K. E. Society's

Rajarambapu Institute of Technology, Sakharale

(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)

Curriculum Structure and Evaluation

To be implemented for Academic Year 2025-26 and 2026-27

Department of Sciences and Humanities

Class: F. Y. B. Tech. **Semester-I** **Group:** A

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
							Max.	Min. %for Passing	Max.	Min. %for Passing
SH 1314	Engineering Physics (BSC)	3	-	-	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1057	Engineering Mathematics-I (BSC)	3	1	-	4	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1334	Programming for Problem Solving (ESC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1335	Universal Human Values and Professional Ethics (CC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1338 SH 1461 SH 148	Indian Politics and Economics/ Vedic Mathematics/ Ancient Indian Astronomy (IKS)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1516	Engineering Physics Lab (BSC)	-	-	2	1	ISE	---	---	100	50
SH 1835 SH 1586 SH 1605	Communication Skills Lab - I/ Japanese Language Lab Level -I /German Language Lab Level – I (HSSM-AEC)	-	-	2	1	ISE	---	---	60	50
						ESE	---	---	40	
SH 1854	Engineering Practice Lab – I (VSEC)	-	-	2	1	ISE	---	---	100	50
SH 1894	Engineering Exploration and Design Project (VSEC)	-	-	4	2	ISE	---	---	50	50
						ESE	---	---	50	
SH 1914	Programming for Problem Solving Lab (ESC)	-	-	4	2	ISE	---	---	100	50
Total:		**12**	**01**	**14**	**20**					
Total Contact Hours:		**27**								

ISE = In Semester Evaluation, UT I = Unit Test- I, UT II = Unit Test- II, ESE = End Semester Evaluation

K.E.S. Rajarambapu Institute of Technology Sciences & Humanities Dept. Rajaramnagar

K.E.S. Rajarambapu Institute of Technology Rajaramnagar Autonomous 415414

K. E. Society's
Rajarambapu Institute of Technology, Sakharale
(An Empowered Autonomous Institute, affiliated to Shivaji University, Kolhapur)
Curriculum Structure and Evaluation
To be implemented for Academic Year 2025-26 and 2026-27
Department of Sciences and Humanities

Class: F. Y. B. Tech. **Semester**-II **Group** : A

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks %)		Practical (Marks %)	
		L	T	P	Credits	Scheme	Max.	Min. % for Passing	Max.	Min. %for Passing
SH 1037	Engineering Chemistry (BSC)	3	-	-	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1027	Engineering Mathematics-II (BSC)	3	1	-	4	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1136	Engineering Graphics (ESC)	2	-	2	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1295	Basic Electrical Engineering (ESC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
	Program Core Course (PCC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1536	Engineering Chemistry Lab (BSC)	-	-	2	1	ISE	---	---	100	50
SH 1795	Basic Electrical Engineering Lab (ESC)	-	-	2	1	ISE	---	---	100	50
SH 1624 SH 1665 SH 1684	Communication Skills Lab - II/ Japanese Language Lab Level – II/ German Language Lab Level – II (HSSM-AEC)	-	-	2	1	ISE	---	---	60	50
						ESE	---	---	40	
SH 1644	Engineering Practice Lab – II (VSEC)	-	-	2	1	ISE	---	---	100	50
SH 1342 SH 158 SH108	*Sports and Yoga/*Cultural Activity/* National Service Scheme (CC)	2	-	-	2	ISE	--	----	100	50
Total:		**14**	**1**	**10**						
Total Contact Hours:		**25**			**20**					

ISE = In Semester Evaluation, UT I = Unit Test- I, UT II = Unit Test- II, ESE = End Semester Evaluation
Note: * indicates – Engagement beyond academic duration.

K.E.S. Rajarambapu Institute of Technology Sciences & Humanities Dept. Rajaramnagar

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Curriculum Structure and Evaluation

To be implemented for Academic Year 2025-26 and 2026-27

Department of Sciences and Humanities

Class: F. Y. B. Tech. **Semester-I** **Group**: B

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks %)		Practical (Marks %)	
		L	T	P	Credits	Scheme	Max.	Min. % for Passing	Max.	Min. %for Passing
SH 1037	Engineering Chemistry (BSC)	3	-	-	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1057	Engineering Mathematics-I (BSC)	3	1	-	4	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1136	Engineering Graphics (ESC)	2	-	2	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1295	Basic Electrical Engineering (ESC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
	Program Core Course (PCC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1536	Engineering Chemistry Lab (BSC)	-	-	2	1	ISE	---	---	100	50
SH 1795	Basic Electrical Engineering Lab (ESC)	-	-	2	1	ISE	---	---	100	50
SH 1835 SH 1586 SH 1605	Communication Skills Lab - I/ Japanese Language Lab Level -I /German Language Lab Level – I (HSSM-AEC)	-	-	2	1	ISE	---	---	60	50
						ESE	---	---	40	
SH 1854	Engineering Practice Lab – I (VSEC)	-	-	2	1	ISE	---	---	100	50
SH 1342 SH 158 SH108	*Sports and Yoga/*Cultural Activity/*National Service Scheme (CC)	2	-	-	2	ISE	--	----	100	50
Total:		**14**	**1**	**10**						
Total Contact Hours:		**25**			**20**					

ISE = In Semester Evaluation, UT I = Unit Test- I, UT II = Unit Test- II, ESE = End Semester Evaluation

Note: * indicates – Engagement beyond academic duration.

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Curriculum Structure and Evaluation
To be implemented for Academic Year 2025-26 and 2026-27
Department of Sciences and Humanities

Class: F. Y. B. Tech. **Semester-II** **Group**: B

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
							Max.	Min. %for Passing	Max.	Min. %for Passing
SH 1314	Engineering Physics (BSC)	3	-	-	3	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1027	Engineering Mathematics-II (BSC)	3	1	-	4	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1334	Programming for Problem Solving (ESC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1335	Universal Human Values and Professional Ethics (CC)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1338 SH 1461 SH 148	Indian Politics and Economics/ Vedic Mathematics/ Ancient Indian Astronomy (IKS)	2	-	-	2	ISE	20	40	---	---
						UT1	15		---	---
						UT2	15		---	---
						ESE	50	40	---	---
SH 1516	Engineering Physics Lab (BSC)	-	-	2	1	ISE	---	---	100	50
SH 1624 SH 1665 SH 1684	Communication Skills Lab - II/ Japanese Language Lab Level – II/ German Language Lab Level – II (HSSM-AEC)	-	-	2	1	ISE	---	---	60	50
						ESE	---	---	40	
SH 1644	Engineering Practice Lab – II (VSEC)	-	-	2	1	ISE	---	---	100	50
SH 1894	Engineering Exploration and Design Project (VSEC)	-	-	4	2	ISE	---	---	50	50
						ESE	---	---	50	
SH 1914	Programming for Problem Solving Lab (ESC)	-	-	4	2	ISE	---	---	100	50
Total:		**12**	**01**	**14**	**20**					
Total Contact Hours:		**27**								

ISE = In Semester Evaluation, UT I = Unit Test- I, UT II = Unit Test- II, ESE = End Semester Evaluation

Group A: Electronics and Telecommunication Engineering, Civil Engineering, Mechanical Engineering, Mechatronics Engineering, Robotics and Automation.

Group B: Electrical Engineering, Computer Engineering, Computer Science and Information Technology, Computer Science and Engineering (Artificial Intelligence and Machine Learning)

Abbreviations:

BSC: Basic Science Course

ESC: Engineering Science Course

PCC: Program Core Courses

VSEC: Vocational and Skill Enhancement Courses

HSSM: Humanities, Social Sciences and Management

AEC: Ability Enhancement Course

IKS: Indian Knowledge System

CC: Co-curricular Courses

Program Core Course, offered by Departments:

Sr. No.	Course Code	Course Name	Program for which course is offered
1	**SH 188**	Engineering Mechanics	Civil Engineering
2	**SH 172**	Electrical Power Generation Technologies	Electrical Engineering
3	**SH 174**	Basics of Sensor Technology	Electronics and Telecommunications Engineering
4	**SH 176**	IT for Business	Computer Science & Engineering, Information Technology
5	**SH 178**	Introduction to Cyber Security	Computer Science & Engineering
6	**SH 180**	Generative AI and Prompt Engineering	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
7	**SH 182**	Applied Mechanics	Mechanical Engineering
8	**SH 184**	Fundamentals of Mechatronics	Mechatronics Engineering
9	**SH 186**	Basics of Robotics & Automation	Robotics and Automation

Choice Based Languages:

Sr. No.	Course Code	Department	Course Title
1	**SH 1835**	Sciences and Humanities Department	Communication Skills Lab I
2	**SH 1634**		Communication Skills Lab II
3	**SH 1586**		Japanese Language Lab Level I
4	**SH 1665**		Japanese Language Lab Level II
5	**SH 1605**		German Language Lab Level I
6	**SH 1684**		German Language Lab Level II

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1314**	Course Name: **Engineering Physics (BSC)**

L	T	P	Credits
3	--	--	3

Course Description:
This course introduces fundamental principles of oscillations, interference, quantum mechanics, semiconductors, fiber optics, and advanced materials. It covers damped and forced oscillations, thin-film and wedge-shaped interference, and the basics of quantum mechanics. Semiconductor physics is explored with applications in diodes, LEDs, and photodiodes. The working principles of lasers and fiber optics are discussed in the context of communication technology. Students will also study magnetic materials, superconductors, smart materials, and shape memory alloys. The course emphasizes problem-solving skills and real-world applications. By the end, students will develop a strong foundation in physics concepts relevant to engineering and technology.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Illustrate the fundamental principles of oscillations, quantum mechanics, lasers, fiber optics, magnetic, superconducting, and nanomaterials.
2. Construct mathematical equations related to damped and forced oscillations, interference phenomena, quantum mechanics, semiconductor properties, laser principles, and optical fiber propagation.
3. Solve problems based on oscillations, interference patterns, quantum mechanics, semiconductors, fiber optics, magnetic materials, and superconductors.
4. Analyze thin-film interference, quantum behavior in a 1D infinite potential box, and the properties of magnetic, superconducting, and nano materials.

Prerequisite: 12th Physics

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Oscillations** Introduction: Free, forced, and damped oscillation, Damped harmonic motion, differential equation of damped harmonic motion and its solution, overdamped, critically damped and underdamped conditions, attenuation coefficients: logarithmic decrement, relaxation time, quality factor, resonance-sharpness and bandwidth, resonance in LCR circuit (series), Lissajous figures.	**06**

2.	**Interference** Introduction, conditions for getting steady interference pattern, interference by division of amplitude: Path difference condition in thin film interference, wedge shaped interference, Newton's rings (Experimental arrangement, condition for diameter of dark and bright rings, radius of curvature of Plano convex lens using Newton's ring experiment), application of interference: measurement of optical flatness of surface and antireflection coatings.	**06**
3.	**Quantum Mechanics** Matter waves and De-Broglie's hypothesis, Heisenberg's uncertainty principle and its application (Nonexistence of electron in nucleus), wave function and its properties, time independent and dependent Schrödinger wave equation, Particle in a box (One dimension), Conceptual discussion: quantum tunneling. Superposition principle, quantum entanglement, quantum computing.	**06**
4.	**Semiconductors** Intrinsic and Extrinsic semiconductors (based on energy band model), carrier generation and recombination, Fermi Dirac distribution function (statement), Fermi energy in semiconductor (conceptual), carrier transport: diffusion and drift, Hall effect, PN junction diode, Light Emitting diode, Photo diode. Tunnel diode.	**06**
5.	**Laser and Fiber Optics** LASER: Introduction, properties of laser, principle of Laser- absorption and emission of radiation, relation between Einstein's coefficient, population inversion, Ruby Laser, He-Ne Laser, Application of laser. Fiber Optics: Introduction, propagation of light in an optical fiber- Total internal reflection (TIR), Angle of Acceptance, Numerical Aperture, types of fibers, advantages of optical fiber, losses in optical fiber, fiber optics communication.	**06**
6.	**Advanced Materials** **Magnetic materials**: Origin of magnetic moment, magnetization, types of magnetic materials-dia, para, ferro, antiferro, and ferrimagnetic materials, domain theory in ferromagnetic materials, hysteresis, soft and hard magnetic materials. **Superconductors:** Introduction to superconductivity, properties of superconductors: critical temperature, critical magnetic field, Meissner effect, type I and type II superconductors. **Nano Materials:** Introduction to nanotechnology, properties of nanomaterials-optical, electrical, mechanical, types of nanomaterials: 0D, 1D, 2D, and 3D,	**06**

	synthesis approach-Ball milling, Characterization technique: Scanning electron microscopy.	

References -

Text Books:

1. H. K. Malik, A. K. Singh, Engineering Physics, Tata McGraw Hill.
2. Avadhanulu, Kshirsagar, A textbook of Engineering Physics, S. Chand Publications.

Reference Books:

1. Halliday, Resnick, Principles of Physics, Wiley India edition.
2. B. K. Pandey, S. Chaturvedi, Engineering Physics, Cengage Learning Publications.
3. A. Beiser, S. Mahajan, S. Rai Choudhari, Concepts of Modern Physics, Tata Mc Graw Hill.

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1516**	Course Name: **Engineering Physics Lab(BSC)**

L	T	P	Credits
--	--	2	1

Course Description:
This course provides practical training in fundamental physics experiments encompassing oscillations, optics, semiconductor physics, and quantum mechanics. Students learn to use advanced measuring tools for experiments covering these theories. Emphasis is on accurate data collection and interpretation to derive meaningful physical quantities. Additionally, students develop effective communication skills through concise lab report writing. This course equips students with essential laboratory skills and analytical abilities crucial for advanced engineering studies.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Perform experiments related to oscillations, optics, semiconductors, quantum mechanics, and magnetic materials.
2. Use the necessary tools and techniques to perform specific experiment.
3. Analyze the collected data to determine relevant physical parameter such as wavelength, band gap energy, Planck's constant, carrier concentration, radius of curvature of plano convex lens, numerical aperture, particle size, and magnetic properties.
4. Write the lab report on the experiment which conveys experimental findings and interpretation in clear manner.

Prerequisite: Basic practical knowledge upto 12^{th} standard

Course Content (Any 10 experiments)		
Expt. No.	**Description**	**Hrs**
1.	Error Analysis in Physics Laboratory.	**02**
2.	Determination of resonant frequency in forced oscillator.	**02**
3.	Determination of radius of curvature of plano convex lens using Newton's rings arrangement.	**02**
4.	Determination of band gap energy of semiconductor using four probe method.	**02**

5.	Determination of wavelength of given laser source using plane diffraction grating.	**02**
6.	Determination of type, carrier concentration and mobility in given semiconductor using Hall effect.	**02**
7.	Determination of Planck's Constant.	**02**
8.	Determination of particle size of lycopodium powder using LASER.	**02**
9.	Determination of numerical aperture of optical fiber.	**02**
10.	Determination of retentivity, coercivity, and energy loss in ferromagnetic material using hysteresis curve.	**02**
11.	Determination of wavelength of different colors of white light using plane diffraction grating.	**02**
12.	Determination of thickness of small object using air wedge.	**02**
13.	Determination of resolving power of telescope.	**02**
14.	Determination velocity of ultrasound in given liquid.	**02**

References –

Reference Books:

1. M. N. Avadhanulu, A. A. Dani, P.M. Pokley, Experiments in Engineering Physics, S. Chand Publications.
2. Halliday and Resnick, Principles of Physics, Wiley India edition.

Class:- **First Year B. Tech**	Semester- **I**
Course Code: **SH1057**	Course Name: **Engineering Mathematics-I (BSC)**

L	T	P	Credits
3	1	--	4

Course Description:
This course introduces fundamental mathematical concepts essential for solving engineering problems. It covers linear algebra, differential equations, and numerical methods, Complex Variables providing both analytical and computational techniques for mathematical modeling and problem-solving. The course emphasizes conceptual understanding and practical applications across various engineering fields.

Pre-requisite: Higher secondary (10+2) Mathematics

Course Outcomes:
After successful completion of the course, students will be able to,

1. Apply matrices and iterative method to solve linear and simultaneous algebraic equations.
2. Apply the concepts of vector spaces to solve problems in linear algebra.
3. Solve the problems on ordinary differential equations analytically and numerically.
4. Develop the concept of complex variables.

Course Content

Unit No.	Description	Hrs.
1.	**Matrices** Rank of Matrix by Echelon form, Linear System of Equations, Eigen Values & Eigen Vectors, Properties of Eigen Values & Eigen Vectors	06
2.	**Solution of Simultaneous Algebraic Equations:** Gaussian elimination method, Gauss-Jordan method, LU Decomposition, Jacobi's iteration method, Gauss-Seidel iteration method,	06
3.	**Vector spaces:**	06

	Vector Space, Vector Subspace, Independence and dependence of Vectors, Basis of a Vector Space, Dimension.	
4.	**Ordinary Differential Equations of first order & first degree and its applications:** Introduction, Types of Differential Equation, Exact, Non-exact, Linear Equations, Bernoulli's Equations, Orthogonal trajectories (Rectangular and Polar), Applications to simple electrical circuits	**06**
5.	**Numerical Solution of ordinary differential equations:** Introduction, Taylor's series method, Euler's method, Modified Euler's method, Runge-Kutta method of fourth order.	**06**
6.	**Complex Variables:** Complex functions- Limits, Continuity and Differentiation, Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions	**06**

Tutorials: (Any 10 tutorials)		
Sr. No.	**Title**	**Hrs**
1.	System of Linear Equations	**1**
2.	Eigen Values & Eigen Vectors	**1**
3.	Solution of Simultaneous Algebraic Equations: Direct Methods	**1**
4.	Solution of Simultaneous Algebraic Equations: Iterative Methods	**1**
5.	Vector Spaces	**1**
6.	Basis and dimension	**1**
7.	Ordinary Differential Equations of first order & first degree	**1**
8.	Application of Differential Equations	**1**
9.	Numerical Solution of Ordinary Differential Equations- I	**1**
10.	Numerical Solution of Ordinary Differential Equations- II	**1**
11.	Complex variables I	**1**

12.	Complex variables II	**1**
13.	Self-Paced Online Course (Onramp)	**1**
14.	Matrices Using MATLAB	**1**
15.	Solution of Differential Equations using MATLAB	**1**

Text Books

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers

Reference Books:

1. Lay David C, Linear Algebra and Its Applications, Pearson Education
2. B. V. Raman, Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
3. N. P. Bali, A. Saxena, N. Ch. S. N. Iyengar, A Text Book of Engineering Mathematics, Laxmi Publication, New Delhi
4. Peter V. O'Neil, Advanced Engineering Mathematics, Cole publishing House
5. P. N. Wartikar, J. N. Wartikar, A Text book of Applied Mathematics, Vidyrthi Griha Prakashan, Pune

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1334**	Course Name: **Programming for Problem Solving (ESC)**

L	T	P	Credits
2	--	--	2

Course Description:

This is an introductory course of C programming language for problem solving so as to improve the computational and logical thinking of the students. The course focuses on fundamentals of C language including Data types, Operators, I/O statements, control statements, functions array, pointer and structure. This course makes the students familiar with the use of computers for scientific calculations, use of programming language and the logic for writing computer programs for problem solving in engineering, mathematics and statics.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Explain the basic terminology and concepts of C programming language.
2. Design algorithm and draw a flowchart for the given problem.
3. Develop a C programs to solve given problems.
4. Analyse the given C program to predict the output.
5. Evaluate the C program to resolve the errors.

Prerequisite: Basic knowledge of Mathematics and computer fundamentals

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Algorithm and 'C' Language** **Basics of Algorithm and flowchart**: Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo-code with examples.	**04**

	Introduction to 'C' Language: Importance of 'C' Language, Sample 'C' Program, Structure of 'C' Program, Constants, variables and data types. Operators and expressions. Managing input / output operations	
2.	**Control Statements** Control statements: Decision making and branching, Decision making and looping, Unconditional control statements.	**04**
3.	**Functions** Basics of function, definition, declaration and calling of function, Function prototype, Method of parameter passing- call by value, Recursion	**04**
4.	**Arrays** Array: Basics of Array, Array declaration and initialization, Types of array: One and Two dimensional arrays, Linear Search, Character arrays, String, Passing array to function.	**04**
5.	**Pointer** Pointer: Fundamentals, Pointer declaration, Operations on pointer, Pointer to an array, Method of parameter passing- call by reference.	**04**
6.	**Structures** Basics of Structure, Structure declaration and initialization, Array of structure variable, Pointer to structure, Methods of passing structure to function, Nested structure.	**04**

References -

Textbook:

1. K. Balaguruswamy, "Programming in ANSI C", TGMH Publication.
2. A. M Padma Reddy, "C Programming Techniques" Sri Nandi Publication.

Reference Books:

1. Yashvant Kanitkar, "Let us C", BPB publication.
2. B.W. Kernigghan, D. M. Ritchie, "The 'C' Programming Language", Pearson Education.
3. Ashok N. Kamthane, "Programming with ANSI and Turbo C", Pearson Education.

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1914**	Course Name: **Programming for Problem Solving Lab (ESC)**

L	T	P	Credits
--	--	4	2

Course Description:
This is an introductory course of C progeramming language for problem solving so as to improve the computational and logical thinking of the students. The course focuses on fundamentals of C language including Data types, Operators, I/O statements, control statements, functions array, pointer and structure. This course makes the students familiar with the use of computers for scientific calculations, use of programming language and the logic for writing comuter programs for problem solving in engineering, mathematics and statics.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Demonstrate the fundamental concepts of C programming language
2. Draw flowchart based on designed algorithm for writing programs.
3. Develop a C programs to solve given problems.
4. Predict the output of C program.
5. Resolve errors in the C program

Prerequisite: Engineering Mathematics and computer fundamentals

Course Content - List of experiments (Any 10)		
Expt. No.	**Description**	**Hrs**
1.	Algorithm and Flowchart	**04**
2.	Basic of C Language	**04**
3.	Decision making and branching.	**04**
4.	Decision making and looping	**04**
5.	Function	**04**

6.	1-D Array	**04**
7.	2-D Array	**04**
8.	String handling	**04**
9.	Pointer	**04**
10.	Structure	**04**
11.	Nesting of Structure	**04**
12.	File Management.	**04**

Reference Books:

1. K. Balaguruswamy, "Programming in ANSI C", TGMH Publication.
2. A. M Padma Reddy, "C Programming Techniques" Sri Nandi Publication.
3. Y. Kanitkar, "Let us C", BPB publication.
4. B.W. Kernigghan, D. M. Ritchie, "The 'C' Programming Language", Pearson Education.

Class:- **First Year B. Tech.**	Semester- **I/II**
Course Code : **SH1322**	Course Name : **Universal Human Values and Professional Ethics (CC)**

L	T	P	Credits
2	--	--	2

Course Description:
The course augments student's initially exposure to human values during the Induction Program. The course takes the student further to explore the self and to harmonize with family in particular and society at large. The course helps student in developing holistic perception of harmony at all levels of existence. The implications of ethical conduct on private, social, and professional life of a person are highlighted here.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain the significance of value inputs in education, social, and professional life.
2. Apply the value of harmonious relationship based on trust and respect in their life and profession.
3. Define the role of a human being in ensuring harmony in society and nature.
4. Make use of ethical conduct in formulation of the strategy for ethical life and profession.

Prerequisite: Participation and successful completion of AICTE recommended Induction Program in the college with special emphasis on Universal Human Values.

Course Content

Unit No.	Description	Hrs
1.	**Introduction to Value Education** Recapitulation from Universal Human Values discussed during AICTE recommended Student Induction Program at the institute: Aspirations and concerns, Self-Management, Relationships, Participation in society, Natural environment, Understanding Value Education, basic guidelines for value education.	04
2.	**Need, Basic Guidelines, Content and Process for Value Education** Self-Exploration, Natural acceptance, Continuous happiness and prosperity, Right understanding, relationship and physical facility, Understanding happiness and prosperity, Understanding and living in harmony at various levels.	04

3.	**Harmony in the Human Being - Harmony in Myself!** Co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body', Understanding the Body as an instrument of 'I', Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: programs to ensure Sanyam and Health.	**04**
4.	**Harmony in the Family and Society** Harmony in the Family – the Basic Unit of Human Interaction, Understanding the meaning of Trust, Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and Differentiation, Understanding the harmony in the society (society being an extension of family, Undivided Society, Universal Order- from family to world family.	**04**
5.	**Harmony in the Nature and Existence** Harmony in the Nature, The four orders of nature recyclability and self-regulation in nature, Understanding existence as co-existence of mutually interacting units, Holistic perception of harmony at all levels of existence.	**04**
6.	**Implications of Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for humanistic education, constitution and universal order, Competence in professional ethics – a) i)Introduction to Code of Conduct (Definition and purpose, Role of professional ethics in technical education and practice) ii) Core Ethical Principles for Engineers iii) Conduct in the Workplace ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems	**04**

References:

1. A. Nagraj, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan.
2. T. A. N. Human Values, New Age Intl. Publishers.
3. R. R. Gaur, A Foundation Course in Human Values and Professional Ethics, Excel Books, ISBN 978-93-87034-47-1.

4. M. Govindrajran, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
5. B. P. Banerjee, Foundations of Ethics and Management, Excel Books.
6. E. G. Seebauer, Berry, Robert L. Fundamentals of Ethics for Scientists and Engineers, Oxford University Press.

Class:- **First Year B. Tech**	Semester- **I/II**	**L**	**T**	**P**	**Credits**
Course Code: **SH1338**	Course Name: **Indian Politics and Economics (IKS)**	**2**	**--**	**--**	**2**

Course Description

This course provides an understanding of Indian governance, economic development, and policy frameworks with a focus on industrial and technological transformation. It examines key economic indicators, sector-specific policies, and global economic trends affecting India. The course is tailored for engineering students to understand how economic policies influence industries, business environments, and technology-driven growth.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Understand the constitutional and governance structure that influences economic policies in India.
2. Analyze India's economic development, from the License Raj to globalization and digital economy trends.
3. Evaluate key industrial and agricultural policies and their impact on economic and technological growth
4. Examine globalization, trade policies, and India's role in the international technological growth
5. Apply real-world case studies to understand economic policies impact on technology, industries and sustainability.

Prerequisite: Students should have basic knowledge of post independent political, economic issues and developments in India.

Unit No.	Course Content Description	Hrs.
1.	**Foundations of Indian Political and Economic System** Introduction to the Indian Constitution & Governance, Economic Philosophy of the Constitution (Socialism, Mixed Economy) Legislature, Executive & Judiciary	06

	(Composition, Powers & Role in Economic Policy-Making) Federalism & Economic Planning (NITI Aayog vs. Planning Commission)	
2.	**Economic Growth and Development** Pre-1991 Economic Model: Five-Year Plans, State-led Industrialization, 1991 Economic Reforms & Liberalization (LPG), Sectoral Growth & Labor Market Transformations, Digital Economy & Financial Inclusion (UPI, Aadhaar, JAM Trinity), NITI Aayog's role in economic governance, Economic Inequality & Human Capital (Skill Development, Education Policies)	**07**
3.	**Industrial Policies, Business Environment & Technology** Industrial Policy Resolutions (1956, 1991), Foreign Direct Investment (FDI), Startups & MSMEs, Technology & Industry 4.0 (AI, automation, digital manufacturing), India's Infrastructure & Energy Policies (Smart Cities, Renewable Energy), Climate Change & Sustainable Development (India's Net-Zero goal, Renewable Energy Policies)	**06**
4.	**Agriculture & Rural Economy** Agriculture's Role in India's Economy, Green Revolution: Success and Challenges, Agricultural Market Reforms & Policies (MSP, APMC Act, Farm Bills, E-NAM), Agri Tech Innovations (AI in Agriculture, Precision Farming, Climate Resilient Crops)	**05**

References:

Text Books-

1. D.D. Basu -Introduction to the Constitution of India – (LexisNexis)
2. Uma Kapila - Indian Economy: Performance and Policies (Academic Foundation)
3. V. K. Puri & S. K. Misra - Indian Economy (Himalaya Publishing House)

Reference Books:

1. Jean Drèze & Amartya Sen - *India: Development and Participation* (Oxford University Press)
2. Rakesh Mohan - Growth with Financial Stability (Oxford University Press)
3. Kaushik Basu - An Economist in the Real World (MIT Press)
4. Arvind Panagariya - India: The Emerging Giant (Oxford University Press)
5. G. Datt & A. Mahajan - Indian Economy (S. Chand and Company)
6. Economic Survey of India (Latest Edition) - Ministry of Finance, Government of India
7. Ramesh Singh - Indian Economy (McGraw Hill Education)
8. M. Laxmikant -Governance in India – (McGraw Hill)

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code: **SH1461**	Course Name: **Vedic Mathematics (IKS)**

L	T	P	Credits
2	--	--	2

Course Description:
This course introduces students to the fascinating world of Vedic Mathematics, an ancient Indian system of mathematical principles and techniques. Originating from the Vedas, the sacred texts of ancient India, Vedic Mathematics offers alternative and often quicker methods for solving mathematical problems compared to conventional approaches.
Throughout the course, students will explore a wide range of topics including basic arithmetic operations, algebra, calculus, and more, all through the lens of Vedic Mathematics. The course aims to develop students' problem-solving skills, mental math abilities, and overall mathematical proficiency.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Apply Vedic sutras to usual multiplication
2. Solve problems on division and divisibility by Vedic sutras
3. Factorise the polynomials of degree two and three using Vedic sutras
4. Employ Vedic Sutras to solve system of linear equations and matrices faster and with ease.

Prerequisite: Basic understanding about Mathematics

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Multiplication** Ekadhikenpurven method, Eknyunenpurven method, Urdhvatiryagbhyam method, Nikhilam method, Anurupyena method, Practical application in compound multiplication	**06**
2.	**Division and Divisibility**	**06**

	Division: Nikhilam method, Paravartya method, Anurupyena method Divisibility: Remainder Theorem, Argumental Division, Ekadhikenpurven method, Eknyunenpurven method	
3.	**Factorisation** Factorisation of Simple Quadratics, Factorisation of Harder Quadratics, Factorisation of Cubics etc., Highest Common Factor	**06**
4.	**Simple Equations** Simple equations (First Principles), Sunyam Samyasamuccaye method, Merger type of easy simple equations, Complex mergers, Simultaneous Simple Equations, Sunyam Anyat, Sankalana Vyavakalanabhyam, Practical application of linear equations in two variables	**06**

References -

Textbook:

Vedic Mathematics, Motilal Banarsi Das, New Delhi.

Reference Books:

1. Vedic Ganita: Vihangama Drishti-1, Siksha Sanskriti Uthana Nyasa, New Delhi.
2. Vedic Ganita Praneta, Siksha Sanskriti Uthana Nyasa, New Delhi.
3. Vedic Mathematics: Past, Present and Future, Siksha SanskritiUthana Nyasa, New Delhi.
4. https://mathlearners.com

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH148**	Course Name: **Ancient Indian Astronomy (IKS)**

L	T	P	Credits
2	--	--	2

Course Description:
This course introduces ancient Indian astronomy, its key concepts, and its practical applications. Students will learn about the contributions of astronomers like Āryabhaṭṭa and Varāhamihira, traditional timekeeping methods, and the Indian calendar system. The course covers planetary motion, Yuga cycles, and the Panchanga, comparing ancient and modern techniques. It also explores how these concepts are used in fields like navigation, agriculture, and space research.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Identify the fundamental principles of ancient Indian observational astronomy, including astronomical instruments and the contributions of notable Indian astronomers.
2. Describe the time measurement techniques, celestial motion concepts, and the Indian Calendar System, including Panchanga and its computational methods.
3. Apply ancient Indian astronomy concepts in analyzing timekeeping techniques and understanding their influence on fields like festivals, agriculture, meteorology, and navigation.

Prerequisite: Basic concepts in Physics

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Ancient Indian Astronomy** Astronomical Practices in India: Observational Astronomy: The principals and applications of different instruments (Yantras): Sanku Yantra (Gnomon), Naḍi Yantra (Sundial), Gola Yantra (Armillary Sphere), Kartari Yantra (Quadrant), Some Ancient Indian Astronomers and their work: Aryabhaṭṭa, Varahamihira, Bhaskara I, Brahmagupta, Bhaskara II.	**06**
2.	**Some concepts in Ancient Indian Astronomy** Time Measurement in Ancient Astronomy: Yuga system, Mahayuga & Kalpa system, ayanas, and lunar/solar cycles, Motion of Celestial Bodies: Sun and Moon's motion, planetary positions, and ayanachalana (precession), Indian nakshatra system	**06**
3.	**The Indian Calendar System:** Elements of the Indian Calendar: Aryabhatiya and Siddhantic traditions in astronomical calculations. Solar and Luni-Solar Calendar Systems: Concept of	**06**

	Adhikamāsas (leap month) and periodic corrections, Panchanga System: Five elements of Panchanga (Tithi, Nakshatra, Yoga, Karana, Vara) and their scientific significance, Katapayadi system and zero precision year.	
4.	**Applications of Astronomy and Modern Relevance** Applications in Yajnya, festivals, agriculture, meteorology, ayurveda, navigation, case study: Jantar Mantar and Ujjain Observatory, Influence of ancient Indian astronomy on ISRO and space exploration.	**06**

References -
Reference Books:
1. B.V. Subbayappa and K.V. Sarma, Indian Astronomy-A Source Book, Nehru Centre, Mumbai
2. S. N. Sen & K. S. Shukla – History of Astronomy in India, Indian National Science Academy.
3. S. Bhalchandra Rao, Indian Astronomy, Universities Press, Hyderabad

Class:- **First Year B. Tech.**	Semester-**I**
Course Code : **SH1835**	Course Name: **Communication Skills Lab-I (HSSM-AEC)**

L	T	P	Credits
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Course Description:
This course aims to enhance basic language skills-listening, speaking, reading, and writing to improve students' overall English proficiency. The main goal of this course is to provide an environment in the classroom where students effectively practice language skills while replicating real-life scenarios. Through individual and group activities, engaging exercises, and worksheets students will work on enhancing language skills throughout the course.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Analyse aspects of nature and process of communication in professional contexts.
2. Demonstrate active receptive skills of English language.
3. Apply speaking skills in various situations.
4. Make use of English language with grammatical accuracy in verbal oral and written communication.

Prerequisite: Knowledge of basic grammar and an intermediate-level vocabulary of English language.

Course Content
(Any 10 experiment)

Expt. No.	Description	Hrs
1.	Nature and Process of Communication	02
2.	Vocabulary Building (For competitive exams)	02
3.	Essential Grammar in Use	02
4.	Listening Skills – I (Listen and reproduce [oral])	02
5.	Listening Skills – II (Listen and summarize [written])	02
6.	Listening Skills – III (Listen and answer the questions)	02
7.	Speaking Skills – I (Phonetics)	02
8.	Speaking Skills – II (Conversational English)	02

9.	Reading Skills – I (Read and reproduce [oral])	**02**
10.	Reading Skills – II (Read and summarize [written])	**02**
11.	Writing Skills – Essay Writing	**02**
12.	Student Correspondence	**02**

References –

Reference Books:

1. D. Sudha Rani, Business Communication and Soft Skills Laboratory Manual, Pearson Education, Mumbai.
2. K. Mohan, Meera Banerji, Developing Communication Skills, Macmillan India Ltd., New Delhi.
3. H. Martin, Advanced English Grammar – A Self Study Reference Book, Prentice –Hall of India Pvt. Ltd., New Delhi.
4. R. J. Dixson, Everyday Dialogues in English, Prentice Hall India Pvt Ltd.
5. N. Lewis, Word Power Made Easy, Goyal Publications.

Class:- **First Year B. Tech.**	Semester- **II**
Course Code : **SH1624**	Course Name: **Communication Skills Lab- II (HSSM-AEC)**

L	T	P	Credits
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Course Description:
This course comprises comprehensive areas i.e. speaking, reading, and fundamentals of technical writing. Introduction of the units like Technical Paragraph writing, drafting emails and Letters, Technical Reports, and Information Transfer in the syllabus aims at preparing the basics of the aspirants from the technical field. The course aims to equip students with communication skills suitable for their academic as well as professional purposes.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Identify the need of personal appearance and grooming for professionals.
2. Demonstrate conversational and comprehension skills of English language.
2. Demonstrate writing skills through reports, letters, emails, and notices.
3. Organize the content of technical documents in specific forms.

Prerequisite: Knowledge of basic grammar and intermediate-level vocabulary of English language.

Course Content
(Any 10 experiment)

Expt. No.	Description	Hrs
1.	Professional Appearance and Grooming	02
2.	Speaking Skills (Extempore and Telephone Conversations)	02
3.	Reading Comprehension (For Competitive Exams)	02
4.	Technical Writing (Characteristics, types, language)	02
5.	Technical Paragraph Writing	02
6.	Online Communication – e-mails and Teleconferencing	02
7.	Resume and Cover Letter	02
8.	Drafting Notices and Note Making	02

9.	Information Transfer (Graphs, charts, and tables)	**02**
10.	Report Writing (Formats and types)	**02**
11.	Report Writing I (Visit / Event)	**02**
12.	Report Writing II (Project Report)	**02**

References -

Text Book:

1. J. Seely, Oxford Guide to Effective Writing and Speaking, OUP.

Reference Books:

1. D. Sudha Rani, Business Communication and Soft Skills Laboratory Manual, Pearson Education, Mumbai.
2. K. Mohan, M. Banerji, Developing Communication Skills, Macmillan India Ltd., New Delhi.
3. M. Raman, S, Sharma, Technical Communication: Principles and Practice, Oxford University Press.

Class:- **First Year B. Tech.**	Semester-I
Course Code : **SH1605**	Course Name: **German Language Lab Level-I (HSSM-AEC)**

L	T	P	Credits
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Course Description:
This course provides an opportunity to enhance acquisition of the fundamental elements of German language. Emphasis is on the progressive development of basic listening, speaking, reading, and writing skills through the use of supplementary learning media and materials.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Make use of familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.
2. Express him /herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has.
3. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help.
4. Make use of the basic grammar concepts correctly.
5. Demonstrate reading and writing skills.

Prerequisite: Communicate moderately using English Language.

Course Content

Expt. No.	Description	Hrs
1.	Introduction of the language, Greetings, to Introduce oneself, speaking about yourself and others.	02
2.	Alphabets and numbers.	02
3.	Listening of Alphabets and numbers, Reading Information about other people and understanding simple information about them, country names and languages.	02
4.	Speaking about Hobbies. Conjugation of strong verbs and revision of regular verbs.	02
5.	Learning articles and genders of nouns, Singular / Plural noun forms.	02

6.	Learning weekdays, months and Seasons. Speaking about informal appointments. Grammar: yes/no questions, Verb position in normal statements and in questions.	**02**
7.	Learning Professions, reading small texts and understanding information about working days, hours and profession.	**02**
8.	Learning to name the famous places, buildings in a city, name the modes of transportation.	**02**
9.	Learning definite/ indefinite and negative articles in German.	**02**
10.	To learn to describe the way. Imperative for Pronoun "Sie".	**02**
11.	To speak about food, understanding food items, where one can buy what, Quantities and packing of the grocery items. Conversation between shopkeeper and customer.	**02**
12.	Understanding of Grammar: Subject and object of the sentence and introduction of akkusativ case in German. Reading and understanding professions related to food and grocery.	**02**

Note: This course (after successful completion of 1st course) will prepare the students for Start Deutsch 1 exam (A1 exam by Goethe Institue, Max Mueller Bhavan). The students will find it very easy to pursue for this exam after completion of this course. They just need some exam training to get acquainted with Goethe pattern.

Class:- **First Year B. Tech.**	Semester-**II**
Course Code : **SH1684**	Course Name : **German Language Lab Level – II (HSSM-AEC)**

L	T	P	Credits
--	--	2	1

Course Description:
This course provides an opportunity to enhance acquisition of the fundamental elements of German language. Emphasis is on the progressive development of basic listening, speaking, reading, and writing skills through the use of supplementary learning media and materials.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Make use of familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type.
2. Express him /herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has.
3. Interact in a simple way provided the other person talks slowly and clearly and is prepared to help.
4. Make use of the basic grammar concepts correctly.
5. Demonstrate reading and writing skills.

Prerequisite: Nil

Course Content		
Expt. No.	**Description**	**Hrs**
1.	Understanding and learning of routine activities. To understand the watch timings, giving information about time,	**02**
2.	Giving Information about time. Prepositions and Wh questions related to watchtimings.	**02**
3.	Speaking about family and vocabulary related to family. Grammar: Possessivarticles in Nominativ and akkusativ case.	**02**
4.	Continuation and exercises of possessivarticles.	**02**
5.	Learning of Modalverbs können, wollen, müssen. Learning about punctuality in Germany and how to excuse for delay,	**02**

	telephonic conversation about the appointments.	
6.	Different free time activities. Things related to activities and listening based on these activities.	**02**
7.	Telling birth date and birth year, how to tell years and dates in German. Ordinal numbers, Listening based on ordinal numbers.	**02**
8.	To plan something together, speaking about birthday, to understand invitation and to write an invitation, to order and to pay in restaurant, to speak about own experiences.	**02**
9.	Vocabulary related to topic Restaurant. Learning, understanding and speaking about ordering and paying in restaurant. Learning personal pronouns in akkusativ and Preposition für + akkusativ.	**02**
10.	Simple past tense of the verbs haben and sein. To understand particular information from the texts, to understand about different events and events related information in Radio.	**02**
11.	Understanding work routine and activities related to work in daily routine. Information and words related to internship and activities related to internship.	**02**
12.	Comprehension related to internship and exercises with conjunctions "und, oder, aber"	**02**

Note: This course (after successful completion of 1st course) will prepare the students for Start Deutsch 1 exam (A1 exam by Goethe Institute, Max Mueller Bhavan). The students will find it very easy to pursue for this exam after completion of this course. They just need some exam training to get acquainted with Goethe pattern.

Class:- **First Year B. Tech.**	Semester-**I**	**L**	**T**	**P**	**Credits**
Course Code: **SH1586**	Course Name: **Japanese Language Lab Level-I (HSSMM-AEC)**	--	--	**2**	**1**

Course Description:
This course is designed to introduce students to the everyday language of Japan. Lessons will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Acquire basic Japanese language skills (listening, speaking, writing, and reading).
2. Enable students demonstrate an awareness of the relevance of Japanese language to professions and careers.
3. Make students understand the cultures and civilizations of the country of Japan.
4. Enable the students to function in an environment where Japanese is used exclusively

Prerequisite: A student, who is going to going to enroll for this course, should have following abilities:

1) Knowledge of basic grammar of English Language.
2) Communicate moderately using English Language.

	Course Content	
Expt. No.	**Description**	**Hrs**
1.	Affirmation & negation in simple present tense.	**02**
2.	Uses of particles から & まで	**02**
3.	To express time in Japanese language.	**02**
4.	Uses of particles へ、で、と、よ	**02**
5.	Uses of interrogative pronouns なん、 いつ、 なに	**02**
6.	Expressions expressing sympathy & agreements.	**02**

7.	Uses of particle を　in case of transitive verb.	**02**
8.	Difference between interrogative pronoun　なん&　なに	**02**
9.	Expressions used to invite someone to do something.	**02**
10.	How to say a word or sentence in another language.	**02**
11.	Different verbs indicating imparting things, information or action.	**02**
12.	Omission of particles.	**02**

*Note: Words written phonetically using the Latin alphabet (romaji) will be only used in the initial stage to aid learning pronunciations.

Class:- **First Year B. Tech.**	Semester-**II**
Course Code : **SH1665**	Course Name: **Japanese Language Lab Level – II (HSSM-AEC)**

L	T	P	Credits
--	--	**2**	**1**

Course Description:
This course is designed to introduce students to the everyday language of Japan. Lessons will be organized around natural conversational topics, leading students from fundamental aspects of grammar to readings in simple texts.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Acquire basic Japanese language skills (listening, speaking, writing, and reading).
2. Enable students demonstrate an awareness of the relevance of Japanese language to professions and careers.
3. Make students understand the cultures and civilizations of the country of Japan.
4. Enable the students to function in an environment where Japanese is used exclusively.

Prerequisite: A student, who is going to going to enroll for this course, should have following abilities:

1) Knowledge of basic grammar of English Language.
2) Communicate moderately using English Language.

Course Content		
Expt. No.	**Description**	**Hrs**
1.	Brief history of Japan &Japanese Language, introduction of 3 scripts. Writing Hiragana alphabets & words from あ to ぜ	**02**
2.	Writing Hiragana alphabets from た to ぽ Daily expressions & greetings.	**02**
3.	Writing letters from ま to ん Doubling of consonants Compound letters	**02**
4.	Katakana alphabets from ア to ゼ Numbers from 1 to 100	**02**

5.	Katakana alphabets from タ to ン Classroom expressions.	**02**
6.	Doubling of consonants & compound letters in Katakana Multiples of 100, 1000, 10,0	**02**
7.	Use of particles, affirmation, negation.	**02**
8.	Interrogation in simple present tense.	**02**
9.	Uses of demonstrative pronouns これ、それ、あれ	**02**
10.	Substitution for a noun.	**02**
11.	The こ、そ、あ、ど system of demonstrative.	**02**
12.	Demonstrative pronouns ここ、そこ、あそこ、どこ& its polite forms.	**02**

*Note: Words written phonetically using the Latin alphabet (romaji) will be only used in the initial stage to aid learning pronunciations.

References –

Text Book:

1. Minna No Nihongo I, 3A Corporation, Japan, Goyal publishers.

2. Nihongo shouhou, Publication: JALTAP

Class:- **First Year B. Tech.**	Semester- **I/II**
Course Code : **SH1894**	Course Name: **Engineering Exploration and Design Project (VSEC)**

L	T	P	Credits
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Course Description:
The Engineering Exploration course is an introduction to engineering concepts with a focus on critical thinking, creativity, teamwork, communication, and working across different engineering disciplines. Students will be introduced to various disciplines as well as engineering design processes through activity-based instructions. The main aim of this workshop is to introduce product development skills at first year of engineering through a semester-long project, providing a design-built-test experience. This course makes students familiar with Engineering Design, Project and Constraints Management, Multi-disciplinary nature of engineering, problem solving, data acquisition analysis, Team Building, Engineering Ethics & Sustainability.
Students are expected to complete the mini project by applying the engineering concepts/principles taught in the course. Students could join (maximum 4 students) together, form a small team, and execute a simple project in multi-disciplinary engineering field under the guidance of course teachers.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain the role of an Engineer as a problem solver.
2. Design engineering solutions to complex problems utilizing multi-disciplinary systems approach.
3. Examine a given problem using process of engineering problem analysis.
4. Build simple systems/prototypes using engineering design and development process.
5. Analyze engineering solutions from ethical and sustainability perspectives.
6. Apply basics of engineering project management skills in project development.

Prerequisite: Nil

Course Content		
Unit No.	**Description**	**Hrs**
1	**Introduction to Engineering and Engineering Study**	**04**

	Difference between science and engineering, Problem space of an engineer (needs), various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer and Graduate Attributes.	
2	**Engineering Design** Engineering Design Process, Importance of analysis in engineering design, General analysis procedure, Multidisciplinary facet of design, Electric circuit design – 5V & 12V DC power supply design, Conversion of Electrical to Mechanical Energy.	**08**
3	**Mechanisms** Mechanisms and Machines, Different types of Mechanisms, Degrees of freedom or mobility of a mechanism, 4-Bar Mechanisms, Slider Crank Mechanism, Power transmission devices – Need, Selection, types and working principle.	**06**
4	**Platform based development** Introduction to systems and Platform Based Development, Arduino as a development board, Arduino programming environment, Sensors, actuators and drivers, Interfacing of I/O devices, Pulse Width Modulation, Analog and Digital data,	**08**
5	**Data Acquisition and Analysis** Basics of MIT app development, Google firebase, Interfacing of MIT app, firebase and Arduino, Data Acquisition using Sensors interfaced with Arduino, Types of Data, Descriptive Statistics techniques, Types of graphs, Usage of Microsoft Excel tool for descriptive statistics, Exporting acquired data to Microsoft Excel and analysis using visual representation,	**06**
6	**Project Management, Engineering Ethics, Sustainability** Project Management: Importance of Teamwork, Importance of Project Life Cycle, Project Management Tools, Importance of communication and Communication Media, Various Tools used in Electronics Documentation. Engineering Ethics: Introduction to ethics, moral values, Significance of Professional Ethics, Code of Conduct for Engineers. Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon foot print.	**06**
7	**Course Project reviews**	**04**
8	**Project Work Hours (PWH)**	**08**

Reference Books:

1. C. Starkey, Basic Engineering Design, Butterworth-Heinemann Publisher.
2. Y. Haik, Sangarappillai Sivaloganathan, Tamer M. Shahin, Engineering Design Process, Cengage learning.
3. H. Jack, Engineering Design, Planning, and Management, Academic press.
4. S. S. Rattan, Theory of Machines, Tata McGraw-Hill.
5. R. S. Khurmi, Theory of Machines, S. Chand Publications.
6. Kenneth Ayala, The 8051 Microcontroller, Architecture, Programming, and Applications, West publishing Company.
7. Boylsted, Electronic Devices and Circuits, Person publication.
8. R. P. Jain, Modern Digital Electronics, TMH publication
9. J. Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley publication.
10. S. Monk, Programming Arduino Next Steps: Going Further with Sketches, McGraw-Hill / Tab Electronics.
11. M. Banzi, Make: Getting Started with Arduino, Shroff Publications.
12. S. Yarnold, Arduino in Easy Steps, In Easy Steps Publications.
13. J. Blum, Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Publications.

Class:- **First Year B. Tech.**	Semester- **I/II**
Course Code : **SH1037**	Course Name : **Engineering Chemistry (BSC)**

L	T	P	Credits
3	--	--	3

Course Description:
This foundational Engineering Chemistry course provides first-year engineering students with a comprehensive integration of chemical principles and engineering applications across six key modules: Water Treatment, Modern Analytical Methods, Engineering Materials, Nanomaterials, Corrosion Science, and Fuels & Lubricants. The curriculum combines theoretical knowledge with practical case studies, enabling students to tackle real-world engineering challenges while gaining hands-on experience with advanced analytical tools and cutting-edge materials. Students learn to apply chemical concepts to develop innovative solutions in diverse fields including electronics, construction, environmental remediation, and biomedical engineering, with particular emphasis on advanced materials like graphene and quantum dots. Through exposure to industrial problems and sustainable practices, the course equips students with the necessary skills to analyze challenges, evaluate materials, and design effective solutions, ultimately preparing them for future roles in research, industry, and innovation by bridging fundamental chemistry with practical engineering applications.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Analyze the causes and effects of water hardness in industrial and domestic purpose.
2. Apply the principles of instrumental methods to analyze chemical samples.
3. Analyze the properties, synthesis, and applications of conjugated polymers, alloys, and construction materials, and apply this knowledge to design innovative engineering solutions.
4. Compare top-down and bottom-up approaches for nanomaterial synthesis, and propose applications.
5. Investigate the mechanisms of corrosion and recommend appropriate corrosion control methods.
6. Evaluate the calorific value of fuels, and assess the physical properties of lubricants for their suitability in engineering applications.

Prerequisite: Fundamental concepts in Organic, Inorganic, Analytical and Physical Chemistry.

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Water** Introduction, water quality parameters: dissolved oxygen and hardness. Hardness: Types of hardness, causes of hardness, units, ill effects of hard water in various industries and boilers (scale & sludge). Treatment of for domestic purpose by sedimentation, coagulation and sterilization, treatment of water for industrial purposes reverse osmosis (RO) and ion exchange process.	**06**
2.	**Instrumental Methods** Introduction to instrumental methods, basic laws of spectroscopy (Lamberts law and Beers law), principle, construction, working and applications of single beam spectrophotometer, Flame Photometer, Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD) and pH-metry.	**06**
3.	**Engineering Materials** **a) High Polymers:** Conjugated polymers – synthesis properties and applications of polyacetylene, polyaniline. **b) Alloys:** Definition, purpose of making an alloy, composition, properties and applications of stainless steel, brass, nichrome, alnico. **c) Construction Materials:** Introduction to Cement and Plaster of Paris.	**06**
4.	**Nanomaterials** Introduction, properties of nanomaterials, synthetic approach for the nanomaterials: Chemical bath deposition (CBD),Chemical vapor deposition (CVD), Sol-Gel, Hydrothermal method, Introduction to Carbon Nanotubes (CNT's), Graphene and Metal-Organic Frameworks (MOFs), Quantum Dots, Applications of nanomaterial's in electronics, biomedical field, water remediation and catalysis.	**06**
5.	**Corrosion Science** Introduction, causes, theories and mechanism of corrosion– dry corrosion and wet corrosion (Hydrogen evolution and Oxygen absorption), factors affecting corrosion, corrosion control methods –cathodic protection, surface coatings - methods of application on metals- hot dipping galvanizing, tinning and electroplating.	**06**
6.	**Fuels and Lubricants** **Fuels:** Introduction, Characteristics of good fuels, calorific value and its types, Bomb calorimeter and Boy's gas calorimeter.	**06**

	Lubricants: Functions of lubricants, Types of lubricants, Physical properties of lubricant (definition and significance)-viscosity, viscosity index, flash and fire point, cloud and pour point, Aniline point.	

References -

Text Books:

1. B. H. Mahan, University Chemistry.
2. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications, New Delhi.
3. B. S. Godbole, M. H. Pendase, S. S. Joshi, Engineering Chemistry, Nirali Publication.

Reference Books:

1. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd, New Delhi.
2. Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, New Delhi.
3. B Sivasankar, Engineering Chemistry, Tata McGraw-Hill Publishing Company Ltd New Delhi.
4. O. G. Palanna, Engineering Chemistry, McGraw-Hill education (India) Publishing Company Ltd. New Delhi.
5. R. V. Gadag, A. N. Shetty, Engineering Chemistry, I. K. International publication house Pvt. Ltd., New Delhi.
6. S. K. Bhasin and Vijay Sharma, Essentials of Engineering Chemistry, Himalaya Publishing House.

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1536**	Course Name: **Engineering Chemistry Lab (BSC)**

L	T	P	Credits
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Course Description:

Engineering Chemistry Laboratory experiments related to the six modules in theory course. This course deals with analysis of different samples including water samples having varying hardness, chlorides, alkalinity, acidity, different metal salts solutions, solutions of varying pH, etc. also it deals with synthesis of nanomaterials and polymers.

Course Learning Outcomes:

After successful completion of the course, students will be able to,

1. Examine the materials by using analytical instruments.
2. Identify the quality of water for industrial and domestic purposes.
3. Apply the knowledge of corrosion science for measurement of rate of corrosion.
4. Apply science of polymers and nanomaterials in the synthesis of materials.
5. Inspect the quality of fuel and lubricants.

Prerequisite: Basic chemistry including knowledge of 12^{th} Std. Chemistry.

Course Content		
Expt. No.	**Description (Any 10 experiments)**	**Hrs**
1.	Estimation of total hardness/chloride content of given sample.	**02**
2.	Estimation of alkalinity of given water sample.	**02**
3.	Estimation of acidity of given water sample.	**02**
4.	Determination of corrosion rate of steel in the acid medium by weight loss method.	**02**
5.	Determination of coefficient of viscosity using Ostwald's viscometer.	**02**
6.	Synthesis of simple polymer.	**02**
7.	Estimation of iron by photo-colorimeter/spectrophotometer.	**02**
8.	Determination of p^H of given sample solutions by water analyzer.	**02**

9.	Estimation of sodium and potassium in the given sample of water using Flame Photometer.	**02**
10.	Synthesis of Nanomaterials.	**02**
11.	Determination of percentage of zinc from brass.	**02**
12.	Determination of strength of acid/base conductometrically.	**02**
13.	Synthesis of Copper nanoparticles.	**02**
14.	Determination of Saponification number of given lubricating oil.	**02**
15.	Determination of Aniline number of given lubricating oil.	**02**

References:

Reference Books-

1. V. K. Ahaluwaliya, S. Dhingra, A. Gulati, College Practical Chemistry, Universities Press.
2. Sudha Rani and S.K. Bashin, Laboratory Manual on Engineering Chemistry, Dhanpat Rai & Co.
3. Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, New Delhi.
4. J. N. Gurtu, Amit Gurtu. Advanced Physical Chemistry experiments.

Class:- **First Year B. Tech**	Semester- **II**
Course Code : **SH1027**	Course Name : **Engineering Mathematics-II (BSC)**

L	T	P	Credits
3	1	--	4

Course Description:
This course introduces fundamental mathematical concepts essential for solving engineering problems. It covers Special Functions, Curve Tracing, Multiple Integrals, and Applications of Multiple Integrals, Partial Differentiation, and its Applications, Complex Integration. This course intends to build the competency in students to apply Mathematical concepts in various Engineering Problems.

Course Outcomes:
After successful completion of the course, students will be able to,

1. Solve problems on improper and multiple integrals
2. Sketch the curve and use it to solve the problems on multiple integral.
3. Prove the results of partial differentiation and apply partial differentiation for problems on Jacobian, maxima and minima
4. Solve various problems on complex integration.

Prerequisite: Higher Secondary Mathematics

Course Content:

Unit No.	Description	Hrs.
1.	**Special Functions** Beta and Gamma Functions, Properties of Beta and Gamma Functions, Differentiation under the Integral Sign	**06**
2.	**Curve Tracing** Basic notions, Asymptotic behaviour of curves, Tracing of standard rectangular curves, Tracing of standard polar form curves	**06**
3.	**Multiple Integrals** Introduction to double integrals, Evaluation of double integrals (Cartesian and polar forms), Evaluation of double integrals over the given region (Cartesian and polar forms), Change of order of integration	**06**

4.	**Applications of Multiple Integrals** Area under the curves using double integrals, mass of lamina, moment of inertia of a plane lamina, volumes of solids by double integral	**06**
5.	**Partial Differentiation** Functions of two and three variables, Partial derivatives of first order and higher order, Partial derivatives of composite functions and Implicit functions, Euler's theorem on homogeneous function, Jacobian, Maxima and Minima of function of two variables.	**06**
6.	**Complex Integration** Cauchy's integral theorem, Cauchy's integral formula, Taylor series, Laurent series, Residue theorem, Solution integrals	**06**

Tutorials: (Any 10 tutorials)		
Sr. No.	**Title**	**Hrs.**
1.	Special Functions (Gamma function)	**1**
2.	Special Functions (Beta function)	**1**
3.	Tracing of Cartesian Curve	**1**
4.	Tracing of Polar Curve	**1**
5.	Multiple integrals-I	**1**
6.	Multiple integrals-II	**1**
7.	Applications of Multiple Integrals (Area, Mass)	**1**
8.	Applications of Multiple Integrals (Moment of Inertia, Volume)	**1**
9.	Partial Differentiation	**1**
10.	Applications of Partial Differentiation	**1**
11.	Complex Integration I	**1**
12.	Complex Integration II	**1**

13.	Special Functions Using MATLAB	**1**
14.	Curve Tracing Using MATLAB	**1**
15.	Multiple Integral using MATLAB	**1**

References:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publications, New Delhi.
2. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Publications, New Delhi.

Text Books:

1. Raman B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi.
2. N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar,"A Text Book of Engineering Mathematics", Laxmi Publications, New Delhi.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Cole publishing house,
4. P. N. Wartikar and J. N. Wartikar, A Text book of Applied Mathematics, Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune.

Class:- **First Year B. Tech**	Semester-**I/II**
Course Code : **SH1136**	Course Name: **Engineering Graphics (ESC)**

L	T	P	Credits
2	--	2	3

Course Description:
A picture speaks a thousand words, and visual communication is often more effective than words alone. Since ancient times, humans have used drawings to convey ideas. With technological progress, the need for a **standardized** graphical language led to the development of **Engineering Drawing.** Mastering Engineering Drawing requires understanding its **grammar**—standard conventions, notations, and methods—along with proficiency in AutoCAD. This course equips students with these essential skills, enabling them to create precise technical drawings. A basic understanding of geometrical theorems and construction procedures is recommended as a prerequisite.

Prerequisite: The knowledge of simple geometrical theorems and constructional procedure.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Draw the projections of line, plane and regular solids with respect to reference planes as per given conditions using AUTOCAD.
2. Generate the sectional view, true shape of the section and development of the solid with the help of AUTOCAD software.
3. Prepare orthographic views of engineering components with AUTOCAD software.

Course Content

Unit No.	Description	Hrs
1.	**Projection of Point and Lines** Basic principles of orthographic projection Projections of points, Projection of oblique line by rotation or auxiliary plane method using first angle projection method.	04
2.	**Projection of Planes** Types of plane, line view of a plane, true shape of a plane, oblique plane. Projection of planes by rotation or auxiliary plane method.	04
3.	**Projection of Solids**	04

	Define Solid, types of solid, projection of solid in simple position, projections of solids with axes inclined to one of the reference plane and parallel to the other, projections of solid with axes inclined to both the reference planes.	
4.	**Section of Solids** Significance of section planes, types; vertical cutting plane, horizontal cutting plane, AVP, AIP; HT, VT; Section of Solids like prism, pyramid, cone, cylinder and true shape of the sections.	**04**
5.	**Development of Solid Surfaces** Development of solids like prism, pyramid, cone, cylinder. Industrial applications of development of surfaces, methods of development,	**04**
6.	**Orthographic Projection** Introduction, projections methods, types of lines (continues, hidden, center line etc.), types of scales, theory of projections, HRP, FRP, PRP, steps to convert 3D view into 2D view multi view, simple and sectional orthographic drawings, types of hatch lines and their rules. Orthographic projection of objects by first angle projection method. Procedure for preparing scaled drawing, sectional views and hatching of sections.	**04**

*Note: Drawings of Theory paper of UT1, UT2 and ESE exam will be conducted on AutoCAD software.

References –

Text Books:

1. D. A Jolhe. Engineering Drawing, Tata-McGraw hill.
2. N. D. Bhatt. Elementary Engineering Drawing, Charotar Publishing House, Anand (India)
3. K. L. Narayana, P. Kannaiah. Text Book on Engineering Drawing, Scitech Publications (India) Pvt. Ltd., Chennai.

Reference Books:

1. W. Luzzader. Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.
2. P. S. Gill. Engineering Graphics, S. K. Kataria and sons New Delhi.
3. D.M. Kulkarni, A. P. Rastogi, A. K. Sarkar. Engineering Graphics with AutoCAD, PHI Publication.

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code : **SH1295**	Course Name: **Basic Electrical Engineering (ESC)**

L	T	P	Credits
2	--	--	2

Course Description:
Engineering students of almost all disciplines have to undergo this course as a core subject in the first year. A reasonable understanding on the basics of applied electricity is very important for every engineer. The course can be broadly divided into three major parts, namely: electrical circuits, magnetic circuits and electrical machines. Apart from learning D.C. and A.C. circuit analysis both under steady state and transient conditions, students will learn basic working principles and analysis of transformer, magnetic circuits, D.C. motors and induction motor.

Course Outcomes:
After successful completion of the course, students will be able to,
1. Solve D.C. and A.C. electric circuits.
2. Illustrate the notions of magnetic circuits.
3. Explore suitable capacity of wires, cables, and switchgear for electrical installations.
4. Elaborate transformer and rotating electrical machines.

Prerequisite: Concept of potential difference, current and resistance. Ohm's law. Fundamentals of electromagnetics.

Unit No.	Course Content Description	Hrs
1.	**DC Circuits** Ohms Law, Equivalent Resistance, Kirchhoff current Law, Kirchhoff voltage laws, Mesh analysis, Nodal analysis. Superposition Theorem.	04
2.	**AC Fundamentals** Introduction of circuit elements, Generation of Sinusoidal waveform, Basic notions of AC waveform, Analysis of single-phase ac circuits. Power triangle. Introduction of three phase circuits, star and delta configuration.	04
3.	**Magnetic Circuits**	04

	Introduction, concept of magneto-motive force (MMF), Magnet filed intensity, reluctance, permeability and relative permeability, B-H characteristics, comparison between electric and magnetic circuits, leakage flux fringing and staking.	
4.	**Electrical Installations** Components of LT Switchgear: Fuse, MCB, ELCB, MCCB, Earthing, Single Line Diagram and Electrical Layout of Residential Wiring, Elementary calculations for energy consumption, Electrical Safety and Safety Measures	**04**
5.	**Transformer** Construction and working of transformer, types of transformer, EMF equation and transformation ratio, ideal and practical transformer on no load, losses and efficiency of transformers, Introduction to Three Phase Transformer.	**04**
6.	**Electrical Machines** DC machine: construction, working, types and applications. Three phase induction motor: construction, working, slip. Introduction to Single Phase Induction Motor, types & applications	**04**

References:

Text Books-

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.
3. Abhijit Chakrabarti, Sudipta Nath, "Basic Electrical Engineering", McGraw Hill Education (India) Pvt. Ltd.

Reference Books:

1. B.L. Theraja, A.K. Theraja, "A Textbook of Electrical Technology" (Volume I, II and III), S. Chand Publications.
2. C. L. Wadhwa, "Basic Electrical Engineering" 4th Ed, New Age International (P) Ltd., Publishers.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India.
4. NPTEL: Electrical Engineering (online) - Basic Electrical Technology Link: nptel.ac.in/courses/108105053/

Class:- **First Year B. Tech.**	Semester-**I/II**
Course Code : **SH1795**	Course Name: **Basic Electrical Engineering Lab (ESC)**

L	T	P	Credits
--	--	2	1

Course Description:
This course is intended to enhance the learning experience of the student in topics wises. In this lab, students are expected to get hands-on experience in using the basic measuring devices used in electrical engineering and in interpreting the results of measurement operations in terms of the concepts introduced in the first electrical circuits course. How the student performs in the lab depends on his/her preparation, participation, and teamwork. Each team member must participate in all aspects of the lab to ensure a thorough understanding of the equipment and concepts. The student, lab teaching assistant, and faculty coordinator all have certain responsibilities for the successful completion of the lab's goals and objectives.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Analyze electrical DC circuits using Ohm's Law and Kirchhoff's laws.
2. Analyze performance of single and three phase AC circuits and interpret the results.
3. Demonstrate operation of different wiring system and LT switchgears
4. Conduct various tests on transformers and basic electrical machines
5. Develop problem-solving skills to troubleshoot and resolve electrical issues

Prerequisite: Fundamental of Physics

Course Content		
Expt. No.	**Description**	**Hrs**
1.	Introduction to electrical engineering laboratory equipment's, symbols, and safety rules.	**02**
2.	Verify Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in DC electrical circuits.	**02**
3.	Analyze the behavior of a single-phase series RLC circuit by measuring voltages, currents, and phase angles.	**02**
4.	Verify the relationships between line and phase voltages and currents in three-phase star (Y) and delta (Δ) connected circuits.	**02**
5.	Plot the B-H curve of a given magnetic material	**02**

6.	Demonstrate simple, staircase, and gowdown electric wiring circuits	**02**
7.	Demonstration of LT switchgears – (a) Switch fuse Unit (b) Miniature Circuit Breaker (MCB) (c) Moulded case circuit breaker (MCCB) and (d) Earth leakage circuit breaker (ELCB)	**02**
8.	Perform Open Circuit (OC) and Short Circuit (SC) tests on a single-phase transformer to find the efficiency	**02**
9.	Perform direction reversal operation of a three-phase induction motor by changing the phase sequence.	**02**
10.	Self-Learning Activity: Development of Electrical gadget	**02**

References:

Text Books-

1. L.S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press,
2. E. Hughes, Electrical and Electronics Technology, Pearson,

Reference Books-

1. V. Deltoro, Electrical Engineering Fundamentals, Prentice Hall India,

Class:- **First Year B. Tech.**	Semester- **I**
Course Code : **SH1854**	Course Name: **Engineering Practice Lab-I (VSEC)**

L	T	P	Credits
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Course Description:
Workshop practice imparts basic knowledge of various tools and their uses in different sections of manufacturing such as Fitting, Tin Smithy, House Wiring, Carpentry etc. It is true that engineers are not going to become carpenters or blacksmiths or skilled workers on the shop floor, but by exposing themselves to all working trades, they get a bird eye view of the basic practical activities associated with all sections of manufacturing. It helps them, when they occupy managerial positions, in understanding the activities and practical difficulties, so that they can take appropriate decisions.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Acquire skills in basic engineering practice.
2. Use hand tools and power tools.
3. Develop sheet metal model for specific application.
4. Illustrate the various operations performed in machine shop.
5. Perform different joining operations
6. Perform pipefittings operations.

Prerequisite: Nil

Course Content		
Expt. No.	**Description**	**Hrs**
1.	Demonstration of different carpentry operations useful for making wooden pattern, furniture items etc. with the help of hand tools and power tools	**02**
2.	To make a Dovetail Joint using Carpentry Tools	**02**
3.	To make a Butt Joint or T-Joint using Carpentry Tools	**02**
4.	Demonstration of different Sheet metal operations useful for Sheet metal objects like CPU cabinet, Enclosures of inverter, Tray etc. by performing operations like Cutting, Bending, Folding.	**02**

5.	To make small jobs like Electrical meter cover, transformer clamping.	**02**
6.	Demonstration of different machining operations useful for machining objects like crankshaft, camshaft, axis-symmetric parts etc. by performing centre drilling, facing, plain turning, knurling and chamfering.	**02**
7.	Demonstration of different joining processes for metal rods, plates and sheet metal.	**02**
8.	To make Lap joint using metal joining techniques.	**02**
9.	To make Butt joint or T-joint using metal joining techniques.	**02**
10.	Demonstration of different piping connections, plumbing techniques in G.I, PVC, UPVC, CPVC fittings.	**02**
11.	Demonstration of soldering and testing of electronic components.	**02**
12.	Demonstration of use of electronic control circuits.	**02**

Class:- **First Year B. Tech.**	Semester-**II**
Course Code: **SH1644**	Course Name : **Engineering Practice Lab – II (VSEC)**

L	T	P	Credits
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Course Description:
To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labor involved, machinery or equipment necessary, time required to fabricate and should be able to estimate the cost of the product or job work.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Make wooden job.
2. Make Sheet metal job.
3. Make job by various machining processes.
4. Make job by joining processes.

Prerequisite: Experiential knowledge of Engineering Practice lab – I.

Course Content		
Expt. No.	**Description**	**Hrs**
1.	Selection of job and approval from instructor.	**02**
2.	Preparation of drawing, approval of drawing and material selection.	**02**
3.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
4.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
5.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
6.	Assessments of job for job no 1.	**02**
7.	Selection of job and approval from instructor.	**02**
8.	Preparation of drawing, approval of drawing and material selection.	**02**

9.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
10.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
11.	To make a job as per the drawing by using various operations in different sections of workshop.	**02**
12.	Assessments of job for job no 2.	**02**

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code: **SH158**	Course Name: **Cultural Activities** (CC)

L	T	P	Credits
2	--	-	2

Course Description:
This course aims to enrich the holistic development of first-year engineering students by fostering an appreciation for cultural activities. The focus is on encouraging students to engage in various forms of cultural activities, both Classical Music and Tabala. Indian Classical music is one of the oldest forms of art. Indian Classical Music can be divided into its two base elements which are Raga and Tala. The raga mainly forms the musical structure of the song while the tala measures the time. Classical music for studying has been shown to have a positive impact on memory and cognitive function. The research study found that listening to music, especially classical music, can activate regions of the brain associated with attention and visualization. The course includes basic practical aspects of classical music.
Taal plays a crucial role in Indian Music. The importance of Taal is indisputable in Hindustani classical music. The Pakhavaj and Tabla are prominent percussion instruments that accompany various forms of vocal and instrumental music and Dance. The experiment of Tabla in fusion music is remarkable and thus Tabla has gained an important place in the percussion world. The tabla is a complete solo instrument with a wide range of rich repertoire. The course includes basic practical aspects of Tabla Music.

Course Outcomes:
After successful completion of the course, students will be able to,
1. Understand basic knowledge of Indian classical music.
2. Illustrate the fundamental aspects of Tabla musical instrument.
3. Demonstrate the rhythm system applied in classical music.
4. Demonstrate the performance of Tabla musical instrument.
5. Apply different types of Taal, Matra Kandh, Saam, Khali, Thhali & Aavatanan.

Prerequisite: No prior experience in cultural activities is required, although an open mind and willingness to explore new creative fields are encouraged.

Expt. No.	Course Content Description	Hrs.
1	Discussion and practice on fundamentals of classical music - Sangeet, Naad, Swar, Saptak, Alankar, Raag, Wadi, Sanwadi, etc.	04

2	Discussion and practice on fundamentals of classical music - Swar, Pakad, Gansamay, Purwang, Uttarang etc.	**04**
3	Discussion and practice on Taal study, Taal, Laay, (Vavalvit, Madya, Dhrut) Matra Kandh.	**04**
4	Saam, Khali, Thhali, Aavatanan, Classical Music Notation System.	**04**
5	Discussion and practice on Raga - Bhoop Raga – Chota Khyal with Aalap, Taan.	**04**
6	Discussion and practice on fundamentals of performing through Tabla musical instrument - Taal, Theka, Kayda.	**04**
7	Discussion and practice on fundamentals of performing through Tabla musical instruments- Dumdar and Bedam Tehai.	**04**
8	Practice on Teentaal, Ektaal with Peshkar, Tukda.	**04**
9	Practice on Chakkardar, Gat with Padhant and Hastkriya.	**04**
10	Practice on Bhatkhande Taal Notation and Pulaskar Taal notation system	**04**

References:

Text Books-

1. Aneesh Pradhan, Chasing the Raag Dream: A Look into the World of Hindustani Classical Music, Harper India Publications.
2. Amit Chaudhuri, Finding The Raga: An Improvisation on Indian Music, Penguin Random House India Pvt. Ltd. Publications.
3. V. S. Mishra, Art and Science of Playing Tabla, Publications Division of Ministry of Information & Broadcasting.

Reference Books-

1. S. Nagarkar, Raga Sangeet: Understanding Hindustani Classical Vocal Music, Book Baby Publications.
2. L. Chew, S. Spiegel berg, and D. De Reiter, The Daily Book of Classical Music, Walter Foster Publications.
3. D. Courtney, Learning the Tabla, Mel Bay Publications.

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code : **SH1342**	Course Name: **Sports and Yoga (CC)**

L	T	P	Credits
2	--	---	2

Course Description:

This course aims to enrich the holistic development of first-year engineering students by fostering an appreciation for Sports and Yoga. Along with Yoga practices, the syllabus of this Program includes allied topics like Anatomy and Physiology, Sports Psychology, Sports Ethics, Diet and Nutrition. Lectures and practical sessions will be conducted in the practical mode.

Course Outcomes:

After successful completion of the course, students will be able to,

1. Make the students understand the importance of sound health and fitness principles as they relate to better health.
2. Expose the students to a variety of physical and yogic activities aimed at stimulating their continued injury about yoga, physical education, health and fitness.
3. Create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
4. Develop among students an appreciation of physical activity as a lifetime pursuit and a means to a better health.

Prerequisite: No prior experience in Sports and Yoga is required, but student has to be physically and mentally fit.

Expt. No.	Course Content Description	Hrs.
1	Sports Introduction, why is Sports important for student	02
2	Different types of Sports & Workout Explanation.	02
3	Conditioning Exercises -Warming Up General and Specific Exercises. & Cooling Down.	02
4	Indoor Games Practical, teaching, demonstration, training, technical training. Table Tennis, Badminton	02
5	Outdoor Games Practical, teaching, demonstration training, technical training.	02

	Volleyball, Football	
6	Required Physical Fitness Tests: Strength Test, Speed Test, Agility Test, Flexibility Test, etc.	**02**
7	Yoga Introduction, Yoga History, why is yoga important for student.	**02**
8	Nature of Yoga Shastra. Different types of Yoga and Explanation of Ashtanga yoga	**02**
9	Surya Namaskar	**02**
10	Pranayama-Anulom Vilom,Bhramari,Suryabhedan	**02**
11	Purification in Yogasna-Kapalbhati, Tratak.	**02**
12	Yoga Nidra- Relaxation Technique	**02**

References:

1. Amit Arjun Budhe, Career aspects and Management in Physical Education, Sports Publication, NewDelhi
2. Bucher,C.A.(n.d.)Foundation of physical education. St.Louis: The C.V.Mosby Co. Deshpande, S. H. . Physical Education in Ancient India. Amravati: Degree College of Physical education.
3. D.M Jyoti, Yoga and Physical Activities lulu.com3101, Hills borough, NC27609, United States
4. Gharote, M. L. & Ganguly, H. . Teaching methods for yogic practices. Lonawala:Kaivalyadhama.
5. Mohan, V. M. . Principles of physical education. Delhi: Metropolitan Book Dep. Nixon, E. E. & Cozen, F.W. . An introduction to physical education. Philadelphia: W.B. Saunders Co

Class:- **First Year B. Tech**	Semester- **I/II**
Course Code : **SH108**	Course Name: **National Service Scheme (CC)**

L	**T**	**P**	**Credits**
2	**--**	**----**	**2**

Course Description:
The National Service Scheme (NSS) is a voluntary program under the Ministry of Youth Affairs & Sports, Government of India, aimed at developing students' personality through community service. The course is designed to foster a sense of social responsibility, leadership, and community engagement among youth.

Course Outcomes:
After successful completion of the course, students will be able to,

1. Apprehend the community in which they work and their relation
2. Identify the needs and problems of the community and involve them in problem-solving
3. Develop capacity to meet emergencies and natural disasters
4. Practice national integration and social harmony and
5. Utilize their knowledge in finding practical solutions to individual and community problems

Prerequisite: No prior experience in NSS is required, but students have to be physically and mentally fit.

Expt. No.	**Course Content** **Description**	**Hrs.**
1	Personality development through NSS	**02**
2	Tree Plantation	**02**
3	Celebration of National Days (As per NSS list)	**02**
4	Internal Cleanliness Drive.	**12**
5	Blood donation Camp	**04**
6	Participation in disaster management training	**02**

References:

1. National Service Scheme Manual, Government of India.
2. Training Programme on National Programme scheme, TISS.
3. Orientation Courses for N.S.S. Programme officers, TISS.
4 .Case material as Training Aid for field workers, *Gurmeet Hans*.
5. Social service opportunities in Hospitals, *Kapil K.Krishan*,TISS

Program Core Courses

Class:-**First Year B. Tech.**	Semester-**II**
Course Code : **SH174**	Course Name : **Basics of Sensor Technology (PCC)**

L	T	P	Credits
2	--	--	2

Course Description:
This course is designed to introduce basic fundamentals of electronics devices, actuator, sensors, and its importance in the real world. The students will also able to understand how to use sensors for electronics system design, its calibration and design of signal conditioning circuits for the given sensor.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Recognize basic analog and digital devices used for different electronic applications
2. Explain the working principles of various sensors
3. Identify suitable sensors and transducers for real time applications
4. Analyze the different sensor based electronic circuits.

Prerequisite: Basic knowledge of Physics.

Course Content		
Unit No.	**Description**	**Hrs**
1	**Basics electronic components and Sensors** Overview of Resistor, Capacitor, Inductor- value calculation, and its uses. Transformers, diode, working of diode and applications- power supply. Basics of sensors, Difference between sensor, transmitter and transducer, Primary measuring elements , selection and characteristics.	04
2	**Types of sensors** Principle of operation, characteristics and applications of temperature sensor, humidity sensor, hall effect sensor, force sensors, pressure sensors, strain gauge etc.	04
3	**Transistor and Actuators** Types of BJT, Working of BJT, transistor as an amplifier, transistor as a switch. Types of actuators, Definition, types and selection of Actuators; Relay, linear;	04

	rotary; Pneumatic actuator, Hydraulic actuator.	
4	**OP-AMP and Signal conditioning** IC741 pin configuration, characteristics, working, inverting amplifier, non-inverting amplifier, summing amplifier, differential amplifier. Signal conditioning.	**04**
5	**Combinational logic in digital electronics** Number system and codes and their conversion, logic gates, adder, subtractor, multiplexer, demultiplexer, flip flops.	**04**
6	**Sequential digital circuits** Counters, memory elements, shift registers, integrated circuits, other circuits – multivibrator and 555 timer.	**04**

References -

Text Books:

1. S. Salivahanan, N. Suresh Kumar, A. Vallavraj, Electronics Devices and Circuits, TMH Publication.
2. D. Patranabis, Sensors and Transducers, Wheeler publisher.

Reference Books:

1. R. Gaikwad, Op-amp and Linear Integrated Circuits, PHI publication.
2. Robert H Bishop, The Mechatronics Hand Book, CRC Press.

Class: - **First Year B. Tech.**	Semester-**II**
Course Code : **SH186**	Course Name : **Basics of Robotics & Automation (PCC)**

L	T	P	Credits
2	--	--	2

Course Description:
This course provides an in-depth understanding of the fundamental concepts and applications of robotics and automation. It provides an introduction to robotics, it's history and development, various types of end effectors, grippers, kinematic and dynamics of robotics, robot drive systems, sensors and actuators and fundamentals of robot programming and applications. This course also introduces the need for automation, its types and various applications of automation technology in industries.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Explain importance of automation .
2. Discuss fundamentals of robot mechanism.
3. Explain working principle of sensors and actuators.
4. Illustrate microprocessors and microcontrollers for system automation.
5. Discuss different robot programming methods.

Prerequisite: Basic Knowledge of Physics, Mathematics

Course Content		
Unit No.	**Description**	**Hrs**
1.	**Introduction to Robots:** Definition, historical background, laws of robotics, types of robots, various generations of robots, robot anatomy, workspace and work volume, Applications of Robotics	**04**
2.	**Introduction to Robot Mechanisms:** Robot Mechanisms: Kinematic link, types of links, structure, machine, kinematic pair, types of pairs, degrees of freedom, drives and types of drives.	**04**
3.	**Sensors, Microcontrollers and Microprocessors**	**04**

	Various types of sensors, microcontrollers, microprocessors and Programmable Logic Controller	
4.	**Robot End Effectors and Drive Systems:** Types of end effectors, grippers, sensor end effector and tool end effectors	**04**
5.	**Introduction to Automation:** Mechanization and Automation, History of Automation, Reasons for automation, Merits and limitations, Types of Automation: Fixed, Flexible and Programmable.	**04**
6.	**Robot Programming:** Introduction to programming, types of programming-online programming, offline programming Lead-through Programming, Walk-through Programming, Use of Teach pendants - Capabilities and limitations, robot programming languages.	**04**

References:

Text Books:

1. Mittal R K & Nagrath, "Robotics and Control", McGraw Hill Publication TMH.
2. S. K. Saha, "Introduction to Robotics", TMH.
3. Grover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G., Ashish Dutta, "Industrial Robotics, Technology, Programming & Applications", Tata McGraw Hill Education Pvt. Ltd. New Delhi.

Reference Books:

1. John J Craig, "Introduction to Robotics", Pearson Edu.
2. Fu K.S, "Robotics", McGraw Hill.
3. Niku SB, "Introduction to Robotics – Analysis, Control, Applications", 3rd Edition, John Wiley & Sons Ltd.

NPTEL Course on Robotics:

1. https://onlinecourses.nptel.ac.in/noc19_me74/preview
2. https://onlinecourses.nptel.ac.in/noc20_de11/preview

Class:- **First Year B. Tech**	Semester- **I**	**L**	**T**	**P**	**Credits**
Course Code : **SH172**	Course Name: **Electrical Power Generation Technologies (PCC)**	**2**	**--**	**--**	**2**

Course Description:
This course provides an in-depth understanding of India's energy scenario, including conventional and non-conventional energy sources, government policies, and future power demands. It covers power generation technologies such as thermal, nuclear, hydro, solar, and wind, along with their site selection, working principles. The course also explores advanced topics like photovoltaic systems, wind turbine generators. Additionally, it includes alternative energy sources such as biomass, geothermal, ocean energy, fuel cells, and hydrogen energy. Emphasis is placed on sustainable energy solutions and future trends in India's power sector.

Course Outcomes:
After successful completion of the course, students will be able to,

1. Summarize the structure, policies, and future energy demands of Indian power sector.
2. Analyze the working principles of conventional energy sources.
3. Evaluate the operation of Renewable energy sources
4. Explain the fuel cell and other advanced power generation technologies.

Prerequisite: Physics, Chemistry, Science

Unit No.	Course Content Description	Hrs
1	**Energy Scenario in India** Overview of India's Energy and Power Sector, Conventional and Non-conventional energy sources and generation capacity, Government Initiatives and Policies towards sustainable power system development, Future Energy Demands in India, Principles of Energy Conservation and Energy Audit, Electrical safety.	**04**
2	**Thermal Power Plant**	**04**

	Site selection, Main parts and its working, Types of boilers, Ash disposal and dust collection, Draught systems, electrostatic precipitator. Advantages and disadvantages of Thermal power plant, Environmental Impacts	
3	**Nuclear Power Plant** Introduction, site selection, Nuclear Fission & Fusion, nuclear reactors and working, Advantages and disadvantages of Nuclear Power Plant, Nuclear Waste Disposal, Environmental Impacts	**04**
4	**Hydro Power Plant** Introduction, Site selection, general arrangements and operation of hydro power plant, Water Hammer and Surge Tank, Types of Turbines, Types of Power Plants, Advantages and Disadvantages of Hydropower Plant, Environmental Impacts	**04**
5	**Solar and Wind Energy System** Photovoltaic cell, Module, Array, Equivalent Circuit for a Photovoltaic Cell. I-V and PV characteristics, Impacts of Temperature, Insolation and shading on I–V Curves, Environmental Impacts of solar Energy Types of wind turbine, Power in the Wind, Types of wind turbine Generators, Environmental Impacts of Wind Turbines, Advantages and Disadvantages of wind power plant.	**04**
6	**Other Energy Sources** Fuel Cell, Hydrogen Energy, Biomass Energy conversion, Geothermal Energy, Ocean energy, Municipal solid waste to electrical energy conversion, Environmental Impacts	**04**

References:

Text Books-

1. S.Rao, Dr.B.B.Purulekar, "Energy Technology" , Khanna Publications.
2. G. D. Rai, "Non-Conventional Energy Sources", Khanna Publications.
3. V.K.Meheta, Rohit Mehta, "Principles of Power System", S.Chand Publications

Reference Books:

1. B.R.Gupta, "Generation of Electrical Energy", S. Chand Publications.
2. P. K. Nag, "Power Plant Engineering", Tata McGraw Hill Publications

NPTEL: https://archive.nptel.ac.in/courses/112/107/112107291/

Class: F.Y. B. Tech Mech.	Semester: II
Course Code: **SH182**	Course Name: **Applied Mechanics (PCC)**

L	T	P	Credits
2	--	--	2

Course Description:
This course in Engineering Mechanics covers foundational principles and applications essential for understanding the behavior of mechanical systems under various forces and conditions. It begins with an exploration of Scalars, Vectors, and Force Systems, progressing to the analysis of equilibrium in 2D and 3D Force Systems and the calculation of reactions in beams with different supports. Friction phenomena, including laws, coefficients, and applications in mechanical systems like clutches and brakes, are also studied. Students learn methods for analyzing trusses and frames, calculating centroids, and moments of inertia for both basic and composite shapes. The course concludes with an examination of rigid body kinematics and dynamics, encompassing Newton's Laws, energy principles.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Analyze force systems and equilibrium conditions in mechanical structures.
2. Determine reactions in beams, trusses, and frames using free-body diagrams.
3. Evaluate frictional effects in mechanical systems like brakes, clutches, and screw jacks.
4. Calculate centroids and moments of inertia for simple and composite geometries.
5. Apply kinematic and dynamic principles to particle and rigid body motion.

Prerequisite: Engineering Mathematics, Engineering Physics.

Course Content		
Unit No.	**Description**	**Hrs**
1	**Basics of Mechanics:** Scalars, Vectors, and Force Systems, Types of Forces and Resolution of Forces, Resultant of Concurrent Force Systems, Resultant of Non-Concurrent Force Systems, Resultant of Parallel Force Systems, Moment of a Force and its Applications, Varignon's Theorem on Moments,	04

	Couples and Equivalent Force-Couple Systems, Applications of Force Systems in Engineering.	
2	**Equilibrium of Force Systems:** Free Body Diagram (FBD) and its Importance, Conditions of Equilibrium in 2D and 3D Force Systems, Types of Loads (Point Load, UDL, UVL), Types of Beams. Types of Supports, Calculation of Reactions in Simply Supported Beams, Calculation of Reactions in Compound Beams, Equilibrium of Rigid Bodies, Virtual Work Principle and its Applications.	**04**
3	**Friction and Its Applications:** Laws of Friction and Coefficient of Friction, Static and Dynamic Friction, Friction on Horizontal and Inclined Planes, Rolling Friction, Belt-Pulley Systems and Friction, Wedge Friction, Brake Mechanisms and Friction Forces, Clutches and Their Working Principle, Screw Jack – Principle and Efficiency, Friction in Vehicles.	**04**
4	**Analysis of Trusses and Frames:** Basic Concepts, Assumptions in Truss Analysis, Method of Joints for Simple Trusses, Method of Sections for Trusses, Zero-Force Members in Trusses, Compound Trusses and their Analysis, Introduction to Frames and their Types, Equilibrium Analysis of Frames.	**04**
5	**Centroid and Moment of Inertia:** Concept of Centroid and Center of Gravity, Centroid of Basic Geometric Figures (Triangle, Rectangle, Circle), Centroid of Composite Figures, Introduction to Moment of Inertia, Moment of Inertia of Simple Plane Figures, Moment of Inertia of Composite Figures, Parallel Axis Theorem, Perpendicular Axis Theorem, Product of Inertia.	**04**
6	**Kinematics and Dynamics of Rigid Bodies:** Basics of Kinematics – Types of Motion, Rectilinear and Curvilinear Motion of Particles, Kinematics of Rigid Bodies in Plane Motion, Newton's Laws of Motion, D'Alembert's Principle, Work-Energy Theorem for Rigid Bodies, Impulse-Momentum Principle for Linear Motion, Impulse-Momentum Principle for Angular Motion, energy formulations, Lagrange's equation.	**04**

References:

Text Books:

1. Bhavikatti S. S., Rajashekarappa, "Engineering Mechanics", New age International publication (India) Pvt. Ltd. New Delhi.
2. Ramamrutham S., "Engineering Mechanics", Dhanpat Rai Publishing Company Ltd., New Delhi.

Reference Books:

1. S. Junnarkar, "Elements of Applied Mechanics", Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
2. Ferdinand. Beer and E. Russell Johnson, "Vector Mechanics for Engineers (Statics and Dynamics)", McGraw Hill Publication, New York.
3. Ferdinand L. Singer, "Engineering Mechanics (Statics and Dynamics)" Publications (India) Pvt. Ltd. Noida.
4. Timoshenko and Young, "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication, New York.

Class: - **F. B. Tech.**	Semester- **II**
Course Code: **SH184**	Course Name: **Fundamentals of Mechatronics (PCC)**

L	T	P	Credits
2	--	--	2

Course Description:
This course aims at providing fundamental understanding about the basic elements of a mechatronics system, interfacing, and its practical applications.

Course Learning Outcomes:
After successful completion of the course, students will be able to,
1. Identify various elements of mechatronics system.
2. Demonstratin of sensor, actuator, controller, control algorithm for different applications.
3. Differentiate between PLC. Microprocessor, microcontroller.

Prerequisite: The students should have basic knowledge of numbering system, Boolean algebra.

Course Content

Unit No	Description	Hrs
1	**Introduction:** Introduction to Mechatronics, Key elements of Mechatronics, Block diagram of mechatronics system, Control systems and Modes of control, Difference between traditional and concurrent design process.	02
2	**Sensors and transducers:** Transducers- classification, Development in Transducer technology Sensors - Introduction, Need of Sensors, Classification, Working and Application of- Potentiometer Sensors, Strain Gauge Elements. Capacitive Elements, Eddy Current, Proximity Sensors, Inductive Proximity Sensors, Light Sensors, Pressure Sensors, Pneumatic Sensors, Pyro electrical Sensors, Piezoelectric Sensors, Shaft Encoders.	06
3	**Drives and Actuators:** Introduction and Classification of Actuators. Need and Scope. Hydraulic Actuation Systems-Linear, Single and Double Acting system, Pneumatic	04

	Actuation systems- ear Motors and Vane Motors. Electrical Actuation Systems — solenoid type Devices, Stepper Motors, and Servo Motor.	
4	**Controllers:** PLC- Introduction, definitions, PLC block diagram, Difference between Relay panel and PLC, Selection of PLC, Introduction to Ladder logic programming. Microcontroller and Microprocessor- Introduction, Comparison of Microcontroller and Microprocessor, Architecture — Pin configuration of 8051 Microcontroller,	04
5	**Signal Conditioning:** Operational amplifier circuits, filtering circuits, Analog, and Digital signal conversion.	04
6	**Advanced applications in mechatronics:** Mechatronics in automated manufacturing, Artificial intelligence in mechatronics, Case studies of mechatronics systems.	04

References -

Text Books:

1. D. Shetty & R. A. Kolk, Mechatronics System Design, PWS Publishing Company (Thomson Leaming Inc.).
2. W. Bolton, Mechatronics: A Multidisciplinary Approach, Pearson Education.
3. R.K. Rajput, A Textbook of Mechatronics, S. Chand & Company Private Limited.
4. W. Bolton, Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Prentice Hall.

Reference Books:

1. David Alciatore, Introduction to Mechatronics and Measurement Systems.

Class:- **First Year B. Tech**	Semester – **I**
Course Code : **SH 180**	Course Name : **Generative AI and Prompt Engineering (PCC)**

L	T	P	Credits
2	--	--	2

Course Description:
This course provides an understanding of Generative AI, its history, evolution, benefits, challenges, and applications. It explores various generative AI models such as GANs, VAEs, and Transformers, along with the fundamentals of prompt engineering, techniques, and frameworks. The course also covers ethical considerations, limitations, and future trends, equipping students with knowledge of AI-generated text, images, code, audio, and video.

Course Learning Outcomes:
After successful completion of the course, students will be able to: After successful completion of the course, students will be able to:

1. Explain the basic concepts and applications of AI and prompt engineering.
2. Differentiate between various Generative AI models such as GANs, VAEs, and Transformers.
3. Classify different types of prompts and apply prompt priming techniques.
4. Compare and analyze various prompt frameworks to determine their suitability for different AI-driven tasks.
5. **Analyze** ethical concerns biases, and limitations associated with Generative AI and prompt engineering.

Prerequisite: Basic knowledge of Artificial Intelligence concepts.

Course Content		
Unit No	**Description**	**Hrs**
1.	**Introduction to Generative AI** History and Evolution, Benefits, Challenges, Applications of Generative AI, Tools for Text, Image Code, Audio and Video generation, Economic Potential of Generative AI.	**04**

2.	**Models For Generative AI** Generative AI Models: Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), Transformers, Attention Mechanism in detail Long Short-Term Memory Networks (LSTMs).	**04**
3.	**Introduction to Prompt Engineering** Introduction to Prompt Engineering, Categories of Prompts, Basic Concepts and Terminology of Prompt Engineering, Importance of Prompt Engineering.	**04**
4.	**Prompt Engineering Techniques and Approaches** Prompt Creation, Writing effective prompts, Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought, Challenges in generating meaningful and coherent prompts.	**04**
5.	**General Prompt Frameworks** Overview of Prompt Frameworks, Examples of Popular Prompt, Frameworks (e.g., TARS, CLEAR), RGC Prompting, Comparative Analysis of Frameworks.	**04**
6.	**Ethical Issues and Limitations** Ethical and Bias Issues in Prompts, Cross-Disciplinary Applications of Prompts, Future Trends in Prompt Engineering, Limitations of Generative AI: Issues and concerns, Future and professional Growth of Generative AI	**04**

References -

Text Books:

1. David Foster, Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play, O'Reilly Media
2. Russell Power, The Art of Prompt Engineering: Crafting Effective Prompts for AI, AI Mastery Press.
3. Mariya Yao, Adelyn Zhou, Marlene Jia, Applied Artificial Intelligence: A Handbook for Business Leaders, Topbots Inc.

Reference Books:

1. Altaf Rehmani, Generative AI for Everyone, BlueRose One.
2. Brian Christian, The Alignment Problem: Machine Learning and Human Values, W.W. Norton & Company.
3. Rajiv Shah, Optimizing Chatbots with NLP: Strategies for Effective Prompt Engineering, Apress.

Class:- **First Year B. Tech.**	Semester-**I**		**L**	**T**	**P**	**Credits**
Course Code: **SH178**	Course Name: **Introduction to Cyber Security (PCC)**		**2**	**-**	**-**	**2**

Course Description:
In an increasingly digital world, understanding the fundamentals of cyber security is essential for every engineering professional. This course introduces students to the core concepts of cybercrime, cyber threats, and digital forensics. Covering both technical and legal perspectives, it equips learners with knowledge of how cyber offenses are planned and executed, common attack vectors, identity theft mechanisms, and countermeasures.
Students will explore real-world tools and technologies used in cyber-attacks such as phishing kits, keyloggers, DoS tools, and steganography techniques. Additionally, the course emphasizes the importance of cyber law, organizational security implications, and basic computer forensics practices. Through this multidisciplinary approach, students will develop awareness and foundational skills necessary to safeguard digital assets in personal, academic, and professional settings.

Course Learning Outcomes:

1. Define key concepts related to cybercrime, including types of cybercriminals, classifications of cybercrimes, and relevant Indian and global legal perspectives.
2. Explain the planning and execution of cyber offenses, including social engineering techniques, cyberstalking, botnets, and attack vectors.
3. Demonstrate the use of various tools and methods employed in cybercrime such as phishing kits, keyloggers, DoS attacks, and steganography techniques.
4. Interpret different phishing strategies and identity theft mechanisms and identify suitable countermeasures to prevent them.
5. Apply fundamental principles of computer forensics including the forensic lifecycle, digital evidence handling, and network forensics in the context of cybercrime investigations.

Prerequisites: Basic familiarity with computer usage (e.g., browsing, email, file management), General awareness of the internet and digital communication platforms

Course Content		
Unit No	**Description**	**Hrs**
1	**Introduction to Cybercrime**: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives	04
2	**Cyber Offenses**: How Criminals Plan Them: Introduction, how criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafé & cybercrimes. Botnets: The fuel for cybercrime, Attack Vector.	04
3	**Tools and Methods used in Cybercrime:** Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks. Demonstrate tools used.	04
4	**Phishing and Identity Theft:** Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft	04
5	**Understanding Computer Forensics:** Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics	04
6	**Cyber Security:** Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications,	04

	social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.	

References -

Text Books:

1. Sunit Belapure & Nina Godbole, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1e, Wiley India Pvt. Ltd.
2. Chuck Easttom, Computer Security Fundamentals, 4e, Pearson Education.

Reference Books:

1. William Stallings, Computer Security: Principles and Practice, 4e, Pearson Education.
2. Behrouz A. Forouzan, Cryptography and Network Security, 1e, McGraw Hill Education.

Class:- **F.Y. B. Tech**	Semester-**I**
Course Code : **SH176**	Course Name : **IT for Business (PCC)**

L	**T**	**P**	**Credits**
2	--	--	**2**

Course Description:
The primary objective of this course is to familiarize the students with basic concepts of information technology and their applications to business processes and decision making. Course focuses on the technological changes and trends that are revolutionizing the various knowledge areas under business management. The role and applications of information technology in business have been extensively discussed.

Course Learning Outcomes:
After successful completion of the course, students will be able to,

1. Describe the basics of information technology.
2. Compare various types of information systems.
3. Discuss the environment of a business enterprise which leverages IT for managing its business.
4. Explain E - Commerce Technologies and Emerging Issues.
5. Examine the intensity of ethical issues as an important element influencing the ethical decision-making process.

Prerequisite: Basic Knowledge of Computer

Course Content

Unit No.	**Description**	**Hrs**
1.	**Introduction to Information Technology** IT: Meaning and Nature, India: The IT Superpower, Reasons behind IT Growth in India, Role of IT in various Sectors, Information Technology Management, Strategies for gaining IT Advantage.	**04**
2.	**Information Systems**	**04**

	Defining Information System, components, types, Management Information System, Essentials of effective MIS, Transaction Processing System, Decision Support System, Expert systems, Artificial Neural Systems, Strategic Information System.	
3.	**Business view of Information Technology Applications** Business Enterprise Organization, Core Business Processes, Key Purpose of Using IT in Business, The connected world – Characteristics of Internet ready IT Applications, Enterprise Applications and Bespoke IT Applications, Case Study.	**04**
4.	**Electronic Business and E - Commerce** E-Business and E-Commerce, Merits and Demerits E-Commerce, E-Commerce Business Models, Classification of E-Commerce, Value chains in E-Commerce, Functions of E-Commerce, E-Commerce in India, Indian Government's Role.	**04**
5.	**E - Commerce Technologies and Emerging Issues** Network and Communication, Infrastructure, Intranet and Internet, Electronic Data Interchange (EDI), Electronic Payment System, Modes of Payment in E-Commerce, Enterprise Resource Planning (ERP), Regulatory issues, Taxation Issues.	**04**
6.	**Business Ethics** Ethical Issues in Business, Ethical Decision Making Process. A Framework for Ethical Decision Making in Business - Ethical Issue Intensity, Individual Factors, Organizational Factors, Business Ethics Evaluations and Intentions, Views of Corporate Governance. A Real Life Situation, Emotional Quotient.	**04**

References -

Text Books:

1. Dhiraj Sharma, "Information Technology for Business", Himalaya Publication House.
2. R. N. Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley Publication.

Reference Books:

1. O. C. Ferrell, John Paul Fraedrich, Linda Ferrell, "Business Ethics – Ethical Decision Making and Cases", Indian Adaptation, Biztantra. Dreamtech Press.
2. P. Mohan, "Information Technology for Business", Himalaya Publication House
3. Dhiraj Sharma, "Foundations of IT", Excel Books India.

Class: **First Year B. Tech. Civil Engineering**	Semester: **II**
Course Code : **SH188**	Course Name: **Engineering Mechanics (PCC)**

L	T	P	Credits
2	**-**	**-**	**2**

Course Description:
Engineering Mechanics focuses on the analysis of static bodies. The course helps the students to understand facts, concepts, principles and techniques of scientific investigation in the field of engineering. It develops thinking, analytical ability and imaginative skill of student. It is an introductory course which supports study of many other advanced courses like analysis and design of various structures.

Course Outcomes:
After successful completion of the course, students will be able to,

1. Calculate resultant force of coplanar force system.
2. Analyze engineering problems applying conditions of equilibrium
3. Determine centroid & moment of inertia of the geometrical plane composite lamina.

Prerequisite: Engineering Mathematics, Engineering Physics

Course Content

Unit No.	Description	Hrs
01	**Fundamentals of Mechanics and force systems:** Force and classification of force systems. Resultant of parallel, concurrent and non-concurrent coplanar forces.	04
02	**Equilibrium of force system:** Free body diagram, conditions of equilibrium, types of loads, types of beams, types of supports and reactions. Analysis of simple and compound beams using conditions of equilibrium	04
03	**Friction:**	04

	Introduction to Laws of friction, Surface friction for bodies on horizontal and inclined planes.	
04	**Analysis of trusses:** Analysis of simple truss, Method of joints, Method of sections.	**04**
05	**Centroid:** Centroid of plane and composite lamina.	**04**
06	**Moment of Inertia**: Moment of Inertia of plane and composite lamina.	**04**

References:

Text Books:

1. Bhavikatti S. S., Rajashekarappa, "Engineering Mechanics", New age International publication (India) Pvt. Ltd. New Delhi,
2. Ramamrutham S., "Engineering Mechanics", Dhanpat Rai Publishing Company Ltd., New Delhi.

Reference Books:

1. S. Junnarkar, "Elements of Applied Mechanics", Charotar Publishing House (India) Pvt. Ltd., Anand (Gujarat)
2. Ferdinand. Beer and E. Russell Johnson, "Vector Mechanics for Engineers (Statics and Dynamics)", McGraw Hill Publication, New York.
3. Ferdinand L. Singer, "Engineering Mechanics (Statics and Dynamics)" Publications (India) Pvt. Ltd. Noida.
4. Timoshenko and Young, "Engineering Mechanics (Statics and Dynamics)", McGraw Hill Publication, New York.