Mahavir Education Trust's

Shah & Anchor Kutchhi Engineering College

An Autonomous Institute Affiliated to University of Mumbai

2024-25 Scheme & Syllabus

Bachelor of Technology (B.Tech.)

in

Information Technology

First Year B.Tech.

(Effective from Academic Year 2024-2025 onwards)

Mahavir Education Trust's

Shah & Anchor Kutchhi Engineering College

An Autonomous Institute Affiliated to University of Mumbai

CURRICULUM STRUCTURE FIRST YEAR B.Tech.

Information Technology

REVISION: R0-V0-2024-25

Effective from Academic Year 2024-25 onwards

Approved by Board of Studies on 18/05/2024

Approved by Academic Council on 25/05/2024

Shah & Anchor Kutchhi Engg. College Autonomous Institute Mumbai - 88

Ms.Swati Nadkarni
I/C HOD

Chairman BoS
Department of Information Technology
Shah & Anchor Kutchhi Engineering College
Chembur, Mumbai - 400088

Dr. Bhavesh Patel
Principal

Dr. Bhavesh Patel
Chairman
Academic Council
Shah & Anchor Kutchhi Engineering College
Chembur, Mumbai - 400088

UG Program in Information Technology

Vision

- To achieve excellent standards of quality education by keeping pace with rapidly changing technologies.
- To create technical manpower of global standards with capabilities of accepting new challenges in Information Technology.

Mission

- To create competent and trained professionals in Information Technology who shall contribute towards the advancement of engineering, science and technology useful for the society.
- To impart quality and value based education to raise the satisfaction level of all stakeholders.
- To generate technically sound professionals and entrepreneurs to become part of the industry and research organizations at national levels.

UG Program in Information Technology

Program Specific Outcomes

By the end of the educational experience our students will be able to:

1. The Information Technology graduates are able to analyze, design, develop, test and apply management principles, mathematical foundations in the development of IT based solutions for real world and open-ended problems.
2. The Information Technology graduates are able to perform various roles in creating innovative career paths: to be an entrepreneur, a successful professional, pursue higher studies with realization of moral values & ethics.

Program Educational Objectives

1. A graduate will excel in a professional career and contribute to social needs through Information Technology.
2. A graduate will be integrated into the world of practicing professionals for collaborations, pursue higher education, conduct research, demonstrate professionalism and ethics.
3. A graduate will Exhibit innovation, team work, leadership and communication skills through lifelong learning.

UG Program in Information Technology

Program Outcomes

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusion using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solution for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

UG Program in Information Technology

Preamble

Shah and Anchor Kutchhi Engineering College (SAKEC) has been granted academic autonomy by University Grants Commission (UGC) from Academic Year 2024-25 for 10 years.

The program in Information Technology (IT) has prepared an Autonomy Scheme curriculum for 4 years undergraduate (UG) and 2 years of post-graduate (PG). The overall credits and courses for the first year of engineering and second year of engineering curriculum is in line with the NEP 2020. The first year of engineering consists of foundational courses in basic science and engineering science category and other categories are value education, ability enhancement, and co-curricular courses. Second year of engineering contains mainly program core courses. Multidisciplinary courses and entrepreneurship category courses are introduced for the second year. The emphasis is on vocational and skill development courses for all four years of engineering. The first year and second year focuses on building the foundations, and is structured as per NEP credit distribution to categories. The third year and final year is for developing the skills and knowledge of the students in various domains through electives. The curriculum is designed to cater to industry requirements and different students may follow different paths and take different set of courses in it.

The curriculum is designed to impart technical knowledge as per latest industry standards.In order to gain practical skills learners are offered various skill based courses, program electives, project based learning. New courses are introduced to cater to co-curricular and extra curricular development of learners. It provides enhanced learning experience with the introduction of activity based learning and project based learning. Human values are instilled in the learners by incorporating social involvement and real world problem solving through field visits, case studies, project developments and internships. Therefore, it boosts the learner's profile for taking up higher studies as well as for finding appropriate jobs. It has also given ample opportunities to explore entrepreneurship as a career option. It also focuses on continuous internal assessment which is very encouraging and beneficial for the learners.

The factors which led to this present curriculum development are research, innovation and outcome based education. The shift in focus from teacher-centric to learner-centric education for designing this curriculum will definitely improve quality of education. This curriculum is an amalgamation of knowledge, skills and value education.

Motto for the Program in Information Technology is:

Technology driven holistic development through the right blend of courses.

UG Program in Information Technology

Abbreviations used in course codes for course categories based on NEP

Course Category		Abbreviation
BSC/ESC	Basic Science Courses	BS
	Engineering Science Courses	ES
Program Courses	Programme Core Course	PC
	Programme Elective Course	PE
Multidisciplinary Courses	Multidisciplinary Minor	MD
	Open Elective	OE
Skill Courses	Vocational & Skill Enhancement Course	VS
Humanities Social Science & Management	Ability Enhancement Course	AE
	Entrepreneurship/Economics/ Management Courses	EC
	Indian Knowledge System	IK
	Value Education Course	VE
Experiential Learning Courses	Research Methodology	RM
	Field Project/Community Engagement Project	FP/CP
	Project	PR
	Internship	IN
Liberal Learning Courses	Co-curricular course	CC

Mahavir Education Trust's

Shah & Anchor Kutchhi Engineering College

An Autonomous Institute Affiliated to University of Mumbai

UG Program in Information Technology

Program Structure for First Year B.Tech.

(With Effect from 2024-2025)

Semester I

	Scheme of Instruction				Scheme of Examination					
	THEORY									
		Hours per Week		**Total Credits**	**Duration in Hours**	**Maximum Marks**				**Total Marks**
Course Code	**Name of the Course**	**L**	**P**			**CIA**			**ESE**	
						MSE	**CCE**	**Total**		
ITCOR0BS101	Matrices & Differential Calculus	3	0	3	3	20	20	40	60	100
ITCOR0BS102	Applied Chemistry	3	0	3	3	20	20	40	60	100
ITCOR0ES101	Principles of Electrical & Electronics Engineering	2	0	2	3	20	20	40	60	100
ITCOR0ES102	Engineering Graphics	1	0	1	-	-	25	25	-	25
ITCOR0AE101	Effective & Interactive Communication	1	0	1	-	-	25	25	-	25
ITCOR0VE101	Universal Human Values - I	2	0	2	-	-	50	50	-	50
ITCOR0CC101	Yoga & Sports	1	0	1	-	-	25	25	-	25
PRACTICALS						**CIAP**			**ESEP**	
ITLOR0BS101	Matrices & Differential Calculus Lab	0	2	1	3	10			15	25
ITLOR0BS102	Applied Chemistry Lab	0	2	1	3	10			15	25
ITLOR0ES101	Principles of Electrical & Electronics Engineering Lab	0	2	1	3	10			15	25
ITLOR0ES102	Engineering Graphics Lab	0	4	2	3	40			60	100
ITLOR0AE101	Effective & Interactive Communication Lab	0	2	1	-	25			-	25
ITLOR0VS101	Skill Based Laboratory I (Web Fundamentals)	0	4	2	3	40			60	100
ITLOR0VS102	Exploration Lab	0	2	1	-	25			-	25
ITLOR0CC101	Yoga & Sports Lab	0	2	1	-	25			-	25
TOTAL		**13**	**20**	**23**	**-**	**430**			**345**	**775**

*All ESE (Theory/Practical) will be conducted for 100 marks and converted as per Teaching and Examination scheme

CIA=Continuous Internal Assessment MSE=Mid Semester Exam CIAP=Continuous Internal Assessment Practical (CIAP)
ESEP=End Semester Examination Practical CCE= Continuous Comprehensive Evaluation ESE=End Semester Examination

UG Program in Information Technology

Program Structure for First Year B.Tech.

(With Effect from 2024-2025)

Semester II

	Scheme of Instruction				Scheme of Examination					
	THEORY									
		Hours per Week		Total Credits	Duration in Hours	Maximum Marks				Total Marks
Course Code	Name of the Course	L	P			CIA			ESE	
						MSE	CCE	Total		
ITCER0BS103	Differential Equations & Multiple Integrals	3	0	3	3	20	20	40	60	100
ITCER0BS104	Applied Physics	3	0	3	3	20	20	40	60	100
ITCER0PC101	Digital Logic	2	0	2	3	20	20	40	60	100
ITCER0ES103	Engineering Mechanics	2	0	2	3	20	20	40	60	100
ITCER0ES104	Problem Solving and Programming with C	1	0	1	-	-	25	25	-	25
ITCER0VE102	Universal Human Values - II	2	0	2	-	-	50	50	-	50
ITCER0CC102	National Service Scheme	1	0	1	-	-	25	25	-	25
PRACTICALS						CIAP			ESEP	
ITLER0BS103	Differential Equations & Multiple Integrals Lab	0	2	1	3	10			15	25
ITLER0BS104	Applied Physics Lab	0	2	1	3	10			15	25
ITLER0ES103	Engineering Mechanics Lab	0	2	1	3	10			15	25
ITLER0ES104	Problem Solving and Programming with C Lab	0	4	2	3	40			60	100
ITLER0VS103	FAB Lab	0	4	2	-	50			-	50
ITLER0CC102	National Service Scheme Lab	0	2	1	-	25			-	25
TOTAL		**14**	**16**	**22**		**405**			**345**	**750**

*All ESE (Theory/Practical) will be conducted for 100 marks and converted as per Teaching and Examination scheme

CIA=Continuous Internal Assessment MSE=Mid Semester Exam CIAP=Continuous Internal Assessment Practical (CIAP)

ESEP=End Semester Examination Practical CCE= Continuous Comprehensive Evaluation ESE=End Semester Examination

UG Program in Information Technology

Program Structure for First Year B.Tech.
(With Effect from 2024-2025)
Credit Details

Course Code	Course Category		Sem I	Sem II	Total
ITCOR0BS101 / ITCOR0BS102 / ITCER0BS103 / ITCER0BS104	Basic Science Courses		08	08	16
ITCER0PC101	Program Core Courses		-	02	02
ITCOR0ES101 / ITCOR0ES102 / ITCER0ES103 / ITCER0ES104	Engineering Science Courses		06	06	12
ITLOR0VS101 / ITLOR0VS102 / ITLER0VS103	Vocational & Skill Enhancement Course	Skill Courses	03	02	05
ITCOR0VE101 / ITCER0VE102	Value Education Course	Humanities Social Science & Management	02	02	04
ITCOR0AE101	Ability Enhancement Course		02	-	02
ITCOR0CC101 / ITCER0CC102	Co-curricular courses	Liberal Learning Courses	02	02	04
Total			**23**	**22**	**45**

SEMESTER I

Program: First Year B.Tech.	Semester: I	L	P	C
Matrices & Differential Calculus	Course Code: ITCOR0BS101	3	0	3
Matrices & Differential Calculus Lab	Lab Code: ITLOR0BS101	0	2	1
		3	2	4

Course Objectives:	
1	To apply matrices in solving systems of linear equations and explore their use in various fields such as computer graphics, physics and engineering.
2	To comprehend the concept of eigen values and eigen vectors and their properties & apply these concepts in solving practical problems in fields like stability analysis, vibration analysis and dynamic systems.
3	To apply the concept of partial differentiation and series expansion techniques in solving problems involving functions of several variables and to understand their role in approximations, optimizations and error analysis.
4	To apply the knowledge of formulation and solution of ordinary differential equations of first order and first-degree equations in modeling and solving real-world problems in physics, engineering and other disciplines.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Apply the rank method to solve the system of linear equations.
CO 2:	Compute the eigen values and their corresponding eigen vectors.
CO 3:	Apply the concept of partial differentiation to find the total derivative and extreme values.
CO 4:	Solve first order first degree differential equations.

Pre-requisite courses: Elementary transformations, Matrix multiplication, Derivatives of Standard functions.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies / Design Thinking/Innovation/Creativity/Blog writing / Vlogging 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4. End Semester Examination (Theory and Lab components)
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS

Module 1: Matrices & Applications	**10 Hours**

1.1 Rank of matrix by Normal form and Echelon form.
1.2 System of Homogeneous and Non - Homogeneous linear equations.
1.3 Gauss - Jacobi's Iterative method, Gauss-Seidel method.
1.4 Method of encoding and decoding, Hill Cipher coding and decoding using modulo functions, Examples of coding and decoding.

Module 2: Eigen Values & Eigen Vectors	**9 Hours**

2.1 Linear Dependence & Linear Independence of vectors.
2.2 Eigen Values, Eigen vectors and their properties.
2.3 Diagonalisable Matrix.

Module 3: Partial Differentiation & Series Expansions	**10 Hours**

3.1 Partial Differentiation: Function of several variables, Partial derivatives of first and higher order, Direct differentiation & differentiation of Composite function.
3.2 Euler's Theorem on Homogeneous functions with two independent variables (with proof).
3.3 Maxima and Minima of a function of two independent variables, Jacobian's of two and three independent variables (simple problems).
3.4 Taylor's & Maclaurin's series expansion of standard functions.

Module 4: Ordinary Differential Equation of First Order & First Degree	**10 Hours**

4.1 Exact differential equations, Equations reducible to exact form by using integrating factors.
4.2 Linear differential equations (Review), Equation reducible to linear form, Bernoulli's equation.
4.3 Application of Ordinary differential equations to engineering problems.
4.4 Numerical solution of Ordinary differential equations by Euler's method and Runge - Kutta method.

Lecture: 3 Hrs/Week **Total Hours : 39 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Finding rank of a matrix.
2. Finding the numerical solution of linear equations, test for consistency.
3. Finding the solution of system of equations using Gauss-Jacobi's method.
4. Finding the solution of system of equations using Gauss Seidel method.
5. Finding eigen values & eigen vectors of a matrix.
6. Finding diagonal matrix using eigen values & eigen vectors.
7. Finding the solution of real-life example using ODE of first order & first degree.
8. Finding the numerical solution of ODE using Runge - Kutta method.
9. Finding first & higher order partial derivatives of the functions.
10. Applications to Maxima & Minima of two variables.

Practical: 2 Hrs/Week	**Total Hours: 26 Hrs**

Textbooks:

1. Grewal B. S.: "Higher Engineering Mathematics", Khanna Publishers, 44th Ed., 2021.
2. Kreyszig E.: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books:

1. Bali N.P and Goyal M.: "A Textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
2. Dass H. K. and Verma R.: "Higher Engineering Mathematics" S. Chand publication, 3rd Ed., 2014.
3. Gupta C.B, Sing S.R and Mukesh Kumar: "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education, 2015.
4. Lay D. C: "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
5. Pal S. & Bhunia S. C.: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
6. Ramana V.: "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017.
7. Stewart J.: "Calculus" Cengage Publications, 7th Ed., 2019.
8. Strang G.: "Linear Algebra and its Applications", Cengage Publications, 4th Ed. 2022.
9. Williams G.: "Linear Algebra with Applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
10. Wylie C. R, Barrett L.C..: "Advanced Engineering Mathematics" McGraw Hill Book Co., New York, 6th Ed., 2017.

Program: First Year B. Tech.	Semester: I	L	P	C
Applied Chemistry	Course Code: ITCOR0BS102	3	0	3
Applied Chemistry Lab	Lab Code: ITLOR0BS102	0	2	1
		3	2	4

Course Objectives:	
1	To develop awareness about the advanced engineering materials imparting the knowledge of their special properties, versatility and their applications.
2	To apply the principles of electrochemical cells, in the energy sector (batteries and fuel cell) and to solve corrosion related problems in engineering services.
3	To apply the Spectroscopic Techniques in sensors used for biomedical operations, forensic, automobiles and security systems.
4	To apply green chemistry principles and knowledge of E-waste recycling for a sustainable society.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Explain properties and applications of semiconductors, superconductors, advanced polymers, nanomaterials, and smart materials.
CO 2:	Apply the concept of electrochemical theory for corrosion control methods and Battery technology.
CO 3:	Apply knowledge of green chemistry in the interest of society and environmental sustainability.
CO 4:	Categorize the ranges of the electromagnetic spectrum used for instrumental methods of analysis and explain the applications of absorption and emission spectra.

Pre-requisite courses:

Students should be familiar with the properties of materials, general concept of electrochemistry and working of batteries. An understanding of sustainable use of resources is expected from the students. For the topic of instrumental methods of analysis, knowledge of Beer-Lambert's Law is required.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory Component). 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/ Design Thinking/Innovation/Creativity/Blog writing / Vlogging 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/ Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component). 4. End Semester Examination (Theory and Lab Components)
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS

Module 1: Advance Engineering materials	**14 Hours**

1.1 Semiconductors: Silicon and Germanium -Physical and chemical properties, isotopes, chemistry of compounds like GaAs, GaP, InP, InGaAs, ZrO, HfO and application.
1.2 Superconductors: Perovskite structure and, 1:2:3 compound, properties and applications.
1.3 Nanomaterials: Properties, Synthesis and applications of Nanomaterials Carbon Clusters- Graphene chemistry, Fullerene, Quantum dots, Preparation Properties and applications of CNTs.
1.4 Advance polymers: Concept of molecular weight, Determination of molecular weight, Effect of heat on polymers. Conducting polymers- polyaniline, polyfurans, poly(p-phenylenes), polythiophene. Biopolymers-polyglycols, polylactic acid, Polymers in space application- Thermal blankets, Thermal control paints. polymers for electronic components.
1.5 Shape memory alloys: Principle, properties, super elasticity-one way and two-way shape memory effect, Austenite and martensite transformations, applications.
1.6 Smart materials: Self assembled nanostructure, Energy harvesting materials, Intelligent materials Magnetostrictive materials.

Module 2: Electrochemistry, Corrosion & Energy Sciences	**10 Hours**

2.1 Electrochemistry: Concept of electrode potential, Nernst equation, types of electrochemical cells, electrochemical series, simple numerical.
2.2 Corrosion: Electrochemical theory of corrosion, Types of corrosion. Corrosion control methods - cathodic protection, sacrificial anodic protection & impressed current cathodic protection; advantages and applications of electroplating/electroless plating.
2.3 Battery Technology: Introduction, Important terms, Nickel Hydrogen (metal hydride), Rechargeable Lithium-ion batteries, Reserve Batteries.
2.4 Fuel cells: Characteristics, description, construction and working of Hydrogen-oxygen fuel cells, Methanol-oxygen fuel cell, Solid Oxide fuel cell, Types of fuel cells (in brief).
2.5 Renewable source of energy: Introduction, Classification, Solar energy, Production of electricity using solar energy, Photovoltaic cell.

Module 3: Sustainable Chemistry	**5 Hours**

3.1 Green Chemistry: Introduction, Goals, 12 principles of green chemistry, Significance of 12 principles with industrial examples Numerical on atom economy.
Green solvents and their application- Super critical Carbondioxide.
3.2 E-Waste: Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. Recycling and Recovery: Cu, Ag, Au.

Module 4: Instrumental methods of Analysis	10 Hours

4.1 Optical methods of analysis: Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.
4.2 UV Spectroscopy: Types of electronic transitions.
4.3 Infrared spectroscopy: Fundamental and non-fundamental molecular vibrations; IR absorption positions of O, N and S containing functional groups; Effect of H-bonding, conjugation, resonance and ring size on IR absorptions.
4.4 Emission spectroscopy: Flame photometry, fluorescence and phosphorescence Jablonski diagram.
4.5 Electroanalytical techniques: Potentiometry, conductometry, amperometry.
4.6 Electrochemical sensor: Electrochemical gas sensors for SOx and NOx. Biosensors.

Practical: 3 Hrs/Week	Total Hours: 39 Hrs

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Preparation of conducting polymer.
2. Molecular weight determination of polymers by Oswald Viscometer.
3. Construction of Galvanic cell.
4. Comparative study of rate of corrosion in acidic alkaline and neutral medium.
5. Electroplating.
6. Electrolysis of water.
7. Determination of acid content in beverages by using pH sensors.
8. Colorimetry.
9. Flame Photometer Experiment.
10. Experiment on UV-Vis spectroscopy.
11. Recovery of Cu/Al from E-waste.
12. Identification of greener pathway.

Experiments for Demonstration:
1. Flame Photometer Experiment.
2. Experiment on UV-Vis spectroscopy.
3. Recovery of Cu/Al from E-waste.

Practical: 2 Hrs/Week		Total Hours: 26 Hrs

Textbooks:

1. Dara S. S. “A Text book of Engineering Chemistry” S Chand & Co. 1986.
2. Jain P. C. & Jain M. “Engineering Chemistry” Dhanpat Rai Publishing Co. (P) Ltd, 2019.
3. Joshi Payal & Deep Shashank “Engineering Chemistry” (Oxford University Press)2019.

Reference Books:

1. Ahluwalia V.K. “Green Chemistry” publisher-Alpha Science International, 2013.
2. Bahl B. S. Arun Bahl, Tuli G.D. “Essentials of Physical Chemistry” publisher- S. Chand and Co, 2022.
3. Banwell C.N. Elaine M. McCash “Fundamentals of Molecular Spectroscopy (4th Edition)” published-Tata McGraw Hill. 2017.
4. Duerig T.W. Melton K.N., Wayman C. M. “Engineering Aspect of Shape memory alloys” Butterworth Hienmann Publishers, 2013.
5. Johri R. “E-waste: implications, regulations and management in India and current global best practices” publisher- The Energy and Resources Institute (TERI).
6. Kalsi H.S. “Electronic Instrumentation” Hill Education publisher, 2017.
7. Pawar Dnyandeo Chemical Sensors: CRC press (Taylor and Francis group) Publisher,
8. Pradeep T. “Nano: The essentials, understanding Nanoscience and Nanotechnology” publisher-Tata McGraw Hill, 2007.
9. Raghavan V “A Material Science and Engineering” publisher- Printice Hall India Ltd. 2015.
10. Sharma Y.R “Elementary Organic Spectroscopy” publisher- S. Chand and Co, 2007.
11. Sharon M. “Advances in Nano Materials and Applications” Wiley publisher, 2014.

Program: First Year B.Tech.	Semester: I	L	P	C
Principles of Electrical & Electronics Engineering	Course Code: ITCOR0ES101	2	0	2
Principles of Electrical & Electronics Engineering Lab	Lab Code: ITLOR0ES101	0	2	1
		2	2	3

Course Objectives:	
1	To understand DC circuit, theorems & first order R-L circuit.
2	To Study series & parallel AC circuits
3	To understand the working of diodes.
4	To understand working principle of transistors

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Explain DC circuit, theorems & time domain analysis of first order R-L circuit.
CO 2:	Solve series & parallel AC circuits.
CO 3:	Explain the working of diodes.
CO 4:	Explain working of transistors.

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT
1.Continuous Internal Assessment (Theory component) 2.Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging 3.Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4.End Semester Examination (Theory and Lab components)
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS	
Module 1: DC Circuits	**6 Hours**
1.1 Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current law, Kirchhoff's voltage laws, 1.2 Analysis of simple circuits with dc excitation, Superposition Theorem, Thevenin's Theorems, Norton's Theorems. 1.3 Time-domain analysis of first-order RL circuits.	
Module 2: AC circuits	**8 Hours**
2.1 Generation of alternating emf, instantaneous, rms, peak, average values and related other terms, vector representation of AC quantities, 2.2 Steady state analysis of R, L, C series and parallel circuits, resonance. 2.3 Generation of three-phase emf, star connection, delta connection, relationship between line and phase quantities.	
Module 3: Diodes	**6 Hours**
3.1 P-n junction diode, symbol, V-I Characteristics, Diode applications 3.2 Zener Diode: characteristics, Rectifiers – Half wave, Full wave and Bridge rectifiers.	
Module 4: Transistor	**6 Hours**
4.1 Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. 4.2 Unipolar devices – FET, MOSFET.	

Lecture: 2 Hrs/Week **Total Hours : 26 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.
2. To measure output voltage across load resistor/current through
3. load resistor and verify the result using Mesh and Nodal analysis.
4. Verification of Superposition Theorem.
5. Verification Thevenin's Theorem.
6. Verification Norton's Theorem.
7. Verification Maximum Power Transfer Theorem.
8. CRO-Applications
9. Half Wave and Full Wave Rectifier With/Without Filter
10. Study VI characteristics of Diode
11. Study Characteristics of BJT/FET

Practical: 2 Hrs/Week **Total Hours : 26 Hrs**

Textbooks:

1. Theraja, B.L. and Theraja, "A Textbook of Electrical Technology" ,A.K. (2010)
2. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
3. V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
4. Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011.

Reference Books:

1. D P Kothari and I J Nagrath , "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
2. M. Naidu,S. Kamakshaiah ,"Introduction to Electrical Engineering", McGraw-Hill Education, 2004
3. B.R Patil "Basic Electrical Engineering", Oxford Higher Education.

Program: First Year B. Tech.	Semester: I	L	P	C
Engineering Graphics	Course Code: ITCOR0ES102	1	0	1
Engineering Graphics Lab	Lab Code: ITLOR0ES102	0	4	2
		1	4	3

Course Objectives:	
1	To familiarize with the basic principles and conventions of engineering graphics.
2	To impart skills in reading and interpretation of engineering drawing.
3	To enhance visualizations skills.
4	To articulate graphical skills, concepts and ideas through technical drawings.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Apply the knowledge of projections to solve simple application based problems on projection of lines.
CO 2:	Apply the concepts of section of the solids in practical applications.
CO 3:	Interpret two dimensional views with or without section using the knowledge of orthographic projections.
CO 4:	Analyze the drawing to convert two dimensional views into isometric view & sketch a three dimensional model.

Pre-requisite courses: Knowledge of basic geometrical shapes, unit measurement system.

Course Assessment Methods:

DIRECT

1. Continuous Internal Assessment (Theory Component).
2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/ Design Thinking/Innovation/Creativity/Blog writing / Vlogging .
3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/ Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component).
4. End Semester Examination (Theory and Lab Components)

INDIRECT

1. Course-end survey
2. Activity based survey (if any)

DETAILED SYLLABUS	
Module 1: Projection of Points and Lines	**4 Hours**
1.1 Principles of Engineering graphics and their significance, Usage of drawing instruments. 1.2 Types of lines, Dimensioning systems as per IS conventions. 1.3 Concept of projections, Projection of points in four quadrants. 1.4 Projection of lines inclined to both the reference planes (Excluding traces of lines).	
Module 2: Section of Solids	**4 Hours**
2.1 Section of Prism cut by plane perpendicular to at least one reference plane. 2.2 Section of Pyramid cut by plane perpendicular to at least one reference plane. 2.3 Section of Cylinder cut by plane perpendicular to at least one reference plane. 2.4 Section of Cone cut by plane perpendicular to at least one reference plane.	
Module 3: Orthographic and Sectional Orthographic Projections	**2 Hours**
3.1 Fundamentals of orthographic projections. 3.2 Different views of a simple machine part as per the first angle projection method. 3.3 Full or Half Sectional views of the simple machine parts.	
Module 4: Isometric Projections and 3D Modeling	**3 Hours**
4.1 Principles of Isometric projection – Isometric scale, Isometric views. 4.2 Conversion of Orthographic views to Isometric views (Excluding sphere). 4.3 Introduction to 3D modeling, 3D viewing techniques. 4.4 Different types of 3D modeling. 4.5 Application of 3D modeling in various industries e.g. STL files for 3D Prints, Patent drawings.	

Lecture: 1 Hr/Week		**Total Hours: 13 Hrs**

LAB COMPONENT CONTENTS

CAD Laboratory:

Overview of Computer Graphics Covering: Graphics communication, Demonstrating knowledge of the theory of CAD software such as: Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. **4 Hours**

Customization & CAD Drawing: Consisting of set up of the drawing page and the printer including scale settings, setting up of units and drawing limits, ISO and ANSI standards for coordinate dimensioning. **2 Hours**

Annotations, layering & other Functions Covering: Applying dimensions to objects, applying annotations to drawings, setting up and use of layers, layers to create drawings, Create, edit and use customized layers, changing line lengths through modifying existing lines (extend/lengthen), Printing documents to paper using the print command, orthographic projection techniques, Drawing sectional views of objects (simple machine parts). **4 Hours**

3D Modeling: Creating simple solids and surfaces, Modifying objects in 3D space, Editing solids, Creating 2D drawings from 3D models, Generating a drawing for 3D Prints. **8 Hours**

Suggested List of Experiments (Minimum 12 Experiments)

Component 1 - Experiments to be completed in the CAD Laboratory

1. Orthographic Projections **3 Hours**
2. Sectional Orthographic Projections **3 Hours**
3. Reading of Orthographic Projections **2 Hours**
4. Isometric Projections **2 Hours**
5. Floor Plan Layout **3 Hours**
6. 3D modeling **8 Hours**

Component 2 - Experiments to be completed in the Drawing Laboratory **13 Hours**

1. Projections of Lines
2. Section of Solids
3. Orthographic Projections
4. Sectional Orthographic Projections
5. Reading of Orthographic Projections
6. Isometric Projections

Practical: 4 Hrs/Week		**Total Hours: 52 Hrs**

Textbooks:

1. Bhatt N. D., Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House Pvt. Limited.
2. Bhatt N. D. & Panchal V. M., "Machine Drawing", Charotar Publishing House Pvt. Ltd.
3. Jolhe Dhananjay A., Engineering Drawing with an introduction to AutoCAD, Tata McGraw Hill.

Reference Books:

1. Narayana, K.L. & Kannaiah P., Engineering Drawing, Scitech Publications Pvt. Ltd.
2. Parthasarathy N. S. & Murali Vela, Engineering Drawing, Oxford University Press.
3. Tickoo Sham, AutoCAD 2021 (for Engineers and Designers - Basic and Intermediate, 3D and Advanced), Purdue University Northwest, USA.

Program: First Year B.Tech.	Semester: I	L	P	C
Effective & Interactive Communication	Course Code: ITCOR0AE101	1	0	1
Effective & Interactive Communication Lab	Lab Code: ITLOR0AE101	0	2	1
		1	2	2

Course Objectives:	
1	To familiarize Students with the need for communication in various contexts.
2	To analyze different communication styles and use of language
3	To apply the linguistic skills for an interactive environment.
4	To develop confident personality traits along with grooming and social etiquettes.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Eliminate hindrances and use verbal/non-verbal cues at social and workplace situations**.**
CO 2:	Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures , tone and pronunciation..
CO 3:	Acquire effective writing skills for drafting academic and technical documents
CO 4:	Enhance basic linguistic skills for day-to-day situations

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT

1. Continuous Internal Assessment (Theory component)
2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies /Design Thinking/Innovation/Creativity/Blog writing / Vlogging
3. Pre/Post - Experiment Test viva, Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component)
4. End Semester Examination (Theory and Lab components)

INDIRECT

1. Course-end survey
2. Activity based survey (if any)

DETAILED SYLLABUS

Module 1 :Fundamentals of Communication	**6 Hours**
1.1 Aspects of Communication: Meaning, Concept, Definition, Communication Cycle 1.2 Organizational Communication- Formal/Informal Channels of Communication 1.3 Hindrances to Communication- Mechanical, Physical, Linguistic, Psychological; Cultural 1.4 Strategies to Overcome the Hindrances	
Module 2 :Verbal Aptitude for Employability	**2 Hours**
2.1 Vocabulary Building 2.2 Grammar	
Module 3: Formal Writing Skills	**3 Hours**
3.1 Email Étiquettes 3.2 Drafting Official Mails-Use of Language 3.3 How to Respond to Professional Messages on- What's App / Telegram/Emails with Proper étiquettes. 3.4 Technical Writing: Describing the Object and Writing User Instructions	
Module 4 :Language Enhancement with LSRW (based on IELTS)	**2 Hours**
4.1 Listening Skills 4.2 Speaking Skills 4.3 Reading Skills 4.4 Writing Skills	

Lectures: 1 Hr/ Week **Total Hours :13 Hrs**

LAB COMPONENTS CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

Self Introduction and Partner Introduction/ Ice breaking activity

1. Voice the opinion- can be given different topics
2. Extempore
3. Enhancing Listening Skills
4. Activities on Communication Hindrances- Skit writing and role playing
5. Situational Role Plays
6. Reading Activity- Book Review
7. Information transfer through Graphic organizers
    1. Verbal to visual
    2. Visual to verbal
8. Debate
9. Non- Verbal Skit
10. Social and Professional Etiquettes
    1. Formal Dining Étiquettes
    2. Cubicle Étiquettes
12. Case studies on Effective Communication
13. Monologue

Practical: 2 Hrs/Week **Total Hours : 26 Hrs**

Textbooks:

1. Kumar S. & PushpLata, Communication Skills a workbook, New Delhi: Oxford University Press, 2018
2. Ram A.,Place Mentor, Tests of Aptitude for Placement Readiness, Oxford University Press, 2018
3. Raman M., Sharma S.,Technical Communication, Principles and Practice, Oxford University Press, 2004

Reference Books:

1. Arms, V. M., Humanities for the engineering curriculum: With selected chapters from Olsen/Huckin: Technical writing and professional communication, second edition. Boston, MA: McGraw-Hill, 2005
2. Bovée, C. L., &Thill, J. V., Business communication today. Upper Saddle River, NJ: Pearson, 2021
3. Butterfield, J. , Verbal communication: Soft skills for a digital workplace. Boston, MA: Cengage Learning, 2017
4. Masters, L. A., Wallace, H. R., & Harwood, L., Personal development for life and work. Mason: South-Western Cengage Learning, 2011
5. Robbins, S. P., Judge, T. A., & Campbell, T. T. Organizational behavior. Harlow, England: Pearson, 2017

Program: First Year B.Tech.	Semester: I	L	P	C
Universal Human Values-I	Course Code:ITCOR0VE101	2	0	2

Course Objectives:	
1	To provide students with a holistic value-based education that will enable them to be successful in their academic, professional, and social lives.
2	To give students the tools to develop effective habits, promote personal growth, and improve their well-being, stability, and productivity.
3	To allow students to establish a stronger connection with their family through critical thinking and development of qualities such as unity, forgiveness, empathy, and effective communication.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Learn the need for a holistic value-based education.
CO 2:	Develop a positive attitude towards effective habits, personal growth, and well-being.
CO 3:	Establish a stronger connection with their family through critical thinking and effective communication.
CO 4:	Understand the significance of failure as formative learning experiences.

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies /Design Thinking/Innovation/Creativity/Blog writing / Vlogging 3. Pre/Post - Experiment Test viva, Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4. End Semester Examination (Theory and Lab components)
INDIRECT
1.Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS	
Introduction: The Need for Values	**2 Hours**
Students will learn about the need for values as part of their holistic development to become successful in their many roles - as ambitious students, reliable employees, caring family members, and considerate citizens.	
Module 1: Remaking Yourself **Subject: Restructuring Yourself**	**2 Hours**
Students learn how self-improvement enables them to secure a bright future for themselves. They will learn 6 powerful thought-processes that can develop their intellectual, physical, emotional, and spiritual quotients.	
Module 2: Remaking Yourself **Subject: Power of Habit**	**2 Hours**
Students will undergo a study of how habits work, the habits of successful professionals, and the practical techniques that can be used to develop good habits in their life.	
Module 3: Learning from Legends **Subject: Tendulkar & Tata**	**2 Hours**
Students will learn from the inspirational lives of India's two legends, Sachin Tendulkar, and Ratan Tata. They will implement these lessons through relatable case studies.	
Module 4: From House to Home **Subject: Listening & Understanding**	**2 Hours**
Active listening is an essential part of academic progress and communication. Students will learn to listen with their eyes, ears, mind, and heart.	
Module 5: Facing Failures **Subject: Welcoming Challenges**	**2 Hours**
This lecture enables students to revisit the way in which they approach challenges. Through the study of successful figures such as Disney, Lincoln and Bachchan, students will learn to face difficulties through a positive perspective.	
Module 6: Facing Failures **Subject: Significance of Failures**	**2 Hours**
Failure is a student's daily source of fear, negativity, and depression. Students will be given the constructive skills to understand failure as formative learning experiences.	
Module 7: My India My Pride **Subject: Glorious Past - Part 1**	**2 Hours**
India's ancient Rishis, scholars, and intellectuals have made tremendous contributions to the world, they developed an advanced, sophisticated culture and civilization which began thousands of years ago. Students will learn the importance of studying India's glorious past so that they could develop a strong passion and pride for our nation.	
Module 8: My India My Pride **Subject: Glorious Past - Part 2**	**2 Hours**

Our ancient concepts can be used to seek revolutionary ideas and to generate inspiration. Students will develop a deeper interest in India's Glorious Past – by appreciating the need to read about it, research it, write about it, and share it.	
Module 9: Learning from Legends **Subject: A.P.J. Abdul Kalam**	**2 Hours**
Dr Kalam's inspirational life displayed legendary qualities which apply to students (1) Dare to Dream (2) Work Hard (3) Get Good Guidance (4) Humility (5) Use Your Talents for the Benefit of Others.	
Module 10: Soft Skills **Subject: Networking & Leadership**	**1 Hour**
Students are taught the means of building a professional network and developing a leadership attitude.	
Module 11: Soft Skills **Subject: Project Management**	**1 Hour**
Students will learn the secrets of project management through the Akshardham case study. They will then practice these skills through an activity relevant to student life.	
Module 12: Remaking Yourself **Subject: Handling Social Media**	**1 Hour**
Students will learn how social media can become addictive and they will imbibe simple methods to take back control.	
Module 13: Facing Failures **Subject: Power of Faith**	**1 Hour**
Students will learn about the power and necessity of faith in our daily lives.	
Module 14: From House to Home **Subject: Bonding the Family**	**1 Hour**
Students will understand the importance of strong family relationships. They will learn how to overcome the generation gap and connect with their family more.	
Module 15: Selfless Service **Subject: Seva**	**1 Hour**
Students will learn that performing seva is beneficial to one's health, wellbeing, and happiness. It also benefits and inspires others.	

Lecture: 2 Hrs/Week **Total Hours :26 Hrs**

Textbooks:

1. IPDC Workbook-1

Program: First Year B.Tech.	Semester: I	L	P	C
Yoga and Sports	Course Code: ITCOR0CC101	1	0	1
Yoga and Sports Lab	Lab Code: ITLOR0CC101	0	2	1
		1	2	2

Course Objectives:	
1	To make the students understand the importance of sound health and fitness principles as they relate to better health.
2	To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health, and fitness.
3	To create a safe, progressive, methodical, and efficient activity-based plan to enhance improvement and minimize risk of enquiry.
4	To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
CO 2:	Assess current personal fitness levels.
CO 3:	Identify opportunities for participation in yoga and sports activities.
CO 4:	Develop understanding of psychological problems associated with the age and life- style.

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT

1. Continuous Internal Assessment (Theory component)
2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies /Design Thinking/Innovation/Creativity/Blog writing / Vlogging
3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity /Blog writing / Vlogging (Lab Component)
4. End Semester Examination (Theory and Lab components)

INDIRECT

1. Course-end survey
2. Activity based survey (if any)

DETAILED SYLLABUS	
Module 1: Introduction to Physical Education	**1 Hour**
1.1 Meaning and definition of Physical Education 1.2 Aims and objectives of Physical Education 1.3 Changing trends in Physical Education	
Module 2: Olympic Movement	**2 Hours**
2.1 Ancient and Modern Olympics (Summer and Winter) 2.2 Olympics Symbols, Ideals, Objectives and Values 2.3 Awards and Honors in the field of Sports in India (Dronacharya Award, Arjun Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.	
Module 3: Physical Fitness, Wellness & Lifestyle	**2 Hours**
3.1 Meaning and Importance of Physical Fitness & Wellness 3.2 Components of Physical fitness 3.3 Components of Health-related fitness 3.4 Components of wellness 3.5 Preventing Health Threats through Lifestyle Change 3.6 Concept of Positive Lifestyle	
Module 4: Fundamentals of Anatomy & Physiology in Physical Education, Sports & Yoga	**2 Hours**
4.1 Define Anatomy, Physiology & Its Importance 4.2 Effect of exercise on the functioning of various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)	
Module 5: Postures	**1 Hour**
5.1 Meaning and Concepts of Postures 5.2 Causes of Bad Posture 5.3 Concept and advantages of Correct Posture 5.4 Common Postural Deformities- Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis. 5.5 Corrective Measures for Postural Deformities	
Module 6: Yoga	**1 Hour**
6.1 Meaning and importance of Yoga, Elements of Yoga	

6.2 Introduction- Asanas, Pranayama, Meditation & Yogic Kriyas
6.3 Yoga for concentration and related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
6.4 Relaxation Techniques for improving concentration – Yog-nidra

Module 7: Yoga and Lifestyle	**2 Hours**

7.1 Asanas as preventive measures
7.2 Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana.
7.3 Obesity: Procedure, Benefits, and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana.
7.4 Back Pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
7.5 Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pavan Muktasana, Ardh Matsyendrasana.
7.6 Asthema: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.

Module 8: Training and Planning in Sports	**1 Hour**

8.1 Meaning of Training
8.2 Warming up and limbering down: Skill, Technique & Style
8.3 Meaning and Objectives of Planning
8.4 Tournament- Knock-Out, League/ Round Robin and Combination.

Module 9: Psychology & Sports	**1 Hour**

9.1 Definition & Importance of Psychology in Physical Education & Sports
9.2 Define & Differentiate Between Growth & Development
9.3 Adolescent Problems & their Management
9.4 Emotion: Concept, Type & Controlling of emotions
9.5 Meaning, Concept & Types of Aggressions in sports
9.6 Psychological benefits of exercise
9.7 Anxiety & Fear and its effects on Sports Performance.

Lecture: 1 Hr/Week **Total Hours: 13 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Activities

1. Backward and Forward Bending Asanas
2. Meditative Asanas
3. Spinal Twisting and Standing Asanas
4. Balancing and Relaxation Asanas
5. Pranayama
6. Asanas prescribed in the syllabus as per the discretion of the course Incharge.

Practical: 2 Hrs/Week		**Total Hours: 26 Hrs**

Textbooks:

1. Gupta, A. P. (2010). Anatomy and physiology. Agra: Sumit Prakashan.
2. Iyengar, B.K.S. (2000), Light on Yoga. New Delhi: Harper Collins Publishers.

Reference Books:

1. David K. Miller & T. Earl Allen, Fitness, A life time commitment, Surjeet Publication Delhi 1989.
2. Gore, Anatomy and Physiology of Yogic Practices. Lonavala: Kanchan Prkashan,1990
3. Renu Mahtani, The power of Posture, Mumbai, Jaico Publishing House,2014
4. Sharma, R. D. Health and physical education, Gupta Prakashan,1979
5. Swami Kuvalayanda, Asanas. Lonavala: Kaivalyadhama,1998
6. Swami Sivananda, The Science of Pranayama. Chennai: A Divine Life Society Publication,1971
7. Thirumalai Kumar. S and Indira. S Yoga in Your Life, Chennai: The Parkar Publication,2011
8. Uppal A. K. Physical Fitness and Wellness. Friends Publication, India, New Delhi,2004.

Program: First Year B.Tech.	Semester: I	L	P	C
Skill Based Laboratory I (Web Fundamentals)	Lab Code: ITLOR0VS101	0	4	2

Course Objectives:	
1	To Design and create web pages using HTML5.
2	To Design and create web pages using CSS3
3	To Create web pages and provide client side validation.
4	To build static web application using HTML,CSS and javascript

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Identify and apply the appropriate HTML tags to develop a webpage.
CO 2:	Identify and apply the appropriate CSS rules to format data on webpage
CO 3:	Use JavaScript to develop interactive web pages.
CO 4:	Construct web based applications

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT
1.Continuous Internal Assessment (Theory component) 2.Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3.Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity /Blog writing / Vlogging(Lab Component) 4. End Semester Examination (Lab components)
INDIRECT
1. Course-end survey 2.Activity based survey (if any)

DETAILED SYLLABUS	
Module 1:Introduction to the Web	**12 Hours**
1.1 Working of web browsers, HTTP protocol, HTTPS, DNS, TLS,DOM, URL, URI. 1.2 Introduction to HTML5 1.3 Formatting web pages by using different text tags, lists ,hyperlinks and anchors, navigational aids,image maps, and redirecting to another URL. 1.4 HTML5 semantic tags, divisions,semantic layout, positioning and formatting divisions 1.5 Tables, Forms and Media in HTML5	
Module 2: Web page structure and appearance using CSS3	**14 Hours**
2.1 CSS3 Requirement, Syntax and structure 2.2 CSS3 rules for Backgrounds, Colors and properties, Manipulating texts, Fonts, borders and boxes, Margins, Padding Lists, CSS Positioning. Animations, Tool-Tips, Style images, Variables, Media Queries 2.3 Working with Gradients, Pseudo Class, Pseudo elements 2.4 Fundamentals of frameworks such as Bootstrap/Tailwind CSS	
Module 3:Client-side interactivity using Java Script	**14 Hours**
3.1 Syntax of JavaScript, Execution of JavaScript, Internal, Embedded and External Javascript 3.2 JavaScript : variables, arrays, functions, conditions, loops, Pop up boxes, JavaScript objects and DOM, 3.3 JavaScript inbuilt functions, JavaScript validations and Regular expressions. 3.4 Introduction to JavaScript: ES5, ES6, Difference between ES5 and ES6.	
Module 4 :Event Handling using Javascript	**12 Hours**
4.1 Event handling with JavaScript, Callbacks in Javascript 4.2 Function as arguments in JavaScript,Classes and Inheritance. 4.3 Introduction to JQuery. 4.4 Web hosting on github.	

LAB COMPONENT CONTENTS:

A.Suggested List of Experiments (Minimum 7 Experiments)

1	HTML Tags
2	Web page design using HTML5 including header, footer, formatting tags, lists, images etc.
3	Design web pages and link them using different navigating features including forms,multimedia and tables etc
4	CSS3: Selectors, Typography, color mode
5	CSS3:Transitions,Transformations and Animations
6	Responsive web page using inline, external & internal style sheets.
7	Event handling with JavaScript
8	Interactive registration web form using JavaScript Form validation
9	Web page using Jquery
10	Responsive web pages using Bootstrap

B. Mini Project (Group Activity)

Practical: 4 Hrs/Week **Total Hours : 52 Hrs**

Textbooks:

1. Venkat Subramaniam,"Rediscovering JavaScript", Master ES6, ES7, and ES8, By · 2018
2. Alex Banks and Eve Porcello, O'Reilly ," Learning React Functional Web Development with React and Redux"

Reference Books:

1. Thomas Powell,"The complete reference: HTML", Tata McGrawHill publication Third edition
2. Eric Ladd,Jim O'Donnell,"Using HTML 4,XML and JAVA ".

Program: First Year B. Tech.	Semester: I	L	P	C
Exploration Lab	Course Code: ITLOR0VS102	0	2	1

Course Objectives:	
1	To explain the basics of electronic devices and circuits.
2	To summarize knowledge of electronics hardware among students.
3	To develop student's skills of self-learning and problem solving in group.
4	To develop student's interest in electronics hardware based projects.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Learn the technique of soldering and circuit implementation on general purpose PCB (GPP).
CO 2:	Setup and use of integrated development environment (IDE) for Arduino boards.
CO 3:	Interface different sensors and actuators with Arduino boards.
CO 4:	Assemble and test line following robot using Arduino microcontroller.

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4. End Semester Examination (Theory and Lab components)
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS	
Module 1: Introduction to Basic Electronic components	**4 Hours**
1.1 Introduction to Basic Electronic components (Resistors, Capacitors, Color coding of Resistors and capacitors, Diodes, Transistors, PCBs, Relays, ICs, Electronics cables, Connectors, DC motors, Stepper motors, Servo motors, use of bread board, different jumper wires etc. etc.) 1.2 Introduction to electronic lab instruments i.e., Multimeter, Power Supply, DSO, Function Generator etc. 1.3 Measurement of resistance, AC/DC Voltage, DC current etc. 1.4 How to operate DSO and observe different waveform, take measurements of different parameters of Waveforms. 1.5 Soldering practice. 1.6 Brief introduction to Microcontroller. 1.7 Introduction to Arduino Uno board and explanation of Analog I/O pins, Digital I/O pins, PWM, power supply pins etc. 1.8 Setup and use of integrated development environment (IDE). 1.9 Write the code for LED blinking with a specified delay.	
Module 2: Arduino programming	**10 Hours**
2.1 Introduction to programming: GPIO, Analog and PWM PINS. 2.2 Interfacing of DC Motor to Arduino (ON/OFF and Direction control). 2.3 Interface IR Sensors to the Arduino board. 2.4 Interfacing of Motor driver module to Arduino. 2.5 Movement and direction control of robot (F, B, L, R, SL, SR). 2.6 LCD interfacing. 2.7 Interfacing of Ultra sonic sensor for obstruction avoidance. 2.8 Calculation of IR light intensity and display of different IR Sensors values on LCD for Line following. 2.9 Interfacing of Blue Tooth module.	
Module 3: Robot Motion Control	**6 Hours**
3.1 Movement and direction control of robot using Blue Tooth (F, B, L, R, SL, SR). 3.2 Programming of robot for curve line following of simple turns. 3.3 Programming of robot for Y shape and T shape turns.	
Module 4: Robot Arm Control	**6 Hours**
4.1 PWM and its applications (ON time, OFF Time, Duty Cycle, Avg Voltage etc.). 4.2 PWM using Analog Sensor. 4.3 Servo motor Interfacing. Line following Robot competition.	

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Component Identification and Measurement.
2. Using Lab Instrument.
3. Soldering Practice.
4. Arduino Basics.
5. Basic Arduino Programming.
6. Interfacing DC Motors.
7. Interfacing IR Sensors.
8. Interfacing Motor Driver.
9. Interfacing LCD Displays.
10. Interfacing Ultrasonic Sensors.
11. Interfacing Bluetooth Modules.
12. Programming Robots for Line Following.
13. Servo Motor Interfacing.
14. PWM Control and Applications.
15. Line Following Robot Competition.

Practical: 2 Hrs/Week **Total Hours : 26 Hrs**

Reference Books:

1. Neerparaj Rai, “Arduino Projects for Engineers: A multipurpose book for all engineering branches”, BPB Publications.
2. Yashavant Kanetkar and Shrirang Korde, “21 IoT Experiments”, BPB Publications.
3. Vineesh Kumar K K, “Make your first Robot”, notion press.com.
4. Frank Vahid, and Tony Givargis, “Embedded System Design: A unified Hardware/Software Introduction”, Wiley Publication.

Online Repository:

1. www.arduino.cc/education
2. www.electronicshub.org
3. https://thingspeak.com/
4. www.tinkercad.com/
5. www.electronicsforu.com
6. https://circuitdigest.com
7. www.Github.com

SEMESTER II

Program: First Year B.Tech.	Semester: II	L	P	C
Differential Equations & Multiple Integrals	Course Code: ITCER0BS103	3	0	3
Differential Equations & Multiple Integrals Lab	Lab Code: ITLER0BS103	0	2	1
		3	2	4

Course Objectives:	
1	To apply the knowledge of formulation and solution of higher-order linear differential equations in modeling and solving real-world problems in physics, engineering and other disciplines.
2	To comprehend the concept of Beta and Gamma functions and their properties & apply these to solve the improper integrals.
3	To familiarize the basics of multiple integration and its application in calculating areas & volume.
4	To apply numerical integration techniques in approximating definite integrals.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Solve the higher order linear differential equations with constant coefficients.
CO 2:	Evaluate improper integrals using Beta & Gamma functions.
CO 3:	Evaluate multiple integrals using a transformation of coordinates.
CO 4:	Compute the area of the region using double integration.

Pre-requisite courses: Tracing of curves.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies / Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion/ Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4. End Semester Examination (Theory and Lab components)
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS	
Module 1: Higher Order Linear Differential Equations & Applications	**10 Hours**
1.1 Linear Differential Equation with constant coefficient - complementary function, particular integrals of differential equation of the type f(D)y = X where X is e^{ax}, sin (ax+b), cos (ax+b), x^n, e^{ax} V, xV. 1.2 Applications of higher order linear differential equations to engineering problems.	
Module 2: Beta, Gamma Function and Multiple Integration - 1	**10 Hours**
2.1 Beta and Gamma functions and their properties. 2.2 Double integration - definition, Evaluation of Double Integrals. (Cartesian & Polar) 2.3 Evaluation of double integrals by changing the order of integration. 2.4 Evaluation of integrals over the given region. (Cartesian & Polar)	
Module 3: Multiple Integration - 2	**09 Hours**
3.1 Evaluation of double integrals by changing to polar coordinates. 3.2 Triple integration definition and evaluation. (Cartesian coordinates)	
Module 4: Application of Multiple Integration & Numerical Integration	**10 Hours**
4.1 Application of double integrals to compute Area. 4.2 Application of triple integrals to compute Volume. 4.3 Numerical integration - by Trapezoidal, Simpson's 1/3rd & Simpson's 3/8th rule.	

Lecture: 3 Hrs/Week **Total Hours : 39 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Finding the solution of higher order linear differential equations.
2. Finding the solution of real-life example using higher order DE.
3. Evaluation of improper integrals using Gamma function.
4. Evaluation of improper integrals using Beta function.
5. Finding the numerical solution of integrals using Trapezoidal, Simpson's 1/3rd & Simpson's 3/8th rule.
6. 2D & 3D plots for cartesian & polar curves.
7. Evaluation of double integrals.
8. Finding the surface area.
9. Evaluation of triple integrals.
10. Finding the volume.

Practical: 2 Hrs/Week **Total Hours: 26 Hrs**

Textbooks:

1. Grewal B. S.: “Higher Engineering Mathematics”, Khanna Publishers, 44th Ed., 2021.
2. Kreyszig E.: “Advanced Engineering Mathematics”, John Wiley & Sons, 10th Ed., 2018.

Reference Books:

1. Bali N.P and Goyal M.: “A Textbook of Engineering Mathematics” Laxmi Publications, 10th Ed., 2022.
2. Dass H. K. and Verma R.: “Higher Engineering Mathematics” S. Chand publication, 3rd Ed., 2014.
3. Gupta C.B, Sing S.R and Mukesh Kumar: “Engineering Mathematic for Semester I and II”, Mc-Graw Hill Education, 2015.
4. Pal S. & Bhunia S. C.: “Engineering Mathematics” Oxford University Press,3rd Ed., 2016.
5. Ramana V.: “Higher Engineering Mathematics” McGraw-Hill Education, 11th Ed., 2017.
6. Stewart J.: “Calculus” Cengage Publications, 7th Ed., 2019.
7. Wylie C. R, Barrett L.C..: “Advanced Engineering Mathematics” McGraw Hill Book Co., New York,6th Ed., 2017.

Program: First Year B.Tech.	Semester: II	L	P	C
Applied Physics	Course Code: ITCER0BS104	3	0	3
Applied Physics Lab	Lab Code: ITLER0BS104	0	2	1
		3	2	4

Course Objectives:	
1	To familiarize the students with the basic phenomena occurring in day-to-day life to the basic physics concepts in advanced technologies of today's world.
2	To analyze the engineering applications based upon the concept and principles of physics learnt.
3	To apply the knowledge of the theoretical concepts learnt in physics in understanding the phenomenon and functionality of devices, circuits, and systems.
4	To develop an understanding of usage of Physics knowledge in practical applications.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Describe concepts of Interference, Lasers, Fiber Optics, Semiconductors and Superconductors.
CO 2:	Explain concepts from Quantum Physics, and Sensors.
CO 3:	Apply concepts of Interference, Lasers, Fiber Optics, Semiconductors and Superconductors in applications.
CO 4:	Solve problems and apply knowledge based on Quantum Physics, and Sensors in applications.

Pre-requisite courses:

To comprehensively engage with the topics outlined, students should have a strong foundation in classical physics, optics, and electromagnetism. Students should be acquainted with the principles of wave optics. An understanding of atomic structure and band theory would be advantageous for topics related to semiconductors. Familiarity with fundamental principles such as conservation of energy and momentum, as well as knowledge of vectors and their operations, is crucial. Finally, proficiency in Cartesian coordinate systems is necessary for graphical representations and problem-solving in physics.

Course Assessment Methods:

DIRECT

1. Continuous Internal Assessment (Theory component)
2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/CaseStudies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging.
3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day.
4. Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component).
5. End Semester Examination (Theory and Lab components).

INDIRECT
1. Course-end survey. 2. Activity based survey (if any).

DETAILED SYLLABUS	
Module 1: Optics for Engineers	**12 Hours**

1.1 Thin Film Interference:

1.1.1 Interference by division of amplitude; Formation of colors in thin film.

1.1.2 Interference in thin film of constant thickness in reflected light and transmitted light; Interference in Wedge shaped film; Newton's rings.

1.1.3 Applications-Colors in thin film, Anti-reflecting films and Highly reflecting film.; Determination of thickness of very thin wire or foil; Determination of refractive index of liquid; Determination of wavelength of incident light and radius of curvature of lens; Testing of surface flatness.

1.2 Laser:

1.2.1 Interaction between radiation and matter: Absorption, spontaneous emission, and stimulated emission; Lasing action.

1.2.2 Types of Lasers: Ruby Laser, Helium Neon laser, Semiconductor laser.

1.2.3 Application- Holography.

1.3 Fiber optics:

1.3.1 Optical fiber: structure and classification and index profile; critical angle and total internal reflection.

1.3.2 Numerical Aperture for step index fiber; angle of acceptance; V number; number of modes of propagation; types of optical fibers.

1.3.3 Application- Fiber optic communication system.

Module 2: Solid state physics	8 Hours

2.1 Semiconductor:

2.1.1 Direct & indirect band gap semiconductor.

2.1.2 Fermi Dirac distribution.

2.1.3 Fermi level; Fermi energy level in intrinsic & extrinsic semiconductors; Effect of impurity concentration and temperature on fermi level.

2.1.4 Hall Effect.

2.1.5 P-N junction (Energy Band diagram).

2.1.6 LED, Zener diode, photoconductors, Photovoltaic cell.

2.2 Superconductors:

2.2.1 Critical temperature, critical magnetic field; Meissner's effect; Type I and Type II and high Tc superconductors.

2.2.2 Application- Maglev and SQUID.

Module 3: Quantum Physics and Computing	**10 Hours**
3.1 Matter waves, De Broglie hypothesis, Wave Packet, Phase velocity and group velocity. 3.2 Heisenberg Uncertainty Principle. 3.3 Wave function; Physical interpretation of wave function. 3.4 Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well. 3.5 Fundamentals of Quantum Computing (Difference between classical computing; quantum computing, Qubits, Quantum Superposition theorem, Quantum Entanglement theorem).	
Module 4: Sensors and IOT application	**9 Hours**
4.1 Review of different types of sensors used in IoT. 4.2 Electro-optic Sensors: IR sensors, Image sensors. 4.3 Mechanical Sensors: Pressure and Motion Sensors. 4.4 Environmental Sensors: Temperature and Humidity Sensors. 4.5 Piezoelectric transducers: Concept of piezoelectricity, use of piezoelectric transducer as ultrasonic generator and application of ultrasonic transducer for distance measurement.	

Lecture: 3 Hrs/Week **Total Hours :39 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
2. Determination of radius of curvature of a lens using Newton's ring set up.
3. Determination of wavelength of He: Ne Laser.
4. Study of divergence of laser beam.
5. Determination of Numerical Aperture of an optical fiber.
6. Study of fiber optic communication system for audio signal.
7. Study of Hall Effect.
8. Determination of energy band gap of semiconductors.
9. Study of I / V characteristics of semiconductor diode.
10. Study of Zener diode as voltage regulator.
11. Determination of Planck's constant.
12. Simulating quantum circuits in IBM quantum composer.

Practical: 2 Hrs/Week **Total Hours :26 Hrs**

Textbooks:

1. H K Malik, A K Singh: "Engineering Physics", McGraw Hill Education.
2. Avadhanulu & Kshirsagar: "A textbook of Engineering Physics" S. Chand.

Reference Books:

1. B. G. Streetman,:"Solid state electronic devices" Prentice Hall Publisher.
2. Brijlal and Subramanium: "A textbook of Optics", S. Chand (2006).
3. Arther Beiser:"Concept of Modern Physics", McGraw Hill Education.
4. Gaur and Gupta: "Engineering Physics", Dhanpat Rai.
5. Robert Boylestad: "Electronic Devices and Circuits", Pearson Education.
6. S O Pillai: "Solid state physics", New Age International Private Limited; Tenth edition (31 August 2022)
7. P V Naik: "Engineering Physics", Pearson Education, 2006.
8. Optical Fiber communication by Gerd Keiser, McGraw-Hill Inc.
9. H. S. Kalsi, "Electronic Instrumentation", Tata McGraw-Hill education.
10. Jacob Fraden, "Handbook of Modern Sensors Physics Design and application", Springer AIP.

Program: First Year B.Tech.	Semester: II	L	P	C
Digital Logic	Course Code: ITCER0PC101	2	0	2

Course Objectives:	
1	Understand different number systems and their conversions.
2	Study minimization of logic function using boolean algebra.
3	Realization of combinational logic circuits using logic gates and expression.
4	Realization of sequential logic circuit using flip flop and logic gate.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Realize conversion between various number system.
CO 2:	Minimize logic function using Boolean Algebra.
CO 3:	Analyze & design combinational logic circuit.
CO 4:	Design Sequential logic circuit.

Pre-requisite courses: Nil

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies /Design Thinking/Innovation/Creativity/Blog writing / Vlogging 3. Pre/Post - Experiment Test viva, Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component) 4. End Semester Examination (Theory and Lab components)
INDIRECT
1. Course-end survey 2.Activity based survey(if any)

DETAILED SYLLABUS	
Module 1: Number System	**6 Hours**
1.1 Introduction to Number Systems, Binary Number system, signed Binary Numbers: 1's & 2's complement 1.2 Binary Arithmetic: Binary Addition, Binary Subtraction,2's complement arithmetic, Octal Number System, Hexadecimal Number System 1.3 Codes: Binary coded decimal, Gray code	
Module 2: Logic gates & Boolean algebra	**4 Hours**
2.1 Introduction to Logic gates, concept of universal logic gates 2.2 Boolean algebra, implementation of Boolean expressions using logic gates.	
Module 3: Combinational Logic Circuit	**8 Hours**
3.1 K-Map representation of logic functions, representation of truth table on K-Map 3.2 Minimization of logic function specified in truth table or Minterms/Maxterms, Don't care conditions 3.3 Design examples(Arithmetic circuits, BCD to 7 segment decoder, encoder, code conversion), Multiplexer, Demultiplexer.	
Module 4: Sequential Logic Circuit	**8 Hours**
4.1 Introduction to Flip-flops,S-R flip flop,J-K flip flop,T flip flop, D flip flop 4.2 Race around condition & master slave JK flip flop 4.3 Flip Flop Conversion 4.4 Counters (Ring Counter, Ripple/Asynchronous Counter, Synchronous counter)	

Lecture: 2 Hrs/Week **Total Hours : 26 Hrs**

Textbooks:

1. John. M. Yarbrough, Digital Logic Applications and Design", Boston, Mass: PWS Publishing Company, 1997.
2. R. P. Jain, "Modern Digital Electronics",4th edition Tata McGraw-Hill, 2010.

Reference Books:

1. William Fletcher, An Engineering Approach to Digital Design. Englewood Cliffs, Prentice-Hall, 2015.
2. M. M. Mano, Digital design. Prentice Hall, 1991.
3. J. F. Wakerly, Digital Design: Principles and Practices. New York, Pearson Education, Inc., 2018.

Program: First Year B. Tech.	Semester: II	L	P	C
Engineering Mechanics	Course Code: ITCER0ES103	2	0	2
Engineering Mechanics Lab	Lab Code: ITLER0ES103	0	2	1
		2	2	3

Course Objectives:	
1	To familiarize with the basic principles of Mechanics.
2	To apply the different concepts of mechanics to real-world problems.
3	To analyze the rigid bodies which are at rest or in motion.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Apply the concept of the principle of moments, centroid, conditions of equilibrium, laws of friction, Newton's laws of motion and central force motion.
CO 2:	Illustrate the knowledge of various types of systems of forces, and different types of motions with & without considering forces and relate it to different engineering applications.
CO 3:	Interpret the state of the body either at rest or in motion with or without using the concept of friction.
CO 4:	Analyze Equilibrium conditions of bodies, Friction, Kinematics of rigid bodies and accelerated motion of a particle using the equation of motion with different coordinate systems in space mechanics.

Pre-requisite courses: Use of trigonometric functions, sine rule, cosine rule, derivative, integration.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component). 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component). 4. End Semester Examination (Theory and Lab components).
INDIRECT
1. Course-end survey. 2. Activity based survey (if any).

DETAILED SYLLABUS

Module 1: Resultant of coplanar force system and Centroid.	**6 Hours**

Introduction to Statics:

1.1.1 Fundamental concepts, Units of measurement, international system of units.

1.2 Resultant of Coplanar force system:

1.2.1 Classification of the force system, principle of transmissibility of a force, composition and resolution of a force, Free body diagrams, the moment of a force, principle of moments, moment of a couple, simplification of a force and couple system.

1.2.2 Application-based problems to evaluate the value of force and determine the resultant force and moment of a force.

1.3 Centroid:

1.3.1 Centroid of composite plane Laminas

1.3.2 Application-based problems to determine the location of the centroid of the plane lamina.

Module 2: Equilibrium of coplanar force system and Friction.	**6 Hours**

2.1 Equilibrium of Coplanar Force System:

2.1.1 Condition for the equilibrium of a particle, free body diagram, two and three force members, Lami's theorem, types of loads and types of supports.

2.1.2 Application-based problems to determine reaction forces.

2.2 Friction:

2.2.1 Types of friction, mechanism of dry friction.

2.2.2 Problems with blocks kept on the horizontal plane and inclined plane.

2.2.3 Application-based problems to determine the coefficient of friction.

Module 3: Kinematics of a Particle and Kinematics of a rigid body.	**6 Hours**

3.1 Introduction to Dynamics:

3.1.1 Basic concepts, Newton's laws.

3.2 Kinematics of a Particle:

3.2.1 Rectilinear Motion – Application-based problems on uniform acceleration motion and variable acceleration motion.

3.2.2 Application-based problems on projectile motion.

3.3 Kinematics of Rigid Body:

3.3.1 General Plane Motion, Instantaneous center of rotation. Location of ICR for 1 link, 2 link & 3 link mechanism.

3.3.2 Application-based problems on Velocity analysis of rigid bodies using ICR.

Module 4: Kinetics of a Particle: Force and Acceleration, Central force motion and space mechanics.	**8 Hours**

4.1 Kinetics of a Particle: Force and Acceleration:

4.1.1 Newton's second law of motion, Equation of motion – Rectangular coordinates (Analysis limited to simple systems only).

4.1.2 Normal and tangential components for a particle moving along a curved path (Analysis limited to simple systems only).

4.1.3 Cylindrical coordinates (Analysis limited to simple systems only).

4.2 Central force motion and space mechanics:

4.2.1 Central force motion, free flight trajectory of the satellite, eccentricity of the conic section for the trajectory and types of paths traveled by the satellite depending on the value of the

eccentricity of the conic section.

4.2.2 Application-based problems regarding the motion of the satellite, determining the eccentricity of the orbital path, velocity of the satellite at apogee and perigee, period of time required to cover one orbital revolution.

Lecture: 2 Hrs/Week **Total Hours: 26 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 8 Experiments)

1. To verify the law of moments using the Bell crank lever.
2. Determine the centroid of the composite plane lamina.
3. Determine the support reaction of the simply supported beam.
4. Determine the value of the coefficient of friction between two surfaces.
5. Determine the resultant velocity of a particle performing the projectile motion.
6. Determine the tension in a string by using D'Alembert's Principle / Newton's second law.
7. Write a program to determine the resultant of a coplanar force system.
8. Write a program to determine the different kinematic parameters for a particle performing rectilinear motion.
9. Write a program to determine the different kinematic parameters for a particle performing the projectile motion.
10. Write a program to determine the angular velocity of the link and velocity at any point on the link for a rigid body performing General Plane motion.

Practical: 2 Hrs/Week **Total Hours: 26 Hrs**

Textbooks:

1. Timoshenko S, Young D.H., Rao J.V., Engineering Mechanics, 5th Edition, McGraw Hill Education, 2017.

Reference Books:

1. Beer F.P., Johnston E.R., Mazurek D.F., Cornwell P.J., Self B.P., Vector Mechanics for Engineers, Statics and Dynamics, McGraw Hill Education, 2016
2. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, Pearson Education, 2017.
3. Meriam L.J., Kraige . L.G., Bolton J.N., Engineering Mechanics: Statics, John Wiley & Sons, 2018.
4. Meriam L.J., Kraige . L.G., Bolton J.N., Engineering Mechanics: Dynamics, John Wiley & Sons, 2018.
5. Shames I.H., Rao G.K.M., Engineering Mechanics: Statics and Dynamics, Prentice-Hall, 2006.

Program: First Year of B.Tech. Semester: II		L	P	C
Problem Solving using C Programming Lab	Course Code: ITCER0ES104	1	0	1
Problem Solving using C Programming Lab	Lab Code: ITLER0ES104	0	4	2
		1	4	3

Course Objectives:	
1	Design simple algorithms and flowcharts for solving arithmetic and logical problems, and then guide them to implement these solutions in C language programs.
2	Implement conditional branching (like if-else) and iteration (like loops) in C to manage the flow of their programs based on varying conditions.
3	Decompose complex problems into manageable functions and synthesize complete programs using the divide and conquer approach, enabling modular and maintainable code development
4	Apply programming constructs of C language to solve real-world problems.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Formulate and translate simple algorithms/flowchart for arithmetic and logical problems to programs (in C language)
CO 2:	Implement conditional branching and iteration
CO 3:	Decompose a problem into functions and synthesize a complete program using divide and conquer approach
CO 4:	Demonstrate the use of homogeneous and heterogeneous data types in C.

Pre-requisite courses: Nil.

Course Assessment Methods:

DIRECT
1.Continuous Internal Assessment (Theory component)
2.Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging.
3.Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity /Blog writing / Vlogging(Lab Component)
4.End Semester Examination (Theory and Lab components)

INDIRECT
1. Course-end survey 2.Activity based survey (if any)

DETAILED SYLLABUS

Module 1: Introduction to the C Language	3 Hours

1.1 Introduction to the C Language – Algorithm, pseudocode, Flow chart, Background, C Programs
1.2 Identifiers, Data Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.),
1.3 Expressions, Precedence and Associativity, Expression Evaluation, Type conversions

Module 2: Control structures, branching and looping statements	3 Hours

2.1. Statements- Selection Statements (making decisions) – if and switch statements
2.2. Repetition statements (loops)-while
2.3. for, do-while statements, Loop examples
2.4. other statements related to looping – break, continue, go to, Simple C Program examples.

Module 3: Functions, Arrays and Strings	4 Hours

3.1. Functions- Introduction to Structured Programming
3.2. Functions- basics, user defined functions, inter function communication (call by value, call by reference
3.3. Standard functions. Storage classes-auto, register, static, extern, scope rules, Recursive functions, example C programs.
3.4. Arrays– Basic concepts, one-dimensional arrays, two – dimensional arrays, multidimensional arrays, arrays to functions, C programming examples

Module 4: Structure, Union and Pointers	3 Hours

4.1. Understanding the Concepts of Structure and Union, Defining and Initializing Structures and Unions,
4.2. Utilizing Nested Structures, Working with Arrays of Structures, Passing Structures to Functions
4.3. Introduction (Basic Concepts), pointers to pointers, compatibility, Pointer Applications, Arrays and Pointers,
4.4. Pointer Arithmetic, memory allocation functions, array of pointers, pointers to void, pointers to functions, command –line arguments

Lecture: 1 Hr/Week **Total Hours : 13 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Experiments (Minimum 12 Experiments)

1	Introduction to Turbo C IDE =, writing and compiling a simple C Program Write a C program to scan and print values of different types of variables.
2	The driver is driving a car from city Ahmedabad to city Mumbai in Ahmedabad temperature displayed in Celsius while in Mumbai the temperature displayed in Fahrenheit, a driver wants to find the difference between the temperatures of two cities in Celsius.
3	compute the weekly salary of the employee
4	Write c program to display following pattern: A A B A B C A B C D
5	Write c program to display following pattern: 1 2 1 3 2 1
6	Display transpose of the given matrix.
7	String Operation
8	Recursive function
9	Structure
10	Array with recursion
11	Union
12	Nested Structure

Practical: 4 Hrs/Week **Total Hours : 52 Hrs**

Textbooks:

1. Pradeep Day and Manas Gosh ,“Programming in C”, Oxford University Press.
2. B.W. Kernighan and D. M. Ritchie, “The C Programming Language”, Second Edition, Pearson, June 2015.
3. E. Balagurusamy,” Programming in ANSI C”, 7th Edition, Tata McGraw-Hill.

Reference Books:

1. Yashavant Kanetkar, “Let Us C”, BPB Publications, 2017.
2. B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series, Tata Mc-Graw Hill Publishers, 1996.
3. Reema Thareja , “Computer Fundamentals and Programming in C”, Oxford University, Second edition, 2017.

Program: First Year B.Tech.	Semester: II	L	P	C
Universal Human Values-II	Course Code:ITCER0VE102	2	0	2

Course Objectives:	
1	To provide students with soft skills that complement their hard skills, making them more marketable when entering the workforce.
2	To enhance awareness of India's glory and global values, and to create considerate citizens who strive for the betterment of their family, college, workforce, and nation.
3	To inspire students to strive for a higher sense of character by learning from role models who have lived principled, disciplined, and value-based lives
4	Learn the importance of Stress Management.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Learn the six steps of teamwork & harmony that are essential for students' professional and daily life.
CO 2:	Develop the soft skills that complement their hard skills, making them more marketable when entering the workforce.
CO 3:	Enhance awareness of India's glory and global values.
CO 4:	Learn the importance of Stress Management.

Pre-requisite courses: Nil .

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component). 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component). 4. End Semester Examination (Theory and Lab components).
INDIRECT
1. Course-end survey 2. Activity based survey (if any)

DETAILED SYLLABUS	
Module-1: Remaking Yourself **Subject: Begin with the End in Mind**	**2 Hours**
Students will learn to visualize their future goals and will structure their lives through smart goals to give themselves direction and ultimately take them to where they want to go.	
Module-2: Remaking Yourself **Subject: Being Addiction-Free**	**2 Hours**
Students will explore the detrimental effects of addictions on one's health, personal life, and family life. They will learn how to take control of their life by becoming addiction free.	
Module-3: Selfless Service **Subject: Case Study: Disaster Relief**	**2 Hours**
Students will apply previous lessons of seva, to analyze the case study of the Bhuj earthquake relief work.	
Module-4: Soft Skills **Subject: Teamwork & Harmony**	**2 Hours**
Students will learn the six steps of teamwork and harmony that are essential for students' professional and daily life.	
Module-5: My India My Pride **Subject: Present Scenario**	**2 Hours**
To implement the transformation of India from a developing country into a developed country it is necessary to have a value-based citizen. Students will see how the transformation to a greater India relies on the vision and efforts of themselves as a youth.	
Module-6: Learning from Legends **Subject: Leading Without Leading**	**2 Hours**
Students will explore a new approach to leadership, through humility.	
Module-7: My India My Pride **Subject: An Ideal Citizen – 1**	**2 Hours**
Students will learn that to become value-based citizens, they must first develop good values in their lives. They start by exploring the values of responsibility and integrity.	
Module-8: My India My Pride **Subject: An Ideal Citizen – 2**	**2 Hours**
Students will learn that by developing the values of loyalty, sincerity, and punctuality, they become indispensable and can leave a strong impression. They will start developing these values by trying to keep perfection in every small task and by looking at the bigger picture.	

Module-9: Facing Failures **Subject: Timeless Wisdom for Daily Life**	**2 Hours**
Students will learn the role wisdom plays in finding long-term stability. They will use ancient wisdom to solve their modern-day challenges.	
Module-10: From House to Home **Subject: Forgive & Forget**	**2 Hours**
Students will understand the importance and benefits that forgiveness plays in their personal and professional life. They will learn to apply this knowledge in realistic situations.	
Module-11: Remaking Yourself **Subject: Stress Management**	**1 Hour**
Students will learn to cope with current and future causes of stress.	
Module-12: Remaking Yourself **Subject: Better Health Better Future**	**1 Hour**
A healthy body prevents disease and stress; increases positivity, productivity, and brainpower. Students will learn to maintain good health through regular exercise, healthy eating habits, and regular and sufficient sleep.	
Module-13:Learning from Legends **Subject: Words of Wisdom**	**1 Hour**
A panel of learned and experienced mentors will personally answer practical questions that students face in their daily life.	
Module-14: Soft Skills **Subject: Financial Planning**	**1 Hour**
Students will develop a variety of practical financial skills that prepare them to become financially stable throughout their future careers.	
Module-15: Remaking Yourself **Subject: Impact of Company**	**1 Hour**
Students will understand that the type of company that we keep has a crucial role in determining who we are and who we will become. They will develop the ability to create a positive environment around them.	
Concluding: Life After IPDC	**1 Hour**
This concluding lecture encourages students to keep practicing these priceless lessons and prepares them for the next steps in their lives.	

Lecture: 2 Hrs/Week **Total Hours :26 Hrs**

Textbooks:

1. IPDC Workbook-2

Program: First Year B.Tech.	Semester: II	L	P	C
National Service Scheme	Course Code: ITCER0CC102	1	0	1
National Service Scheme Lab	Lab Code: ITLER0CC102	0	2	1
		1	2	2

Course Objectives:	
1	To understand the community in which they work.
2	To understand themselves in relation to their community
3	To develop among themselves a sense of social responsibility.
4	To reduce the risk of disasters caused by humans.
5	To better prepared for rescue in case of disaster.
6	To practice national integration and social harmony**.**

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Explain the importance of NSS and execute its role in the field of health and hygiene.
CO 2:	Develop leadership quality and work in a group.
CO 3:	Prepare for emergency situations like national disaster.
CO 4:	Encourage the community for green environment

Pre-requisite courses: Nil**.**

Course Assessment Methods:

DIRECT

1. Continuous Internal Assessment (Theory component)
2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging.
3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments /Assignments/Tutorials/Power-point-presentation/Group discussion /Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component)
4. End Semester Examination (Theory and Lab components)

INDIRECT

1. Course-end survey
2. Activity based survey (if any)

DETAILED SYLLABUS

Module 1: Introduction to NSS:	**2 Hours**

1.1 Structure, orientation, logo- Introduction, greetings, and types of claps, NSS song, regular activities, requirement to become certified NSS volunteer, regular CAMPs arranged by government, activities directed by state and central government, collaboration with NGO's, Shramdaan, Benefits as NSS volunteer.

1.2 Concept of volunteer, leader and role as NSS volunteer.

Module 2: NSS projects as regular activity	**4 Hours**

2.1 Introduction to first-aid medicines: requirement, basic disease and its medicine, fit India movement: importance of sports and Yoga on health, self-defense: requirement and techniques, Swatchhata Abhiyan: importance of cleanliness and its impact on health and environment.

2.2 Water conservation: Awareness on water conservation and techniques to preserve it, green environment: tree plantation, organ donation awareness.

Module 3: Disaster Management & rescue technique	**4 Hours**

3.1 Disaster Management: Definition type and impact, geographical condition of Maharashtra, Preventive and Mitigation Measures,

3.2 Rescue techniques, equipments required for rescue, rope knots, rope coiling techniques

Module 4: NSS Special CAMP activities	**3 Hours**

4.1 Pre-CAMP activities
4.2 During CAMP activities
4.3 Post CAMP activities

Lecture: 1 Hr/Week		**Total Hours: 13 Hrs**

LAB COMPONENT CONTENTS:

Suggested List of Activities (Minimum 8 Activities)

1. CPR demonstration and first aid training
2. Fit India movement – sports climbing
3. Fit India movement - sports2
4. Basic type of rope knots
5. Rope knots and hitches used in mountaineering and rescue.
6. Demonstration of rescue methods in disaster management.
7. Demonstration of rappelling and climbing for emergency situations.
8. Self-defense technique- 1
9. Self-defense technique- 2
10. Water conservation demonstration by group activity.
11. Plastic collection drive in the campus.
12. E-waste collection drive in the campus.
13. Self-paced course on climate change and water management

Practical: 2 Hrs/Week	**Total Hours: 26 Hrs**

Suggested readings

1. NSS Manual by Government of India, Ministry of Youth Affairs and Sports.
2. Gupta Harsh K., ‘Disaster Management’ by, Universities Press Publications
3. Jack Pinkowski, Disaster Management Handbook, CRC Press Taylor, and Francis group
4. National Youth Policy document.

Program: First Year B.Tech.	Semester: II	L	P	C
FAB Lab	Course Code: ITLER0VS103	0	4	2

Course Objectives:	
1	To gain practical expertise in digital fabrication, prototyping, and documentation.
2	To nurture a global community of learners, educators, and innovators in technical invention.

Course Outcomes:	
After successful completion of this course, the students should be able to	
CO 1:	Recall the concepts of Basic Electronics Circuits for PCB design and fabrication.
CO 2:	Use the concepts of 2D design tools in advanced fabrication in 2D and implementation of 3D Printing technologies in 3D modeling.
CO 3:	Classify Robots, learn the concept of robot kinematics, sensor integration , control system and understand advanced robotic application and programming.
CO 4:	Implement the concept of basic electronics,3D printing technology and the fundamentals of Robotics to prepare a mini-project in a group.

Pre-requisite courses: AutoCAD,Basics concepts of Robotics and electronic circuit.

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component). 2. Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case Studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging. 3. Pre/Post - Experiment Test/Viva; Experimental Write-Up for each Experiment, Day to Day Experiments/Assignments/Tutorials/Power-point-presentation/Group-discussion/Quiz/seminar/Case studies/Design Thinking/Innovation/Creativity/Blog writing / Vlogging (Lab Component). 4. End Semester Examination (Theory and Lab components).
INDIRECT
1. Course-end survey. 2. Activity based survey (if any).

DETAILED SYLLABUS

Module 1: Electronics Design	12 Hours

1.1 Introduction to Electronics Design:

1.1.1 Overview of basic electronic components, Circuit design principles, Introduction to EDA software.

1.2 Input and Output Devices:

1.2.1 Types of input devices, Interface design principles, Output device selection and integration.

1.3 Advanced Electronics Design:

1.3.1 PCB layout and design, Signal integrity considerations, Design for manufacturability.

1.4 Electronics Production Techniques:

1.4.1 PCB fabrication methods, Soldering techniques, Quality control in electronics production.

Module 2: Fabrication in 2D, 3D - Advanced 3D Modeling and Printing	20 Hours

2.1 Introduction to Fabrication in 2D:

2.1.1 Understanding 2D design tools, Laser cutting, basics Material selection for 2D fabrication.

2.2Advanced Fabrication in 2D:

2.2.1 Complex geometries in 2D fabrication, Joinery techniques, Prototyping with 2D fabrication.

2.3 Fabrication in 3D :

2.3.1 Introduction to 3D modeling software,3D printing technologies, Post-processing and finishing techniques.

2.4Advanced 3D Modeling and Printing :

2.4.1 Parametric modeling, Design for additive manufacturing, Multi-material and multi-color printing.

Module 3: Robotics	12 Hours

3.1 Fundamentals of Robotics:

3.1.1 Introduction to automation & robotics, Classification of robots and Future Prospects,

3.1.2 Introduction to Robot Kinematics - mechanisms, Degree of freedom (Three, Four and Five). Control system and sensor integration in robotics.

3.2 Robotic Application in Manufacturing:

3.2.1 Material transfer, Machine loading & unloading, processing operations, Assembly & Inspectors.

3.3 Robotics Arm:

3.3.1 Wired / wireless Pick and Place robotic arm. Material sorting robotic arm.

3.4 Basic Robot programming:

3.4.1 Introduction to Arduino, motor driver L298D, Bluetooth. Programming the robot to move forward, backward, left, right and stop.

3.5 MIT App inventor:

3.5.1 Introduction to MIT app inventor. Basic Mobile app designing for robotic car direction control using MIT App inventor.

Module 4: Project Integration & Final Showcase	8 Hours

4.1 Integration Project:

4.1.1 Combining electronics design, fabrication, and robotics, Project planning and execution. Integration of input / output devices.

4.2 Final Project Showcase:

4.2.1 Presentation of individual or group projects, Reflection on learning outcomes. Future directions in rapid prototyping and robotics.

LAB COMPONENT CONTENTS:

Suggested Topic/List of Experiments (Minimum 12 Experiments)

1. Basic Electronics Assembly: Understand basic electronic components by building a simple circuit on a breadboard (e.g., a blinking LED circuit).
2. PCB Design and Layout: Design a simple Printed Circuit Board (PCB) and create a basic layout using Eagle Software.
3. Integrating Input Devices: Explore different input devices and understand how to integrate them with microcontrollers.
4. Integrating Output Devices:Explore different output devices and understand their integration.
5. PCB Fabrication and Soldering:Learn basic PCB fabrication and soldering techniques.
6. To understand the various industrial materials and material selection for laser cutting machines.
7. Design of a model (.dxf) for 2d acrylic/laser and laser fabrication.
8. Design of a model (.dxf) with etching components and laser fabrication.
9. Design multiple .dxf files for a join and laser fabrication.
10. Design a standard model for 3d printing using Fusion 360.
11. Slicing for 3d printing using Creality and 3d Printing.
12. Design a multi – model 3d model and print it.
13. Design a model combining 3d and 2d modeling.
14. Basic Robot Assembly and Control:Assemble a simple robot and control its movements (Assemble
    a basic robot chassis with motors and sensors, then program it to perform basic tasks).
15. To understand the various Degrees of Freedom and different types of motions in robots.
16. Using various concepts of DOF developing the robot for material handling from one point to another point.
17. Robot Path Planning and Navigation:Explore advanced robotics concepts such as path planning and navigation.
18. Programming the robot to move forward, backward, left, right and stop using bluetooth.
19. Integration of Electronics, Fabrication, and Robotics:Create an integrated project that combines electronics design, fabrication, and robotics.
20. Basic Mobile app designing for robotic car direction control using MIT App inventor.

Practicals: 4 Hrs/Week **Total Hours : 52 Hrs**

Reference Books:

1. Neerparaj Rai, “Arduino Projects for Engineers: A multipurpose book for all engineering branches”, BPB Publications.
2. Yashavant Kanetkar and Shrirang Korde, “21 IoT Experiments”, BPB Publications.
3. Vineesh Kumar K K, “Make your first Robot”, notion press.com.
4. Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing- Authors:Ian Gibson , David Rosen , Brent Stucker.
5. Groover and Simmers,“Industrial Robotics”.

Online Repository:

1. www.arduino.cc/education
2. www.electronicshub.org
3. www.tinkercad.com/
4. www.electronicsforu.com
5. https://circuitdigest.com
6. www.Github.com

Mahavir Education Trust's

SHAH & ANCHOR

KUTCHHI ENGINEERING COLLEGE

An Autonomous Institute Affiliated to University of Mumbai

Address
Mahavir Education Chowk,
W.T. Patil Marg, Chembur
Mumbai- 400 088

विद्याधनं सर्वधनेषु प्रधानम्॥

www.sakec.ac.in
info@sakec.ac.in
@sakectweets
www.facebook.com/shahanchor
09136400555