, as a member and leader in a team, and to manage projects in multidisciplinary environments.
PO11	**Life-Long Learning:** Recognize the need for, and have the preparation and ability for (i) independent and life-long learning, (ii) adaptability to new and emerging technologies, and (iii) critical thinking in the broadest context of technological change.

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Semester: I

Theory

Sl. No	Category	Course Code	Course Title	Teaching			Credits
				L	T	P	
1	HS	BTHSTHS101	Entrepreneurship, Innovation and Startup	3	0	0	3
	ES	BTMETES102	Smart Manufacturing				
2	BS	BTBSTBS101	Applied Chemistry	2	0	0	2
	BS	BTBSTBS102	Elements of Engineering Physics				
3	ES	BTCETES101	Basic Civil Engineering	3	0	0	3
	ES	BTMETES101	Basic Mechanical Engg				
4	ES	BTEETES101	Basic Electrical Engineering	2	0	0	2
	ES	BTECTES101	Basic Electronics Engineering				
5	ES	BTCSTES101	Basic Programming Skills	3	0	0	3
Total Hours/Credits (Theory)				**13**	**0**	**0**	**13**

Laboratory

1	HS	BTHSPHS101	Entrepreneurship, Innovation and Startup Lab	0	0	2	1
	AE	BTSDPAE101	Ability Enhancement Training- A Lab				
2	BS	BTBSPBS101	Applied Chemistry Lab	0	0	2	1
	BS	BTBSPBS102	Elements of Engineering Physics Lab				
3	ES	BTCEPES101	Basic Civil Engineering Lab	0	0	2	1
	ES	BTMEPES101	Basic Mechanical Engg Lab				
4	ES	BTEEPES101	Basic Electrical Enggineering Lab	0	0	2	1
	ES	BTECPES101	Basic Electronics Engineering Lab				
5	ES	BTMEPES102	Engineering Graphics with AutoCAD Lab	0	0	3	1.5
	ES	BTMEPES103	Workshop & Digital Manufacturing Lab				
6	ES	BTCSPES101	Basic Programming Skills Lab	0	0	3	1.5
7	PS	BTBSPPS101	Project -I	0	0	2	1
Total Hours/Credit (Laboratory)				**0**	**0**	**16**	**8**
Total Hours/Credits (Theory)				**13**	**0**	**0**	**13**
Overall Credits/Semester							**21**

Semester: II

Theory

Sl. No	Category	Course Code	Course Title	Teaching			Credits
				L	T	P	
1	ES	BTMETES102	Smart Manufacturing	3	0	0	3
	HS	BTHSTHS101	Entrepreneurship, Innovation and Startup				
2	BS	BTBSTBS102	Elements of Engineering Physics	2	0	0	2
	BS	BTBSTBS101	Applied Chemistry				
3	ES	BTMETES101	Basic Mechanical Engg	3	0	0	3
	ES	BTCETES101	Basic Civil Engineering				
4	ES	BTECTES101	Basic Electronics Engineering	2	0	0	2
	ES	BTEETES101	Basic Electrical Engineering				
5	ES	BTCSTES201	Programming Using Data Structure	3	0	0	3
Total Hours/Credits (Theory)				**13**	**0**	**0**	**13**

Laboratory

1	AE	BTSDPAE101	Ability Enhancement Training- A Lab	0	0	2	1
	HS	BTHSPHS101	Entrepreneurship, Innovation and Startup Lab				
2	BS	BTBSPBS102	Elements of Engineering Physics Lab	0	0	2	1
	BS	BTBSPBS101	Applied Chemistry Lab				
3	ES	BTMEPES101	Basic Mechanical Engg Lab	0	0	2	1
	ES	BTCEPES101	Basic Civil Engineering Lab				
4	ES	BTECPES101	Basic Electronics Engineering Lab	0	0	2	1
	ES	BTEEPES101	Basic Electrical Enggineering Lab				
5	ES	BTMEPES103	Workshop & Digital Manufacturing Lab	0	0	3	1.5
	ES	BTMEPES102	Engineering Graphics with AutoCAD Lab				
6	ES	BTCSPES201	Programming Using Data Structure Lab	0	0	3	1.5
7	PS	BTBSPPS201	Project -II	0	0	2	1
Total Hours/Credit (Laboratory)				**0**	**0**	**16**	**8**
Total Hours/Credits (Theory)				**13**	**0**	**0**	**13**
Overall Credits/Semester							**21**

GIFT Autonomous, Bhubaneswar

Scheme of Evaluation

for

B. Tech (2026 Admission Batch)

GIFT Autonomous, Bhubaneswar

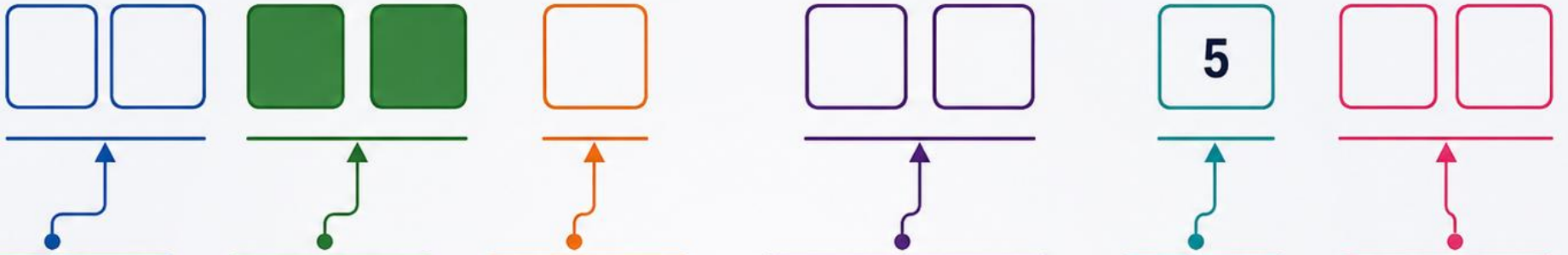
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SUBJECT CODE FORMAT



PROGRAM

- **BT:** B.TECH
- **MB:** MBA
- **MC:** MCA
- **MT:** M.TECH
- **MS:** M.SC.

LEAD BRANCH

- **EE:** EEE
- **EC:** ECE
- **CE:** CIVIL
- **CS:** CSE
- **CA:** CSE (AE)
- **CI:** CSE (IOT)
- **ME:** MECH
- **AG:** AGRICULTURE
- **BS:** BSH/1ST YEAR

Not Applicable for MBA/MCA

SUBJECT TYPE

- T: Theory
- P: Practical

SUBJECT CATEGORY

- **BS:** Basic Science
- **HS:** Humanities and Social Sciences
- **ES:** Engineering Sciences
- **PC:** Professional Core
- **PE:** Professional Elective
- **OE:** Open Elective
- **MC:** Mandatory Courses
- **SC:** Skill Cource/EEC/Internship
- **PS:** Project/Seminar
- **OO:** MOOCs
- **FM:** Finance Specialization
- **MM:** Marketing Specialization
- **HR:** Human Resource Specialization

SEMESTER

5

SERIAL NUMBER

CODE STRUCTURE EXAMPLE

BT	ME	T	PC	5	23
Program	Lead Branch	Subject Type	Subject Category	Semester	Serial Number

Mark Distributions for Internal & External Examinations for B.Tech Program

Internal Examinations					
Sl. No	**Type of Tests**	**Marks**	**Frequency**	**Total Marks**	**Reduced Marks**
1	Modular Test	25	02	50	50
2	Online Quiz Test	10	06	60	10
3	Assignment	05	02	10	10
4	Subject Specific Project	100	1	100	15
5	Attendance	15	1	15	15
				Total Marks	**100**
				Pass Marks	**45**

External Examinations				
Sl. No	**Types of Tests**	**Marks**	**Frequency**	**Total Marks**
1	End Semester Examinations	100	1	100
			Pass Marks	**35**

General Guidelines:

1. **Mandatory Attendance:** Every student is required to appear for all the scheduled internal examinations, including modular tests, without exception.
2. **No Exemptions**: Requests for exemption, rescheduling, or special accommodation for the scheduled internal examinations shall not be entertained under normal circumstances.
3. **Absence Due to Genuine Reasons:** In the event of a medical emergency or other unavoidable circumstances, the student must submit valid supporting documents to the competent authority for consideration of permission to reappear for the examination. As the examination schedule is fixed and non-negotiable, all such requests shall be subject to the approval of the competent authority.
4. **Modular Test Requirement:** Modular tests constitute an integral component of the curriculum and internal assessment process. Students are therefore expected to appear for every modular test. Failure to do so shall attract appropriate penalties as prescribed in the Examination Regulations.
5. **Improvement Examination:** Students who fail to qualify in an internal assessment or wish to improve their internal marks in a particular course may appear for the Improvement Test after completing the prescribed registration process through the College Management System (CMS), in accordance with the Examination Regulations.

Evaluation Process

1. Evaluation Process of Theory Subjects:			
Components	**Frequency**	**Assigned To**	**Marks**
Quiz Tests	06	Concerned Faculty	10
Assignments	02	Concerned Faculty	10
Attendance	Closing of Instruction	To be retrieved from CMS	15
Subject Specific Projects	01 (Before Closing of Instruction)	Concerned Faculty	15
Modular Tests	02	Examination Cell	50
End-Semester Examinations	01	Examination Cell	100
		Total	**200**

2. Evaluation Process of Practical Subjects:			
Components	**Frequency**	**Assigned To**	**Marks**
Attendance	Closing of Instruction	To be retrieved from CMS	10
Daily Performance & Viva-Voce	On the day of Experiment	Concerned Faculty (Upload in CMS in weekly basis)	40
Lab Records	On the day of Experiment	Concerned Faculty	20
End-Semester Lab Tests	01	At the end of the semester as per the schedule published by Examination Cell	30
		Total	**100**

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 Science
AE	Ability Enhancement
PS	Project/Seminar/Internship

Table of Contents

Sl. No.	Title of the Courses
	Semester: I – Chemistry Cycle
1.	Entrepreneurship, Innovation and Start-Up
2.	Applied Chemistry
3.	Basics of Mechanical Engineering
4.	Basics of Electrical Engineering
5.	Basics of Programing Skills
6.	Entrepreneurship, Innovation and Start-Up Laboratory
7.	Applied Chemistry Laboratory
8.	Basics of Mechanical Engineering Laboratory
9.	Basics of Electrical Engineering Laboratory
10.	Basics of Programing Skill Laboratory
11.	Engineering Graphics with AutoCAD Laboratory
12.	Project -1
	Semester: I – Physics Cycle
1.	Smart Manufacturing
2.	Elements of Engineering Physics
3.	Basics of Civil Engineering
4.	Basics of Electronics Engineering
5.	Basics of Programming Skills
6.	Elements of Engineering Physics Laboratory
7.	Basics of Civil Engineering Laboratory
8.	Basics of Electronics Engineering Laboratory
9.	Basics of Programming Skills Laboratory
10.	Workshop and Digital Manufacturing Laboratory
11.	Ability Enhancement Training – A Laboratory
12.	Project – 1

Table of Contents

Sl. No.	Title of the Courses
	Semester: II – Chemistry Cycle
1.	Smart Manufacturing
2.	Elements of Engineering Physics
3.	Basics of Civil Engineering
4.	Basics of Electronics Engineering
5.	Programming using Data Structure
6.	Elements of Engineering Physics Laboratory
7.	Basics of Civil Engineering Laboratory
8.	Basics of Electronics Engineering Laboratory
9.	Programming using Data Structure Laboratory
10.	Workshop and Digital Manufacturing Laboratory
11.	Ability Enhancement Training – A Laboratory
12.	Project – 2
	Semester: II – Physics Cycle
1.	Entrepreneurship, Innovation and Start-Up
2.	Applied Chemistry
3.	Basics of Mechanical Engineering
4.	Basics of Electrical Engineering
5.	Programming using Data Structure
6.	Entrepreneurship, Innovation and Start-Up Laboratory
7.	Applied Chemistry Laboratory
8.	Basics of Mechanical Engineering Laboratory
9.	Basics of Electrical Engineering Laboratory
10.	Programming using Data Structure Laboratory
11.	Engineering Graphics with AutoCAD Laboratory
12.	Project – 2

GIFT Autonomous, Bhubaneswar

Detailed Syllabus: 1st & 2nd Semester

for

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Type	Code	Entrepreneurship, Innovation and Startup	L-T-P	Credits	Marks
HS	BTHSTHS101		3-0-0	3	200
Objectives	1. To introduce students to innovation, creativity, and entrepreneurial mindset. 2. To develop problem identification, problem-solving, and design thinking skills. 3. To familiarize students with startup ecosystem, business models, and funding mechanisms to enable students to ideate, validate, prototype, and pitch innovative solutions.				
Pre-Requisites	Basic Communication, Problem solving Mindset, Ideation and Design, Business Molding, & Basic Finance Knowledge				
Teaching Pedagogy	Regular classroom lectures				
Modules	**Topics**				**Hours**
Module 1	Meaning and importance of innovation and entrepreneurship, Types of innovation (incremental, disruptive, frugal) Entrepreneur vs Intrapreneur, Role of start-ups in economic development Case studies of successful start-ups (India & global)				**6**
Module 2	Creativity techniques (brainstorming, SCAMPER, mind mapping), Introduction to Design Thinking Empathy: Define Ideate, Prototype, Test, Problem identification and opportunity recognition, User-centric thinking **Activities:** Design thinking workshop, Problem identification exercise				**8**
Module 3	Idea generation vs opportunity recognition, Market need analysis Customer discovery and validation, Feasibility study (technical, financial, market), Basics of value proposition				**6**
Module 4	Business Model Canvas (BMC), Revenue models and pricing strategies, Basics of marketing for startups Introduction to finance (costs, funding, breakeven), Legal structures (sole proprietorship, partnership, company) **Activities:** BMC preparation for a startup idea				**8**
Module 5	Startup ecosystem (incubators, accelerators, mentors), Government initiatives (Startup India, Atal Innovation Mission), Types of funding (bootstrapping, angel investors, venture capital), Intellectual Property Rights (IPR) basics, Ethics in entrepreneurship				**6**
Module 6	Basics of prototyping (low-fidelity models), Pitch deck preparation, Communication & storytelling for entrepreneurs, Team building and leadership skills, Final project presentation. **Activities:** Group project: Idea → Prototype → Pitch presentation (demo day format)				**6**
				Total Hours	**40**

Text Books	
T1:	Innovation and Entrepreneurship by Joe Tidd & John Bessant.
T2:	Entrepreneurship Development by Sangeeta Sharma, PHI Pvt. Ltd., New Delhi
T3:	Entrepreneurship by Rajeev Roy, Oxford University Press.
T4:	Dynamics of Entrepreneurial Development and Management by Vasant Desai, Himalaya Publishing House, Mumbai
Online Resources	
1.	https://onlinecourses.nptel.ac.in/noc25_mg81/preview
2.	https://onlinecourses.nptel.ac.in/noc25_mg106/preview
3.	https://onlinecourses.nptel.ac.in/noc21_mg63/preview
4.	https://www.youtube.com/watch?v=_r0VX-aU_T8
5.	https://www.youtube.com/watch?v=uZUo4jryIYw
6.	https://www.youtube.com/watch?v=TbHhSui44TQ
Course Outcomes: At the end of this course the students will be able to	
CO1:	Explain the concepts of innovation, entrepreneurship, and startup ecosystem
CO2:	Identify real-world problems and apply design thinking methods
CO3:	Evaluate the feasibility and market potential of business ideas
CO4:	Develop a basic business model and startup plan
CO5:	Prepare and present a prototype-based entrepreneurial pitch
CO6:	Demonstrate corporate social responsibility, professional leadership, and ethical decision-making while executing growth strategies

Type	Code	Applied Chemistry	L-T-P	Credits	Marks
BS	BTBSTBS101		2-0-0	2	200
Objectives	1. To provide fundamental knowledge of applied chemistry and its engineering applications. 2. Develop analytical and problem-solving skills. 3. Promoting sustainable and ethical engineering practices.				
Pre-Requisites	Students should possess basic knowledge of chemistry, physics, and mathematics at the higher secondary level. Familiarity with fundamental scientific concepts and simple laboratory practices will facilitate effective learning.				
Teaching Pedagogy	The course will be delivered through interactive lectures, laboratory demonstrations, problem-solving sessions, and ICT-enabled learning. Continuous assessment, assignments, discussions, and case studies will be used to achieve the desired learning outcomes.				

Module	Topics	Hours
Module 1	**Reaction Kinetics:** Rate Law, Order; Molecularity, Determination of order of a reaction. Zero, 1st, and 2nd order reactions. Examples and Problems, Collision Theory, Activation Energy. **Chemical Thermodynamics**: Thermochemistry. Hess's Law, Born-Heber cycle, Enthalpy Calculation, 1st law of thermodynamics, 2nd Law of thermodynamics, Entropy and its application to ideal gases.	**7**
Module 2	**Phase Rule:** Phase, Component, Degree of freedom. One component system: Water, Sulphur system, & Two Component system: Bi-Cd, **Crystal Systems:** Bravais Lattice, Symmetry elements in Cubic system, Unit cell, Atomic packing factor, Miller Indices (d hkl)	**6**
Module 3	**Battery:** Types of cell, Nernst equation. Dry cell, Alkaline battery, Lithium-ion battery, Pb-Acid storage cell, Fuel cell (H2-O2- fuel cell). **Corrosion:** Dry, Wet corrosion, Factors affecting corrosion, Cathodic protection, Galvanizing and Tinning process.	**6**
Module 4	**Fuel:** Classification, GCV, NCV, Bomb Calorie meter, Refining of crude oil, Cracking, knocking, anti-knocking, Octane, Cetane number. Combustion calculations. Properties of Petrol, Diesel, Kerosene, LPG, CNG, Biogas.	**5**
Module 5	**Polymer:** Classification, Thermosetting and thermoplastic polymer: Examples and their applications, Natural rubber, Vulcanized rubber **Nanomaterials:** Classification, Size dependent properties. Synthesis by Top Down & Bottom Up approaches. Application to energy storage and electronic applications. Properties of Quantum dots.	**6**
Module 6	**Rare Earth Elements (REEs):** Lanthanides, Electronic configuration, and position in periodic table, Oxidation states, Anomaly in atomic radii, Lanthanide contraction- Ionic radii, Isolation, Extraction from monazite sand (La). Properties of La and Nd compounds.	**6**
	Total Hours	**36**

Text Books	
T1:	Theory & Practical's of Engineering Chemistry, By Shashi Chawla, Dhanpati Rai CO.(Pvt.) Ltd
T2:	Engineering Chemistry Vol-I & II, By, Jain & Jain, Dhanpati Rai Publishing Company.
T3:	Text Book of Inroganic Chemistry, By, Malik, Tuli, Madan, S. Chand Publication
T4:	Engineering Chemistry, Prasant Rath, 2015, Cenage Learning India Pvt, Ltd
T5	Textbook on Engineering chemistry. Achyutananda Acharya & Biswit Samantaray, Pearson
Reference Books	
R1:	A textbook of engineering chemistry, Dr. Rajshree Khare publisher: S.K. Kataria & sons.
R2:	Textbook of nanoscience and nanotechnology. Mc Graw Hill Education (India) Pvt. Ltd., 2012.
R3:	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.nptel.ac.in/courses/103101004
4.	https://afdc.energy.gov/vehicles/fuel_cell.html
5.	https://nptel.ac.in/courses/104106089
Course Outcomes: At the end of this course the students will be able to	
CO1:	Explain the principles of reaction kinetics, thermodynamics, and their applications in chemical processes.
CO2:	Interpret phase diagrams, crystal structures, Bravais lattices, and Miller indices for engineering materials.
CO3:	Describe the working principles of batteries, fuel cells, corrosion mechanisms, and corrosion prevention techniques.
CO4:	Analyze the properties of fuels, combustion processes, petroleum refining, and evaluate fuel quality using octane and cetane numbers.
CO5:	Differentiate polymers and nano-materials based on their properties, synthesis methods, industrial applications and properties of quantum dots.
CO6:	Explain the chemistry of rare earth elements, including their electronic configuration, extraction, properties, and technological applications.

Type	Code	Basic Mechanical Engineering	L-T-P	Credits	Marks
ES	BTMETES101		3-0-0	3	200
Objectives	1. To understand the thermodynamic systems for practical application 2. To understand the application of advanced manufacturing processes 3. To understand the importance of Engineering materials and their classifications				
Pre-Requisites	Knowledge of Physics, Mathematics and Computer Programming 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 group task, project planning and video				

Module	Topics	Hours
Module 1	**Basic Thermodynamics:** Systems, Properties, Process, State, Cycle, Zeroth Law, Properties of ideal gas, First law and Second Law of Thermodynamics, Basic Concept Entropy, Properties of pure substances, Enthalpy, Specific Volume, Internal energy and dryness fraction of steam, use of Steam tables. Related numerical.	**8**
Module 2	**Application of Thermodynamics:** Single stage air compressor, Steam Power Plant, I.C. Engines (Brief Description on working principles with Schematic diagrams only), Refrigeration system and types of refrigerants. Heat transfer and its modes and principle (Concepts only).	**6**
Module 3	**Advanced Machining Process:** Introduction and Working Principle operations of: USM, AJM, ECM, EDM, WEDM and Chemical Machining. Advantages, Disadvantages and its Applications	**6**
Module 4	**Basic Power transmission devices:** Belt, Gear drives, clutch, brakes (Working Principle only). Introduction to Robotics and automation: Robot anatomy, Joints and links and common robot configurations. Automation kit.	**6**
Module 5	**Elements of Fluid Mechanics:** Fluid Statics, Concept on buoyancy and floatation Kinematics and Dynamics (Concepts only), Hydraulic machines, types and working Principle only. **Mechanical Measurement:** Concept of measurements, errors in measurement, Measurement of Temperature, Pressure, Velocity, and Flow. (Working principle Only.)	**8**
Module 6	**Engineering Materials:** Classification of engineering materials & its properties. Introduction to Manufacturing processes: Welding, Casting, Forming- Extrusion, Drawing, Rolling, and Forging (Basics Only).	**6**
	Total Hours	**40**

Text Books	
T1:	Basic Mechanical Engineering by Pravin Kumar, Pearson.
T2:	Text book of Elements of Mechanical Engineering, S T Murthy, Universities press.
T3:	Cengal, Y., Boles, "Thermodynamics", Mc-Graw Hill, 2001.
Reference Books	
R1:	Basic Mechanical Engineering by Basant Agrawal, C M Agrawal, Willey.
R2:	Elements of Mechanical Engineering by J K Kittur and G D Gokak, Willey.
R3:	Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press.
R4:	Basic Mechanical Engineering by D. Mishra, P. K Parida, S. S. Sahoo, India Tech Publishing.
R5:	Engineering Materials, S C Rangwala, Charotar Publishing House.
Course Outcomes: At the end of this course the students will be able to	
CO1:	Discuss the Properties of Common Engineering Materials and measuring equipment
CO2:	Describe the advanced Machining process.
CO3:	Explain the Working Principle of IC engines and Refrigeration and Air conditioning.
CO4:	Get knowledge of fluid properties and explain working principle of Hydraulic Machines
CO5:	Explain different power transmission systems.

Type	Code	Basic Electrical Engineering	L-T-P	Credits	Marks
ES	BTEETES101		2-0-0	2	200
Objectives	1. To introduce students to the fundamental concepts and principles of Electrical and Electronics Engineering. 2. To develop an understanding of basic electrical and electronic circuits, devices, and their applications. 3. To enable students to apply fundamental electrical and electronic engineering concepts in solving basic engineering problems.				
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.				
Module	**Topics**				**Hours**
Module 1	**DC Circuit Fundamentals and Network Analysis:** Introduction to Electrical Engineering, Ohm's Law, Series and Parallel Circuits, Kirchhoff's Current Law (KCL), Kirchhoff's Voltage Law (KVL), Voltage Division Rule, Current Division Rule, Star-Delta (Y-Δ) Transformation, Mesh Analysis, Nodal Analysis **DC Network Theorems:** Superposition Theorem, Thevenin's Theorem, Maximum Power Transfer Theorem				**8**
Module 2	**AC Fundamentals:** Generation of AC Voltage, Sinusoidal Waveforms, RMS Value, Average Value, Form Factor, Peak Factor, Phasor Representation, R-L, R-C and R-L-C Series Circuits, Power Triangle, Active, Reactive and Apparent Power, Resonance				**6**
Module 3	**Magnetic circuits:** Magnetic Materials, Magnetic Flux, Flux Density, Magnetic Field Intensity, Permeability, Reluctance, Magnetic Circuits, B-H curve. **DC Machines:** Construction, Working Principle, EMF Equation, Types of DC Generators, DC Motors, Applications				**6**
Module 4	**Electrical Machines**: **Transformers:** Construction, Principle of Operation, EMF Equation, Ideal and Practical Transformer, Losses, Efficiency, Applications. **Poly-phase system:** Introduction to 3-phase system, Line & Phase quantity in star and delta connection, Analysis of 3-phase balanced AC circuit, Multi-phase and its applications. **Three Phase Induction Motor:** Rotating Magnetic Field, Construction, Principle of Operation, Slip, Industrial Applications **Single Phase Induction Motor:** Working Principle, Types, Applications				**7**
Module 5	**Electrical Safety:** Domestic Wiring, Earthing, Types of Earthing, Electrical Shock, Protective Devices, Fuse, MCB, ELCB, RCCB, MCCB, Surge Protection Device, Electrical Safety Standards				**4**
Module 6	**Introduction to power System:** Generation of Electrical Energy (Thermal,				**5**

	Hydro and Nuclear power generation), Transmission and Distribution, Single Line Diagram, Renewable Power generation. Practical applications on power system.	
	Total Hours	**36**

Text Books	
T1:	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
T2:	Principles of Electrical Safety, Peter E. Sutherland, Wiley-IEEE Press.
Reference Books	
R1:	"Basic Electrical Engineering" by Mittle, V and Arvind Mittle, Tata McGraw Hil.
R2:	E. Hughes, "Electrical and Electronics Technology", Pearson.
R3:	Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand. R4. "Basic Electrical Engineering" by C L Wadhwa, New Age pub.
R4:	"Basic Electrical Engineering" by C L Wadhwa, New Age pub.
R5:	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.
R6:	Electrical Safety Handbook, 4th Edition Hardcover by John Cadick Mary Capelli-Schellpfeffer Dennis Neitzel Al Winfield
Online Resources	
1.	https://onlinecourses.nptel.ac.in/noc23_ee62
2.	https://onlinecourses.nptel.ac.in/noc23_ee17
3.	https://onlinecourses.nptel.ac.in/noc23_ee65
4.	https://onlinecourses.nptel.ac.in/noc23_ee66
5.	https://onlinecourses.nptel.ac.in/noc23_ee15
Course Outcomes: At the end of this course the students will be able to	
CO1:	Understand the fundamentals of DC circuits and Network theorems
CO2:	Analyses of different problems of electrical AC circuits.
CO3:	Apply the concept of magnetic circuits.
CO4:	Identify different types electrical machineries and its applications
CO5:	Design the earthing and wiring for domestic utilization.
CO6:	Evaluate the energy consumption of different luminaries.

Type	Code	Programming Using Data Structure	L-T-P	Credits	Marks
ES	BTCSTES201		3-0-0	3	200
Objectives	1. To introduce fundamental concepts of data structures, algorithms, and their analysis for efficient problem solving. 2. To develop proficiency in implementing and analyzing linear and non-linear data structures such as arrays, stacks, queues, linked lists, trees, and graphs. 3. To enable students to apply appropriate searching, sorting, hashing, and graph algorithms to solve real-world and engineering problems efficiently.				
Pre-Requisites	Knowledge of Mathematics in Secondary Education and Basic Programming concept.				
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	**Introduction to Data structure:** Types of data structures, Algorithm and Assymtotic Notations, time and space complexity. **Basic data structure:**1d-Array and 2d-Array Data Structure: row major and column major order, Operations: insertion, deletion, traversal Sparse matrix, address calculation of Array, ADT (Abstract Data type), DMA (Dynamic memory allocation), pointer, Self-referential structure. DMA vs. SMA. De-allocation Strategy, Compaction.				6
Module 2	**Stacks:** ADT Stack array representation and its operations: Algorithms Applications of Stacks: Postfix and Prefix conversion and its evaluation. **Queues:** ADT queue, Types of Queue: Linear Queue, Circular Queue, Double ended queue, Priority Queue; Array representation and Operations, algorithms and their analysis				6
Module 3	**Linked Lists:** Introduction to Linked List, Types of linked list, Representation in memory, Linked list operations: Insertion, Deletion, Traversal, searching and sorting. Application of Linked List: Linked Stack and Linked Queue and its insertion and deletion operations.				8
Module 4	**Sorting:** Introduction, Types of sorting: 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 techniques of hashing.				7
Module 5	**Trees:** Basic Tree Terminologies, Types of tree, Binary Tree and its traversal method, Binary Search Tree and its operations, AVL Tree and its rotations: Applications of Binary Trees. Introduction to B-Tree and B+ Tree				7
Module 6	**Graph:** Basic Terminologies and Representations (Adjacency matrix and linked list representation), Graph search and traversal algorithms and complexity analysis, classification of graph, topological sorting.				6
				Total Hours	**40**

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. orouzan, Cengage Learning
R2:	Data Structures And Algorithms A.V.Aho, J. E. Hopcroft, and J. D. Ullman, ǁ, Pearson Education, First Edition Reprint 2003
R3:	How to solve it by Computer, 2nd Impression by R. G. Dormey, Pearson Education
R4:	Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education
Course Outcomes: At the end of this course the students will be able to	
CO1:	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.
CO2:	Understand basic data structures such as arrays, linked lists, stacks and queues.
CO3:	Understand the implementation and application of linear data structure.
CO4:	Understanding of tree traversal techniques and their application.
CO5:	Understand the graph traversal and its application In real life.
CO6:	Understand Algorithm for different sorting, searching techniques and their running.

Type	Code	Entrepreneurship, Innovation and Start-up Laboratory	L-T-P	Credits	Marks
HS	BTHSPHS101		0-0-2	1	100

Objectives	1. To develop entrepreneurial thinking, innovation, and problem-solving skills for identifying and addressing real-world challenges. 2. To apply design thinking and business model development to transform innovative ideas into viable entrepreneurial solutions. 3. To enhance teamwork, leadership, communication, and start-up ecosystem awareness through experiential learning and prototype development.
Pre-Requisites	Basic communication and presentation skills. Fundamental computer literacy. Willingness to learn through teamwork and hands-on activities. Interest in innovation, entrepreneurship, and problem-solving. Basic understanding of engineering concepts related to their discipline.
Teaching Pedagogy	Teach with professional ethics, sustainability, adaptability, and lifelong learning skills while developing innovative products, services, or start-up proposals

Experiments	Topics	Hours
Experiment 1	Creativity Assessment and Brainstorming Exercise for Real-World Problems	**2**
Experiment 2	SCAMPER Technique Application for Product/Service Innovation	**2**
Experiment 3	Mind Mapping and Opportunity Identification Workshop	**2**
Experiment 4	Design Thinking Exercise: Empathy Mapping and Problem Definition	**2**
Experiment 5	Customer Discovery through Survey and Interview Design	**2**
Experiment 6	Feasibility Analysis of a Startup Idea (Technical, Market and Financial)	**2**
Experiment 7	Preparation of Value Proposition Canvas for an Innovative Product	**2**
Experiment 8	Business Model Canvas (BMC) Development for a Startup Idea	**2**
Experiment 9	Low-Fidelity Prototype Development and User Feedback Collection	**2**
Experiment 10	Startup Pitch Deck Preparation and Final Investor Pitch Presentation	**2**
	Total Hours	**20**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Apply creativity and ideation tools to identify innovative solutions.
CO2:	Use design thinking methodology for problem-solving.
CO3:	Conduct customer discovery and validate business opportunities.
CO4:	Evaluate the feasibility of entrepreneurial ventures.
CO5:	Develop value propositions and business models.

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	Applied Chemistry Laboratory	L-T-P	Credits	Marks
BS	BTBSPBS101		0-0-2	1	100
Objectives	1. To develop practical skills in chemical analysis, volumetric estimation, and characterization of materials through laboratory experiments. 2. To enable students to apply theoretical concepts of chemistry for solving engineering and environmental problems using standard laboratory techniques.				
Pre-Requisites	Basic knowledge of Chemistry at the 12th Standard level, including acids, bases, redox reactions, and solutions. Familiarity with laboratory safety practices, handling of chemicals, and measurement techniques.				
Teaching Pedagogy	Demonstration-based laboratory experiments followed by hands-on practice. Experiential learning through laboratory work, observations, data analysis, viva-voce, and laboratory record maintenance.				
Experiments	**Topics**				**Hours**
Experiment 1	Prepare a standard solution using acid-base titration				**2**
Experiment 2	Determine the amount of Sodium Hydroxide and Sodium Carbonate in the given solution using standard acid				**2**
Experiment 3	Standardization of $KMnO_4$ by using sodium oxalate. Determination of Fe^{2+} ion in a double salt.				**2**
Experiment 4	To determine dissolved oxygen in a given sample of water				**2**
Experiment 5	To determine BOD & COD in a given sample of water				**2**
Experiment 6	Determination of available chlorine in a sample of bleaching powder				**2**
Experiment 7	Determination of hardness of water by EDTA method.				**2**
Experiment 8	Estimation of Ca^{2+} ion in a sample of limestone				**2**
Experiment 9	Determination of rate constant of acid catalyzed hydrolysis of ester.				**2**
Experiment 10	Determination of Flash and Fire point of a lubricating oil by Pensky Martine's apparatus.				**2**
Experiment 11	Determination of viscosity of lubricating oil by Redwood viscometer.				**2**
Experiment 12	Construction of Galvanic Cell and measurement of EMF.				**2**
Experiment 13	Preparation of polymer PE or PVC				**2**
Experiment 14	Synthesis of Ag/Fe_2O_3/graphene nanoparticle.				**2**
Experiment 15	Proximate analysis of coal.				**2**
				Total Hours	**30**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Prepare and standardize chemical solutions using volumetric analysis techniques such as acid-base and redox titrations.
CO2:	Analyze the quality of water by determining parameters such as hardness, dissolved oxygen, BOD, and COD using standard analytical methods.
CO3:	Estimate the composition of inorganic compounds and industrial samples using complexometric techniques.
CO4:	Determine important physical properties of engineering materials, including viscosity, flash point, fire point and construction of Galvanic cells.
CO5:	Synthesize useful chemical products such as polymers and nanoparticles using appropriate laboratory procedures.
CO6:	Demonstrate safe laboratory practices, accurately record experimental observations, analyze results, and interpret experimental data for engineering applications.

Type	Code	Basic Mechanical Engineering Laboratory	L-T-P	Credits	Marks
ES	BTMEPES101		0-0-2	1	100
Objectives	1. To develop practical skills in conducting experiments using various measuring devices and equipment. 2. To gain hands-on experience with refrigerators, IC engines, hydraulic machines, power transmission systems, and gear trains. 3. To apply engineering principles such as Bernoulli's theorem and metacentric height through practical experiments.				
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education				
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.				

Experiments	Topics	Hours
Experiment 1	Study of Bourdon tube pressure gauge with U-tube Manometer	**2**
Experiment 2	Study of Flow measuring apparatus (Venturimeter/Orificemeter/ Rotameter)	**2**
Experiment 3	Study the COP of a Vapour Compression Refrigeration Systems	**2**
Experiment 4	Study of Two Stroke & Four Stroke SI engines	**2**
Experiment 5	Study of Two Stroke & Four Stroke CI engines	**2**
Experiment 6	Study of Bernoulli's Theorem	**2**
Experiment 7	Study of Mechanical efficiency of Pelton & Francis Turbine	**2**
Experiment 8	Study the working of Centrifugal and Reciprocating pumps.	**2**
Experiment 9	Study of speed ratio of Simple, Compound & Reverted Gear trains	**2**
Experiment 10	Study of Power transmission systems of an Automobile.	**2**
	Total Hours	**20**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Experience different pressure and flow measuring instruments
CO2:	Experience working principle of refrigerator and IC engines
CO3:	Get knowledge about application of Bernoulli's Theorem and Metacenter
CO4:	Get knowledge of different types of hydraulic machines
CO5:	Experience different types gear trains and able to find out mechanical advantage and gear
CO6:	Get idea of power transmission system

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

Type	Code	Basic Electrical Engineering Laboratory	L-T-P	Credits	Marks
ES	BTEEPES101		0-0-2	1	100
Objectives	1. To train the students in conducting load tests on electrical circuit and equipment's 2. To gain practical experience in characterizing electrical machinery.				
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education				
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.				

Experiments	Topics	Hours
Experiment 1	Study of Different Electrical Measuring Instruments and other electrical equipment	**2**
Experiment 2	Verification of thevenin's theorem using DC circuits.	**2**
Experiment 3	Verification of Superposition theorem theorem using DC circuits.	**2**
Experiment 4	Verification of Maximum power transfer theorem using DC circuits.	**2**
Experiment 5	Measurement of Voltage, current, power and power factor calculation in series R-L-C circuit.	**2**
Experiment 6	Verification and calculation of Resonance frequency in series R-L-C circuit.	**2**
Experiment 7	Connection and Demonstration of Domestic Wiring System	**2**
Experiment 8	Connection and Running of DC Motors, DC generators, 3- phase Induction motors and 1- phase Transformers	**2**
Experiment 9	Power and phase measurements in three phase system by two wattmeter method	**2**
Experiment 10	OC and SC test on single phase transformer	**2**
BEYOND SYLLABUS		
Experiment 11	Verification of Ohm's Law	**2**
Experiment 12	Verification of B-H curve	**2**
	Total Hours	**24**

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
CO5:	Design different circuits using diode, BJT and opamps.
CO6:	Design and analyze logic gates

Indicative Projects:	
1:	Mobile Charger
2:	Extension Board
3:	Multiple USB Port
4:	Brushless DC Motor Driver
5:	Small Transformers Up to 7V.
6:	Small Model Of Bio-Gas Plant
7:	Temperature Control 12v DC Fan
8:	Making Of Led Bulbs.
Online Resources	
1.	http://vlabs.iitkgp.ernet.in/be/
2.	http://sl-coep.vlabs.ac.in/

Type	Code	Programming Using Data Structure Laboratory	L-T-P	Credits	Marks
ES	BTCSPES201		0-0-3	1.5	100
Objectives	1. To develop practical skills in implementing fundamental data structures such as arrays, stacks, queues, linked lists, and binary search trees. 2. To enable students to implement and apply searching and sorting algorithms for solving computational problems efficiently. 3. To develop problem-solving and programming skills through hands-on implementation of data structures and algorithms using C.				
Pre-Requisites	Knowledge of Mathematics in Secondary Education and basic Programming concept.				
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.				

Experiments	Topics	Hours
Experiment 1	Write a C program to perform matrix addition and multiplication using array	**2**
Experiment 2	Write a C program to print an upper triangular, lower triangular and transpose of a matrix	**2**
Experiment 3	Write a C program to create a stack using an array and perform the push, pop and display operation.	**2**
Experiment 4	1. Write a C program that converts infix expression into postfix expression Using Stack operations. 2. Write a C program that evaluate the postfix expression using stack.	**2**
Experiment 5	1. Write a C program that performs the enqueuer, dequeuer and display operations of linear queue. 2. Write a C program that perform the insertion, deletion and display operations of circular queue.	**2**
Experiment 6	1. Write a C program that uses functions to perform the following operations on Single linked list: 1. Creation 2. Insertion 3. Deletion 4. Traversal 2. Write a C program that uses functions to perform the following operations on Double linked list: 1. Creation 2. Insertion 3. Deletion 4. Traversal in both ways	**2**
Experiment 7	1. Write a C program to perform linear search. (using both recursive and non-recursive function) 2. Write a C program to perform binary search. (using both recursive and non-recursive function)	**2**
Experiment 8	Write a C program that uses functions to perform the following operations on Binary Search Tree: 1) Creation 2) Insertion 3) Deletion	**2**
Experiment 9	Write a C program that implement Selection sort. Write a C program that implement Bubble sort. Write a C program that implement Insertion sort.	**2**
Experiment 10	Write a C program that implement Merge sort. Write a C program that implement Quick sort. Write a C program that implement heap sort.	**2**
	Total Hours	**20**

Course Outcomes: At the end of this course the students will be able to	
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:	
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	Engineering Graphics with AutoCAD Laboratory	L-T-P	Credits	Marks
ES	BTMEPES102		0-0-3	1.5	100
Objectives	1. To develop basic skills in engineering drawing and graphical representation using standard conventions. 2. To familiarize students with the fundamental tools and commands of AutoCAD for creating engineering drawings. 3. To develop the ability to prepare and interpret basic two-dimensional engineering drawings using AutoCAD.				
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.				

Experiments	Topics	Hours
Experiment 1	Introduction to Engineering Graphics and AutoCAD in Engg. Applications.	**3**
Experiment 2	To prepare a sheet on Lines, Lettering, Dimensioning and Scaling.	**3**
Experiment 3	To prepare a sheet on Projection of point and lines.	**3**
Experiment 4	To prepare a sheet on Projection of planes & Solids.	**3**
Experiment 5	Familiarization with the AutoCAD Interface and Basic Drawing Tools	**3**
Experiment 6	Creation of 2D Engineering Drawings Using AutoCAD	**3**
Experiment 7	Creation of 3D Engineering Models Using AutoCAD	**3**
Experiment 8	Dimensioning and Detailing of Engineering Drawings Using AutoCAD	**3**
Experiment 9	Generation of Sectional Views of Engineering Components Using AutoCAD	**3**
Experiment 10	Preparation of Engineering Drafting and Layouts Using AutoCAD	**3**
	Total Hours	**30**

Course Outcomes: At the end of this course the students will 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	Smart Manufacturing	L-T-P	Credits	Marks
ES	BTMETES102		3-0-0	3	200
Objectives	1. To understand the principles and technologies of smart manufacturing in Industry 4.0 and Industry 5.0 environments. 2. To apply digital technologies to design, automate, and monitor modern manufacturing systems. 3. To analyze and optimize manufacturing processes for improved productivity, quality, and sustainability using smart manufacturing tools.				
Pre-Requisites	Engineering Graphics and Engineering Drawing, Manufacturing Processes, Computer Fundamentals, Basic Electrical and Electronics Engineering				
Teaching Pedagogy	Regular classroom lectures and when required, sessions are planned to be interactive with focus on problem solving activities.				
Module	**Topics**				**Hours**
Module 1	**Introduction to Smart Manufacturing and Industry 4.0:** Fundamentals of Manufacturing: Concept of manufacturing and production; evolution of manufacturing systems - transition from conventional manufacturing to digital manufacturing. Definition and characteristics of smart manufacturing; need for smart manufacturing; benefits and challenges of smart manufacturing. Concept of the manufacturing value chain; product design to customer delivery and after-sales services. Evolution from Industry 1.0 to Industry 4.0; Concepts of Internet of Things (IoT), Industrial Internet of Things (IIoT), Cyber-Physical Systems (CPS), Cloud computing, Artificial Intelligence, Robotics, Additive Manufacturing, Big Data and Analytics.				**8**
Module 2	**Digital Design and Digital Manufacturing:** Introduction to CAD; advantages of CAD; 2D and 3D modelling; basic geometric modelling concepts; applications of CAD in engineering. Concept of the digital product development cycle; Basic concept of Computer-Aided Engineering; Concept of Computer-Aided Manufacturing; relationship between CAD and CAM; tool paths; CNC programming concept; CAD-to-CAM workflow. Digital Fabrication: Introduction to: Laser cutting, CNC routing, Vinyl cutting, 3D printing. Basic principles of DFMA; Reverse Engineering.				**8**
Module 3	**Sensors, IoT and Manufacturing Data**: Concept of sensors and transducers; classification; accuracy, sensitivity, and range; Examples: Temperature sensor, Proximity sensor, Light sensor, Pressure sensor, Humidity sensor, Vibration sensor, Current sensor. Concept of smart sensors; applications in manufacturing. Basic concept of data acquisition; sensor signal; data conversion; sampling; data storage. Introduction to Embedded Systems: Concept of embedded systems; microcontrollers; input/output; basic programming concepts. Introduction to Arduino; connecting sensors; reading sensor values; simple monitoring applications. ESP32 and Wireless Monitoring: Introduction to ESP32; Wi-Fi/Bluetooth capability; basic wireless data transmission. Concept of IoT and IIoT; devices, connectivity, gateway, cloud and user interface.				**7**

Module 4	**Automation, Robotics and Smart Production:** Fundamentals of Automation: Definition of automation; objectives; advantages and limitations; levels of automation. Basic Components of an Automated System; Actuators and Drives: Basic concepts of: Electric motors, Pneumatic actuators, Hydraulic actuators, Servo motors, Stepper motors. Robot Anatomy: Base; links; joints; end effector; controller; work envelope; degrees of freedom. Robot Applications: Pick-and-place, Welding, Painting, Assembly, Material handling, Inspection; Collaborative Robots: Concept of cobots; human–robot collaboration; safety considerations. AGVs and AMRs: Basic concept and applications of automated guided vehicles and autonomous mobile robots. Smart Production Systems: Introduction to flexible manufacturing systems; automated material handling; machine-to-machine interaction.	**7**
Module 5	**Additive Manufacturing and Digital Fabrication:** Introduction to Additive Manufacturing: Definition and principles; evolution of 3D printing; layer-by-layer manufacturing.: Additive Manufacturing Workflow; Major 3D Printing Technologies: FDM/FFF, SLA, DLP, SLS, Metal additive manufacturing; Design for Additive Manufacturing: Layer orientation; support structures; wall thickness; infill; overhangs; dimensional considerations. Rapid Prototyping: Concept, advantages and applications. Additive vs Subtractive vs Traditional Manufacturing: Comparison based on: Material utilization, Complexity, Production volume, Cost, Accuracy, Speed, Waste	**7**
Module 6	**Smart Manufacturing Applications, AI and Sustainability:** Introduction to Manufacturing Data Analytics: Meaning of data analytics; descriptive analytics; visualization; trends and patterns; Introduction to Artificial Intelligence: Concept of AI; machine learning as a subset of AI; supervised and unsupervised learning; AI Applications in Manufacturing: Predictive maintenance; Quality inspection; Defect detection; Demand forecasting; Process optimization; Digital Supply Chain : tracking and traceability; real-time information; smart logistics. Green and Sustainable Manufacturing: Energy-efficient manufacturing; waste reduction; resource efficiency; pollution reduction; sustainable materials. Industry 5.0: Concept of Industry 5.0; human-centric manufacturing; sustainable manufacturing; resilient manufacturing. Future of Manufacturing : Smart factories; autonomous manufacturing; human–robot collaboration; AI-enabled production; connected products; digital twins as an emerging technology	**7**
	Total Hours	**44**

Text Books	
T1:	Groover, M. P., Automation, Production Systems and Computer-Integrated Manufacturing, Pearson.
T2:	Dimitris Mourtzis., Smart Manufacturing: The Lean Six Sigma and Industry 4.0 Approach, CRC Press
T3:	Gilchrist, A., Industry 4.0: The Industrial Internet of Things, Apress.
T4:	Gibson, I., Rosen, D., and Stucker, B., Additive Manufacturing Technologies, Springer.
Reference Books	
R1:	Kalpakjian, S. and Schmid, S., Manufacturing Engineering and Technology, Pearson.
R2:	Bahga, A. and Madisetti, V., Internet of Things: A Hands-On Approach, Universities Press.
R3:	Groover, M. P., Principles of Modern Manufacturing, Wiley.
R4:	Chapman, W. A. J., Workshop Technology, CBS Publisher
Course Outcomes: At the end of this course the students will be able to	
CO1:	Understand the evolution of manufacturing systems and explain the principles, architecture, and enabling technologies of Smart Manufacturing, Industry 4.0, Industry 5.0, Cyber-Physical Systems (CPS), Industrial Internet of Things (IIoT), and digital transformation.
CO2:	Apply digital engineering tools such as CAD, CAE, CAM, Product Lifecycle Management (PLM), Design for Manufacturing and Assembly (DFMA), CNC manufacturing, reverse engineering, and digital fabrication technologies for efficient product development and manufacturing.
CO3:	Develop intelligent monitoring solutions by integrating sensors, embedded systems, industrial communication protocols, IoT architectures, cloud platforms, and data acquisition techniques for real-time manufacturing applications.
CO4:	Analyze and implement industrial automation technologies including robotics, collaborative robots, automated guided vehicles (AGVs), autonomous mobile robots (AMRs), flexible manufacturing systems (FMS), and smart production systems to improve manufacturing efficiency and productivity.
CO5:	Evaluate additive manufacturing processes, materials, rapid prototyping, rapid tooling, and hybrid manufacturing techniques for designing innovative and sustainable engineering products.
CO6:	Analyze the applications of Artificial Intelligence, Machine Learning, predictive analytics, block chain, digital supply chains, and sustainable manufacturing concepts to develop intelligent, resilient, energy-efficient, and human-centric manufacturing systems aligned with Industry 5.0 principles.

Type	Code	Elements of Engineering Physics	L-T-P	Credits	Marks
BS	BTBSTBS102		2-0-0	2	200
Objectives	1. To expose students to the fundamental principles of oscillation and mechanical waves. 2. To enable the students to understand principles of semiconductor devices and their role in modern electronic systems. 3. To acquaint the students with the concepts of quantum physics, wave mechanics, and the foundations of quantum computing. 4. To aware the students on the principle of nuclear physics, laser technology, and optical fiber communication to solve engineering problems.				
Pre-Requisites	Basic fundamental of Elementary Physics and mathematics.				
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.				

Module	Topics	Hours
Module 1	**Oscillations:** Damped Harmonic Oscillator, Energy decay in Damped harmonic motion, Quality Factor, forced harmonic motion, Resonance (velocity and amplitude), Electrical Oscillator **Wave Phenomena:** Review of Interference, Newton's rings and its applications, Fraunhofer diffraction at single slit and diffraction grating (Elementary Idea), Polarization of light, Malus law, Brewster law.	**9**
Module 2	**Semiconductor Physics:** Concept of Energy Band, Fermi Level Concept, P-N junction diode (Basic structure and working principle), Zener diode, LED, photodiode, Tunneling in Diode **Bipolar Junction Transistor (BJT):** Construction and Operation of BJT, Transistor Configurations (CE, CB, CC).	**8**
Module 3	**Concept of Quantum Physics:** Failure of Classical Physics, Planck's Quantum Theory and Black Body Radiation (Elementary Idea), Einstein's Photoelectric Effect, Compton Scattering, Matter Waves and de Broglie Hypothesis, Heisenberg's Uncertainty Principle and Applications. **Quantum Formalism:** Wave Function and its Physical Significance, Probability Density, Normalization of Wave Function, Expectation Values, Eigen value and Eigen function.	**8**
Module 4	**Scrodinger Wave Equations:** Time dependent and independent Schrodinger Equations, Particle in a One-Dimensional Rigid Box **Introduction to Quantum Computing:** Classical bits vs Qubits, Superposition and Quantum entanglement, Basic Concept of Quantum gates	**8**
Module 5	**Nuclear Physics:** Nuclear reactions, Nuclear Fission and Fusion, Nuclear Reactors and Applications, Elementary idea to Particle Physics.	**6**
Module 6	**Laser:** Introduction to LASER, Classification of Lasers, spontaneous and stimulated emission, Einstein Co-efficient, population inversion and Characteristics of LASER	**6**

	Optical fibers: Principle and Construction, Acceptance Angle and Numerical Aperture, Attenuation in Optical Fibers, Applications	
	Total Hours	**45**

Text Books	
T1:	Concepts of Modern Physics: A Beiser, S Mahajan, S. Raychaudhuri
T2:	Principles of Engineering Physics-Vol. I and II by M. Khan & S. Panigrahi, Cambridge university Press
T3:	Engineering Physics: H. K Mallik, A. K Singh, McGraw Hill Education Press
T4:	Nuclear Physics: An Introduction, S. B. Patel, New Age International.
T5:	Quantum Computing: A Gentle Introduction, Eleanor G. Rieffel and Wolfgang H. Polak, MIT Press.
Reference Books	
R1:	Engineering Physics: D. R Joshi, McGraw Hill Education Press
R2:	Optics: A. K. Ghatak
R3:	Engineering Physics by Gaur Gupta
R4:	Feynman Lectures on Physics –Vol.-I, Vol.-II, Vol.-III
R5:	Quantum Computing: An Applied Approach, Jack D. Hidary, Springer.
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:	Demonstrate proficiency and perceptive of the principles of oscillatory systems and resonance.
CO2:	Interpret band theory and semiconductor device physics.
CO3:	Exploring the quantum mechanical principles and applications.
CO4:	Apply the Schrödinger equation for solving quantum systems.
CO5:	Develop the basic knowledge of nuclear reactor and particle physics.
CO6:	Understand the comprehensive idea on laser and optical fiber.

Type	Code	Basic Civil Engineering	L-T-P	Credits	Marks
ES	BTCETES101		3-0-0	3	200
Objectives	1. To introduce students to the fundamental concepts and various disciplines of Civil Engineering. 2. To develop a basic understanding of Civil Engineering principles, materials, processes, and practices. 3. To familiarize students with the applications of Civil Engineering in infrastructure development and the built environment.				
Pre-Requisites	Knowledge of Physics, Mathematics and Computer programming 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 group task, project planning and video demonstration.				

Module	Topics	Hours
Module 1	**Introduction to Construction materials:** Basics of Civil Engineering & Broad disciplines of Civil Engineering Building components and Materials –Cement, Concrete, Steel. Concept of smart building, Tiles for flooring, Different Types of Doors and windows, Paints. New and smart Materials – flyash, new-age concrete, recycling of materials.	**8**
Module 2	**Field Survey:** Scale, plan, map, principles of survey, Linear measurements, Ranging, Compass Survey, Bearing of a line, Levelling, Introduction to Modern Survey Instruments (EDM and Total Station), GIS and GPS (Introduction only). **Fundamentals of Soil Mechanics:** Fundamentals of soil classification, properties, foundation (deep and shallow)and types.	**6**
Module 3	**Transportation:** Different modes of transport, Highway, classification of road, Railway , Types of Bridges, concept of Tunnels and Metro rail, underground and overhead, Airport, Introduction to Basics of Port and Harbor, Breakwater, Concept of inland waterways	**6**
Module 4	**Water Resource & Water Supply:** Fundamentals of Water Resource engineering-sources and Introduction to hydraulic structures like canals, siphons, weirs, dams, etc., Sources of water supply, advantages and disadvantages of water supply, water supply system and its components. pumps and pressure regulators.	**6**
Module 5	**Plumbing System:** Plumbing in Building, plumbing system, Purpose of plumbing system, plumbing tools, Fitting and fixtures in domestic building, Valves, joints. Solenoid valve Advanced plumbing Technologies, Pumps- its types, centrifugal pump its principle	**8**
Module 6	**Basics of Town Planning & Indian Architecture:** Introduction: Definition, Scope, Objectives and Basic Principles, Major Urban & Settlement Development Patterns. Introduction to Indian Architecture, Importance, Evolution and recent development in Indian Architecture.	**6**
	Total Hours	**40**

Text Books	
T1:	Engineering Mechanics, S.S. Bhavikatti, NEW AGE International Publishers.
T2:	Strength of Materials (Mechanics of Solids), R.K. Rajput, S. Chand & company Ltd., New Delhi
T3:	Engineering Mechanics, Timoshenko, (TMH Publication Delhi).
Reference Books	
R1:	"Strength of Materials", Rattan S.S., Tata McGraw Hill Education Pvt .Ltd., New Delhi, 2017
R2:	Applied Mechanics & Strength of Material, I.B. Prasad
Online Sources	
1	https://archive.nptel.ac.in/content/syllabus_pdf/105104160.pdf
2	https://onlinecourses-archive.nptel.ac.in/noc17_ce17/preview
3	https://archive.nptel.ac.in/content/syllabus_pdf/105104160.pdf
Course Outcomes: At the end of this course the students will be able to	
CO1:	Understand the Laws of Thermodynamics.
CO2:	Being aware of how crucial thermodynamics is to IC engines, power plants, refrigerators, and Heat Pump.
CO3:	Have a fundamental understanding of welding, Casting, Forming and other manufacturing techniques.
CO4:	Recognize fundamental power transfer mechanisms and aware of the fundamental robotics system.
CO5:	Being aware of fluid mechanics and hydraulic machines.
CO6:	Understand the working of different mechanical measuring instruments.

Type	Code	Basic Electronics Engineering	L-T-P	Credits	Marks
ES	BTECTES101		2-0-0	2	200
Objectives	1. To introduce students to the fundamental concepts and principles of Electronics Engineering. 2. To develop a basic understanding of electronic components, circuits, and their applications. 3. To enable students to apply fundamental electronic principles for analyzing and solving basic engineering problems.				
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				
Module	**Topics**				**Hours**
Module 1	Introduction to Electronics Engineering, passive and active components, Electronic signals and waveforms, Analog versus digital systems, Electronic applications in AI, EVs, robotics, healthcare, agriculture, renewable energy and communication.				**4**
Module 2	PN Junction Diode: Working Principle, Study of Zener diode, Light Emitting Diodes (LEDs), Rectifier circuits, Clipping circuits, Clamping circuits,				**6**
Module 3	Bipolar Junction Transistors and Their Applications: Construction & Operation, Transistor operation as an electronic switch and as an amplifier., Transistor biasing (fixed, voltage divider, emitter), Relationship between transistor current gains (α and β),				**6**
Module 4	Introduction to Operational amplifiers, Ideal characteristics , Inverting amplifier, Non-inverting amplifier, Voltage follower configurations, Virtual Ground Concepts, Opamp as Integrator, Differentiator & Summing Amplifier,				**4**
Module 5	Digital Electronics Basics: number systems and number system conversions, Binary arithmetic, Boolean algebra and simplification of logical expressions using Boolean identities, De Morgan's theorem , Logic gates, Universal gates, SOP & POS Expressions, Introduction to combinational and sequential circuits(only introduction)				**5**
Module 6	Microprocessor & Microcontroller concept, Introduction to Chip Manufacturing: The Manufacturing process of Microprocessor Chips, The Ecosystem for Manufacturing Microprocessor Chips, The Global Landscape of Semiconductor Chip Manufacturing, The Growing Landscape of Microprocessor Chip Manufacturing In India.				**5**
				Total Hours	**30**

Text Books	
T1:	Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylested and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092
T2:	Fundamentals of Digital Circuits, 4th Edition A Anand Kumar PHI
T3:	B.Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications
T4:	Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, Pearson Education.
Reference Books	
R1:	E. Hughes, "Electrical and Electronics Technology", Pearson.
R2:	Microelectronic Circuits, 7th Edition Adel S.Sedra and Kenneth C Smith Oxford University Press
R3:	Digital Design, 5th Edition M.Morris Mano and Michael D Ciletti Pearson
R4:	Integrated Electronics, 2nd Edition Jacob Millman and Christos Halkias Tata McGraw Hills
R5:	A course in Electrical and Electronic Measurements and Instrumentation, Author: A K Sawhney Publisher: Dhanpat Rai & Co. (P) Limited.
Online Resources	
1.	https://onlinecourses.nptel.ac.in/noc23_ee62
2.	https://onlinecourses.nptel.ac.in/noc23_ee17
3.	https://onlinecourses.nptel.ac.in/noc23_ee65
4.	https://onlinecourses.nptel.ac.in/noc23_ee66
5.	https://onlinecourses.nptel.ac.in/noc23_ee15
6.	https://onlinecourses.nptel.ac.in/noc22_ee90
Course Outcomes: At the end of this course the students will be able to	
CO1:	Explain basic electronic components, signals, measurements, and applications.
CO2:	Analyze diode characteristics and basic diode circuits using simulation tools.
CO3:	Explain BJT operation and its applications as a switch and amplifier.
CO4:	Analyze basic operational amplifier circuits and their applications.
CO5:	Apply number systems, Boolean algebra, logic gates, and basic combinational circuits.
CO6:	Explain microcontrollers, embedded systems, PCB design, fabrication, and sustainable electronics.

Type	Code	Basic Programming Skills	L-T-P	Credits	Marks
ES	BTCSTES101		3-0-0	3	200
Objectives	1. To introduce students to fundamental concepts of problem-solving, algorithms, flowcharts, and programming using C. 2. To develop students' programming skills through decision-making, loops, functions, arrays, pointers, structures, and file handling. 3. To enable students to apply programming concepts to solve real-life engineering problems through practical and experiential learning activities.				
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.				
Module	**Topics**				**Hours**
Module 1	Number System, Block diagram of a computer system, Von Neumann and Harvard architecture, Primary and Secondary Memory, Input and Output Devices, Operating System, Compiler, Application Program, Machine language, assembly language, and high-level languages, Microprocessor Vs Microcontroller, Introduction to Arduino Platform. Demonstrations illustrating how software controls hardware (Displays, LEDs, sensors and actuators).				8
Module 2	**Algorithm, Representation of Algorithm:** Flowchart/Pseudo-code with examples. C Program structure, data types, variables, constants, Memory addresses, Storage of variables in memory, storage class. Syntax and logical errors in compilation, object and executable code. Arithmetic expressions, Operators and Precedence.				7
Module 3	**Decision making:** Conditional Branching, if statement, if else statement, nested if else statement, switch, nested switch statements. Iteration and loops: while, do-while, for, break, continue.				7
Module 4	Functions, Parameter passing in functions, call by value, idea of call by reference, recursion, local and global variables, static variables.				9
Module 5	**Arrays:** Arrays (1-D, 2-D), initialization, Accessing Array Elements, Matrix applications, passing arrays to functions, Character arrays and Strings. Pointers, Pointer arithmetic, dynamic memory allocation, pointer to array and array of pointers, Linear Search, Bubble Sort.				7
Module 6	Structures, Array of structures, union, structure vs union, passing structure to function, File handling: ASCII and binary Files.				7
				Total Hours	**45**

Text Books	
T1:	E. Balagurusamy, Programming in ANSI C, 8th Edition, Tata McGraw Hill, 2019
T2:	Herbert Schild, C: The Complete Reference, Tata McGraw Hill
Reference Books	
R1:	Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication Pvt. Ltd
R2:	Rajaraman, V., Computer Programming in C, PHI Publications
R3:	Somashekara, M. T., Guru, D. S. , Manjunatha, K. S., Problem Solving With C, PHI
R4:	Yashavant Kanetkar, Let Us C, 17th Edition, BPB Publications New Delhi, 2019
R5:	The Arduino Projects Book, Scot Fitzgerald and Michael Shiloh, 2022, (https://www.uio.no/studier/emner/matnat/ifi/IN1060/v21/arduino/arduino-projects-book.pdf)
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	Elements of Engineering Physics Laboratory	L-T-P	Credits	Marks
BS	BTBSPBS102		0-0-2	1	100
Objectives	To enable the students to perform experiments based on the physical phenomenon and correlate between the theory and principles associated with it.				
Pre-Requisites	Knowledge of elementary Physics and mathematics				
Teaching Pedagogy	Regular practical classes with use of virtual lab, sessions are planned to be interactive with focus on problem solving activities using software tools.				

Experiments	Topics	Hours
Experiment 1	Determination of acceleration due to gravity (g) by bar pendulum.	**2**
Experiment 2	Determination of surface tension of a given liquid by capillary rise method.	**2**
Experiment 3	Determination of Young's modulus by using Searle's apparatus	**2**
Experiment 4	Determination of rigidity modulus of a wire using Barton's apparatus.	**2**
Experiment 5	Determination of wavelength of an unknown monochromatic source of light using Newton's ring apparatus.	**2**
Experiment 6	Plotting of input and output characteristics of BJT (Bipolar junction transistor).	**2**
Experiment 7	Plotting of V~I characteristics of PN junction diode.	**2**
Experiment 8	Study of Zener diode characteristics and voltage regulation.	**2**
Experiment 9	Study of V-I characteristics of Photodiode under dark and illuminated conditions.	**2**
Experiment 10	Determination of grating element of a plane diffraction grating.	**2**
	Total Hours	**20**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Understand the concept of oscillatory system and its applications
CO2:	Analyze the mechanical properties of materials using elastic constants.
CO3:	Understand the basic mechanism of liquid flow and properties.
CO4:	Characterize diffraction gratings and monochromatic light sources.
CO5:	Evaluate the electrical characteristics of semiconductor devices.

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	Basic Civil Engineering Laboratory	L-T-P	Credits	Marks
ES	BTCEPES101		0-0-2	1	100
Objectives	1. To introduce the fundamental concepts and major disciplines of Civil Engineering. 2.To develop basic knowledge of construction materials, surveying, soil, transportation, water resources, plumbing, and town planning. 3. To familiarize students with modern technologies, sustainable practices, and infrastructure systems used in Civil Engineering. 4. To enable students to appreciate the role of Civil Engineering in societal development and sustainable growth.				
Pre-Requisites	Basic knowledge of Physics, Mathematics, and Computer Programming acquired at the higher secondary level..				
Teaching Pedagogy	Lecture-based learning, demonstration method, laboratory learning, field exposure, ICT-enabled teaching, collaborative learning, and experiential learning.				

Experiments	Topics	Hours
Experiment 1	Determination of Water absorption and Compressive strength test of brick specimen.	**2**
Experiment 2	Determination of Specific gravity of soil specimen.	**2**
Experiment 3	Sieve Analysis of Soil.	**2**
Experiment 4	Study of different instruments used in surveying.	**2**
Experiment 5	Determination of Compressive strength of Concrete.	**2**
Experiment 6	Study of Different components of plumbing system.	**2**
Experiment 7	Determination of Normal Consistency of Cement using Vicat Apparatus.	**2**
Experiment 8	Determination of Initial and Final Setting Time of Cement by Le-Chateliers Method	**2**
Experiment 9	Chain Survey of a Small Area and Preparation of Field Book.	**2**
Experiment 10	Determination of Aggregate Impact Value (AIV) of Coarse Aggregates	**2**
Experiment 11	Determination of Aggregate Crushing Value (ACV) of Coarse Aggregates	**2**
	Total Hours	**22**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Identify and test basic construction materials.
CO2:	Determine basic engineering properties of soils and aggregates.
CO3:	Use surveying instruments for simple field measurements.
CO4:	Perform basic tests on concrete and masonry materials.
CO5:	Identify components of plumbing and water supply systems.
CO6:	Apply laboratory and field-testing techniques in civil engineering practice

Type	Code	Basic Electronics Engineering Laboratory	L-T-P	Credits	Marks
ES	BTECPES101		0-0-2	1	100

Objectives	1. To gain practical experience in characterizing electronic devices. 2. To train the students to use CRO and DSO for measurements. 3. To analyze the designing process of basic digital circuits.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Experiments	Topics	Hours
Experiment 1	Identification of electronic components, devices and Basic Sensors and introduction to general safety rules for laboratory.	**2**
Experiment 2	Study and use of CRO/ DSO, Function generator to view and measure different waveforms.	**2**
Experiment 3	To plot the V-I characteristics of PN Diode.	**2**
Experiment 4	To analyse the waveforms of Half Wave Rectifier and Full Wave Rectifier circuits, and calculation of efficiency.	**2**
Experiment 5	To design and view the output waveforms of a basic clipper/clamper circuit.	**2**
Experiment 6	To design and view the output waveforms of Opamp as Inverting amplifier , Non-inverting amplifier; integrator and differentiator	**2**
Experiment 7	Study and truth table verification of logic gates.	**2**
Experiment 8	Multilevel implementation of Boolean functions.	**2**
Experiment 9	To design and fabricate an LED blinker circuit using PCB.	**2**
Experiment 10	To design PCB for LDR/Temperature sensor.	**2**
	Total Hours	**20**
BEYOND SYLLABUS		
Experiment 1	Interfacing a Temperature Sensor (LM35/DHT11) with Tinkercad	**2**
Experiment 2	IR Sensor interfacing for obstacle detection with Tinkercad.	**2**
Experiment 3	To design transistor switch and implement on PCB.	**2**
Experiment 4	To implement half wave rectifier on PCB.	**2**
	Total Hours	**8**

Course Outcomes: At the end of this course the students will be able to	
CO1:	Identify electronic components, sensors, and laboratory instruments safely.
CO2:	Measure and analyze electrical waveforms using CRO/DSO and function generators.
CO3:	Analyze diode, rectifier, clipper, and clamper circuits experimentally.
CO4:	Design and test basic op-amp amplifier and signal-processing circuits.
CO5:	Implement and verify basic digital logic and Boolean functions.
CO6:	Design, simulate, and fabricate basic sensor and electronic circuits using PCBs and Tinkercad.

Type	Code	Basic Programming Skills Laboratory	L-T-P	Credits	Marks
ES	BTCSPES101		0-0-3	1.5	100
Objectives	1. To develop practical programming skills in C through the implementation of basic programming constructs and problem-solving techniques. 2. To enable students to implement fundamental programming concepts such as arrays, functions, pointers, structures, file handling, searching, and sorting algorithms. 3. To provide hands-on experience in Arduino programming, sensors, microcontrollers, and serial communication through project-based learning.				
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.				

Experiments	Topics	Hours
Experiment 1	Familiarity with basic UNIX/LINUX command, VI editor. Sample C Program.	**2**
Experiment 2	Programs on arithmetic expressions, operators, and precedence.	**2**
Experiment 3	Programs on Conditional Branching.	**2**
Experiment 4	Programs on Loops.	**2**
Experiment 5	Programs on single dimensional array.	**2**
Experiment 6	Programs on two-dimensional array.	**2**
Experiment 7	Programs on Functions.	**2**
Experiment 8	Programs on Recursive Functions.	**2**
Experiment 9	Programs on Pointers.	**2**
Experiment 10	Programs on Dynamic Memory Allocation.	**2**
Experiment 11	Programs on Structure.	**2**
Experiment 12	Programs on Union.	**2**
Experiment 13	Programs on File Handling.	**2**
Experiment 14	Implementation of Linear search.	**2**
Experiment 15	Implementation of sorting algorithm: Bubble Sort	**2**
Experiment 16	Arduino Programming – Introduction to Sensors, Introduction to Microcontrollers.	**2**
Experiment 17	Programing, Serial Communication	**2**
Experiment 18	Arduino based Project	**2**
	Total Hours	**36**

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	Workshop Practice & Digital Manufacturing Laboratory	L-T-P	Credits	Marks
ES	BTMEPES103		0-0-3	1.5	100
Objectives	1. To develop basic practical skills in common workshop processes, tools, machines, and safety practices. 2. To familiarize students with fundamental digital manufacturing concepts, tools, and techniques. 3. To apply workshop and digital manufacturing skills to fabricate simple engineering components and products.				
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.				

Experiments	Topics	Hours
Experiment 1	Workshop Safety Practices, PPE Usage, and Familiarization with Hand Tools & Measuring Instruments	**3**
Experiment 2	Linear Measurement using Steel Rule, Vernier Caliper, and Micrometer	**3**
Experiment 3	Basic Fitting Operations: Marking, Sawing, Filing, and Drilling	**3**
Experiment 4	Familiarization and Safe Operation of Power Tools (Cordless Drill, Screw Driver, Angle Grinder, Mitre Saw)	**3**
Experiment 5	2D Sketching and 3D Modeling of a Simple Component using Fusion 360 / SolidWorks / Catia.	**3**
Experiment 6	STL Generation, Slicing, and G-Code Preparation for 3D Printing	**3**
Experiment 7	Fabrication of a Prototype using FDM 3D Printer	**3**
Experiment 8	Design and Fabrication of a Name Plate/Key Chain using Laser Cutting and Engraving Machine	**3**
Experiment 9	CNC Router Machining of a Simple Wooden Profile	**3**
Experiment 10	Soldering, Desoldering, and Breadboard Assembly of a Simple Electronic Circuit	**3**
Experiment 11	a) Interfacing a DHT11 Temperature and Humidity Sensor & Ultrasonic Distance Sensor (HC-SR04) with Arduino b) Arduino-Based Automatic Light Control System using LDR c) ESP32-Based IoT Data Logging to a Cloud Dashboard	**3**
Experiment 12	Study, Simulation and Programming of a Pick-and-Place Robotic Arm	**3**
	Total Hours	**36**

Course Outcomes: At the end of this course the students will 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.
CO3:	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	Ability Enhancement Training- A Laboratory	L-T-P	Credits	Marks
AE	BTSDPAE101		0-0-2	1	100
Objectives	1. To develop practical skills in MS Office applications (MS Word, MS Excel, and MS PowerPoint) for academic and professional documentation. 2. To introduce the fundamentals of Artificial Intelligence, ChatGPT, and Entrepreneurship for enhancing digital competency and entrepreneurial mindset.				
Pre-Requisites	Basic knowledge of computer operations and familiarity with the Windows operating system, Interest in learning digital productivity tools and entrepreneurial concepts.				
Teaching Pedagogy	Hands-on laboratory sessions with practical exercises using MS Office applications and AI tools. Demonstrations, guided practice, case studies, and activity-based learning on entrepreneurship concepts.				
Modules	**Topics**				**Hours**
Module 1	Introduction Windows OS, OS Commands and operations. **Introduction to MS Office MS-Word:** Create; open, save, print command of file. **Home tab:** Edit texts, Format text, Paragraph setting and apply styles. **Insert tab:** Cover page, blank page, page break, table, picture, clip art, shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.				**6**
Module 2	**MS-WORD:** Mailing tab: Mail merge, Page Layout tab: margin, orientation, size, columns, watermark, page color, page border, Review tab: spelling and grammar checking, Thesaurus. **MS-EXCEL:** Create workbook, Home tab, Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.				**4**
Module 3	**MS-EXCEL:** Page Layout tab: Margin, Orientation, Paper size, Print area, Background. Formulas tab: Auto sum (sum, average, count numbers, max, min), Insert Function (if, sum if, count if, average if, max if, min if) **MS-EXCEL:** Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group.				**6**
Module 4	**MS-POWER POINT:** Create file, Home tab, Insert new slide, change layout Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art, Header Footer, movie, sound. **Introduction to AI**. ChatGPT: Introduction, ChatGPT in general life, Uses and Applications of ChatGPT: Blog Topics and Keyword Research, Assist in Generating Copy for a Website Editing, Creating, Writing and Debugging Code				**4**
Module 5	**Introduction to Entrepreneurship:** Introduction to Principles of Entrepreneurship, who can become an entrepreneur; Traits of successful entrepreneurs; Self-appraisal and Profiling – Individual Exercise Based Types of business organizations it's advantages and disadvantages, choosing right option for company formation.				**6**
Module 6	**Roles of entrepreneurship for economic development:** Mission and Vision formation, Examples of few new generation companies				**4**

	Motivation; Ways to stay motivated during Entrepreneurship; Common challenges in Entrepreneurship and their solutions	
	Total Hours	**30**

Study Materials	
T1:	IT & IS Lab Manual, Department of CSE, GIFT, Bhubaneswar
T2:	Microsoft Office 2010 Introductory BY Gary B. Shelly, Misty E. Vermaat.
T3:	Entrepreneurship Development by Dr. R. K. Singhal
T4:	Entrepreneurship Development by M.L.Sharma

Course Outcomes: At the end of this course the students will be able to	
CO1:	To give basic fundamental concept about computer system
CO2:	To get familiar with MS Windows OS
CO3:	To get hands on expertise in MS Word
CO4:	Able to solve mathematical problems systematically using MS excel
CO5:	Able to design professional presentation using MS PowerPoint and manage the information in computer system using MS Access
CO6:	To gather knowledge about internet technology and its applications

Experiments	**Topics**	**Hours**
Experiment 1	Introduction Windows OS, OS Commands and operations, Introduction to MS Office	**2**
Experiment 2	MS-WORD: Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles.	**2**
Experiment 3	MS-WORD: Insert tab: Cover page, blank page, page break, table, picture, clip art. shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.	**2**
Experiment 4	MS-WORD: Mailing tab: Mail merge, Page Layout tab: margin, orientation, size, columns, watermark, page color, page border, Review tab: spelling and grammar checking, Thesaurus.	**2**
Experiment 5	MS-EXCEL: Create workbook, Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.	**2**
Experiment 6	MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, Print area, Background	**2**
Experiment 7	MS-EXCEL: Formulas tab: Auto sum(sum, average, count numbers, max, min), Insert Function(if, sum if, count if, average if, max if, min if)	**2**
Experiment 8	MS-EXCEL: Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group.	**2**
Experiment 9	MS-POWER POINT: Create file, Home tab: Edit texts, Format text, Paragraph setting and apply styles. Insert new slide, change layout, Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art, Header Footer, movie, sound. Design tab: Theme, color, font, background style. Animation Tab: Custom animation, Transition(style, sound, speed), Slide show)	**2**

Experiment 10	ChatGPT : Introduction, ChatGPT in general life, Uses and Applications of ChatGPT: Blog Topics and Keyword Research, Assist in Generating Copy for a Website Proofreading and Editing, Creating WordPress Plugins, Writing and Debugging Code	**2**
	Total Hours	**20**

Indicative Sessions:	
1:	Introduction to Principles of Entrepreneurship
2:	Who can become an entrepreneur
3:	Traits of successful entrepreneurs
4:	Self-appraisal and Profiling – Individual Exercise Based
5:	Types of business organizations
6:	Advantages and disadvantages, choosing right option for company formation
7:	Mission and Vision formation
8:	Examples of few new generation companies
9:	Motivation : Ways to stay motivated during Entrepreneurship
10:	Motivation : Common challenges in Entrepreneurship and their solutions