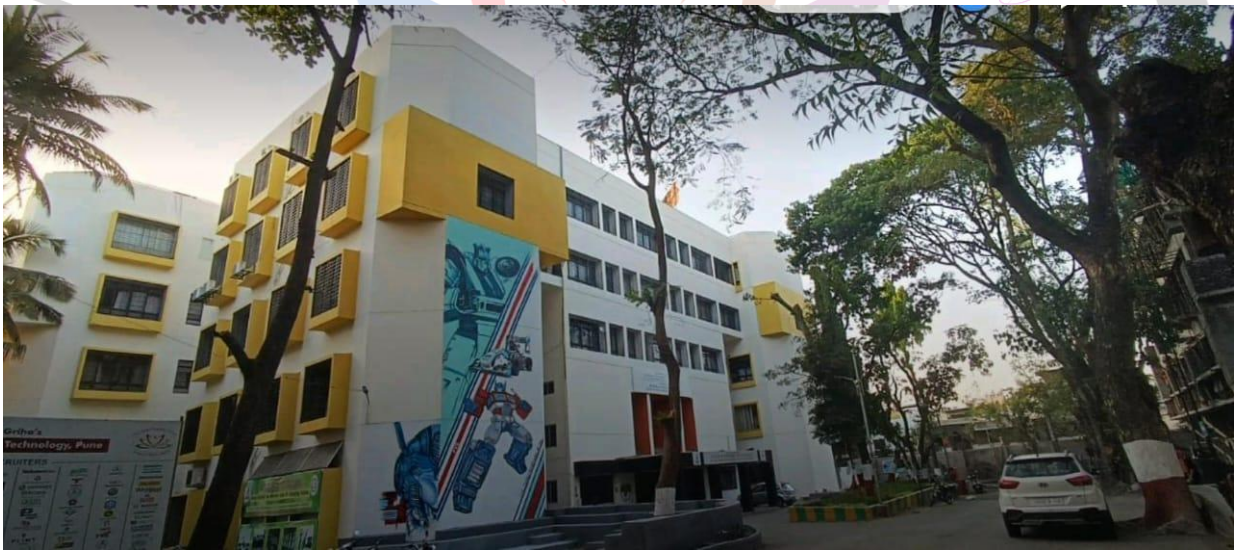
Pune Vidyarthi Griha's

COLLEGE OF ENGINEERING, TECHNOLOGY AND MANAGEMENT, PUNE-411009

(Autonomous Institute Affiliated to Savitribai Phule Pune University)

F.Y. B. Tech Curriculum Structure and Syllabus

(NEP 2020 Compliant)



Prepared by: Board of Studies (Engineering Sciences & Humanities)

Approved by: Academic Council of PVG's COETM, Pune

(Effective from Academic year 2025-26)

Signed by

Chairman: BOS **Chairman: Academic Council**

19 June 2025

Nomenclature

AI: Artificial Intelligence & Data Science Program

BSC: Basic Science Course

CCC: Co-curricular Course

CCE: Comprehensive Continuous Evaluation

CE: Computer Engineering Program

CO: Course Outcome

EL: Electrical Engineering Program

ESC: Engineering Science Course

ESE: End Semester Evaluation

ET: Electronics & Telecommunication Program

IKS: Indian Knowledge system

IT: Information Technology Engineering Program

L: Lecture

ME: Mechanical Engineering Program

OR: Oral

PCC: Program Core Course

PO: Program Outcome

PP: Printing & Packaging Technology Program

PR: Practical

PSO: Program Specific Outcome

SH: Engineering Sciences and Humanities

T: Tutorial

TW: Term Work

VSEC: Vocational and Skill Enhancement Course

Preface

The First Year Engineering Department under Board of Studies (Engineering Sciences & Humanities) offers the curriculum and syllabus for the Engineering Sciences and Humanities courses, which are an integral part of our engineering programs. These courses are designed to provide students with a broad-based education, encompassing both technical and non-technical aspects of engineering.

The curriculum implements Outcome Based Education (OBE) along with Choice Based Credit System integrating the National Education Policy 2020.

These courses are carefully structured to provide students with a strong foundation in engineering principles, as well as essential skills in communication.

It provides a strong foundation in the fundamental principles of engineering, including mathematics, physics, and basic engineering sciences. The curriculum is carefully crafted to equip students with the necessary knowledge, skills, and attitudes required to excel in their chosen fields of engineering

Additionally, we have incorporated the Indian Knowledge System (IKS) course to provide students with an understanding of India's rich cultural heritage and its contributions to science, technology, and philosophy.

Furthermore, our co-curricular course is designed to foster creativity, innovation, and critical thinking among students.

The Curriculum is structured to ensure that students earn a total of 42 credits in the first year, which will prepare them for more advanced studies in their chosen fields of engineering.

Chairman

Board of Studies

Engineering Sciences & Humanities

Vision of The Institute

- To achieve excellence in Engineering and Management Education.

Mission of The Institute

1.To satisfy all stakeholders.

2. To develop ethical, highly motivated engineering professionals with good human values, requisite skills, and competencies.

3. To adopt innovative teaching mechanisms.

4. To promote research culture.

5. To contribute to country's economic developments.

6. To be responsive to changes in technology, socio-economic and environmental conditions.

Vision of The Department

- To work for excellence in integrated learning based on teaching and research.

Mission of The Department

1. To impart fundamental knowledge of sciences and Engineering to students from diverse backgrounds.

2. To equip students with good ethical values to become responsible citizens for the betterment of society.

Program Outcomes (PO)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society, and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture, and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity, and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (Program wise) (PSO)

Electrical Engineering

1. An ability to acquire adequate proficiency in Energy Systems and Sustainability.
2. An ability to acquire multidisciplinary skills in Control and Drives.
3. An ability to acquire enhanced skills and core competency in the field of electrical engineering through hands on training.

Printing and Packaging Technology

1. Demonstrate strong theoretical knowledge and develop expertise and skills in pre-press, press, and post-press operations across various printing processes and packaging technologies.
2. Apply analytical tools to solve problems and investigate quality issues in printing and packaging.
3. Acquire and apply managerial skills to effectively lead and operate in the printing and packaging industries

Electronics &Telecommunication Engineering

1. To demonstrate the ability to solve industrial & societal problems by the application of knowledge in embedded systems, signal processing, communication & allied domain.
2. To apply programming skills & leverage modern software, hardware tools for solving engineering problems.

Mechanical Engineering

1. Demonstrate competency in Thermal, Design, Manufacturing and to apply skills in multidisciplinary areas of engineering.
2. Face competitive examinations that offer challenging and rewarding careers (pursuing higher studies, general administration, or entrepreneurship in mechanical engineering or other areas.

Computer Engineering

1. The ability to work in the domains related to artificial intelligence, machine learning and cyber security for efficient solutions.
2. The ability to apply standard practices and strategies in software project design and development to deliver a quality product.
3. The ability to build successful career in computer engineering and have a zest for higher studies

Information Technology

1. An ability to understand, analyse and develop software applications in the field of web development, database management systems and AI.
2. An ability to apply knowledge of software engineering and project management approaches / processes for multidisciplinary applications to cater the needs of the industry and society.

Artificial Intelligence and Data Science

1. Demonstrate proficiency in collecting, cleaning, and analysing diverse datasets using state-of the-art tools and techniques.
2. Exhibit the machine learning expertise and deep learning competency to design and train neural networks for various applications.
3. Adhere to professional standards and ethical principles in their AI and data science work, respecting data privacy, confidentiality, and intellectual property rights.

Knowledge and Attitude Profiles (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes

Sustainable Development Goals (SDG)

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation, and Infrastructure
10. Reduced Inequality
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice, and Strong Institutions
17. Partnerships for the Goals

Note: In Engineering Education following SDGs are attainable:

4. Quality Education
9. Industry, Innovation, and Infrastructure
11. Sustainable Cities and Communities
12. Responsible Consumption and Production

First Year B. Tech. Course wise Distribution

COURSE CATEGORY	COURSE TYPE	COURSE NAME	CREDITS
BSC: 4(14)	Basic Science Course (BSC)	Linear Algebra & Differential Calculus	4
		Differential Equation & Integral Calculus	4
		Engineering Physics	3
		Engineering Chemistry	3
ESC: 5(14)	Engineering Science Course (ESC)	Fundamentals of Electrical Engineering	3
		Fundamentals of Electronics Engineering	3
		Engineering Mechanics	3
		Engineering Drawing	3
		C Programming	2
VSEC: 2(4)	Vocational and Skill Enhancement Course (VSEC)	Design Thinking	2
		Engineering Practices	2
AEC: 1(2)	Ability Enhancement Course (AEC)	Communication and Linguistic Skills	2
IKS: 1(2)	Indian Knowledge System (IKS)	Indian Knowledge System	2
PCC: 1(2)	Program Core Course (PCC)	Python Programming	2
CCC-I &II: 2(4)	Co-curricular Course- I & II	Co-Curricular Course -I	4
		Co-Curricular Course -II	
		TOTAL CREDITS	42

Curriculum Structure
First Year B. Tech. (Sem-I)
Group-1

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
BSC	SH101	Linear Algebra & Differential Calculus	3	1	-	4	50	50	25	-	-	125
BSC	SH102	Engineering Chemistry	2	-	2	3	50	50	25	-	-	125
ESC	SH103	Fundamentals of Electrical Engineering	2	-	2	3	50	50	25	-	-	125
ESC	SH104	Engineering Mechanics	2	-	2	3	50	50	25	-	-	125
ESC	SH105	C Programming	1	-	2	2	-	-	50	-	-	50
VSEC	SH106	Design Thinking	1	-	2	2	-	-	50	-	-	50
AEC	SH107	Communication and Linguistic Skills	2	-	-	2	-	-	50	-	-	50
CCC	SH108	Co-Curricular Course-I	-	-	4	2	-	-	50	-	-	50
		TOTAL	**13**	**1**	**14**	**21**	**200**	**200**	**300**	**-**	**-**	**700**

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Curriculum Structure
First Year B. Tech. (Semester-II)
Group-1

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
BSC	SH109	Differential Equation & Integral Calculus	3	1	-	4	50	50	25	-	-	125
BSC	SH110	Engineering Physics	2	-	2	3	50	50	25	-	-	125
ESC	SH111	Fundamentals of Electronics Engineering	2	-	2	3	50	50	25	-	-	125
ESC	SH112	Engineering Drawing	2	-	2	3	50	50	25	-	-	125
VSEC	SH113	Engineering Practices	1	-	2	2	-	-	50	-	-	50
IKS	SH114	Indian Knowledge System	2	-	-	2	-	-	50	-	-	50
PCC	SH115	Python Programming	1	-	2	2	-	-	50	-	-	50
CCC	SH116	Co-Curricular Course-II	-	-	4	2	-	-	50	-	-	50
		TOTAL	**13**	**1**	**14**	**21**	**200**	**200**	**300**	**-**	**-**	**700**

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Department Specific Exit Courses
(To award UG Certificate in Technology)
First Year B. Tech. (Semester II)

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
EXIT		Internship	-	-	16	8	-	-	50	-	50	8
		Total	-	-	16	8	-	-	50	-	50	8

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Curriculum Structure
First Year B. Tech. (Semester-I)
Group-2

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
BSC	SH101	Linear Algebra & Differential Calculus	3	1	-	4	50	50	25	-	-	125
BSC	SH110	Engineering Physics	2	-	2	3	50	50	25	-	-	125
ESC	SH111	Fundamentals of Electronics Engineering	2	-	2	3	50	50	25	-	-	125
ESC	SH112	Engineering Drawing	2	-	2	3	50	50	25	-	-	125
ESC	SH105	C Programming	1	-	2	2	-	-	50	-	-	50
VSEC	SH113	Engineering Practices	1	-	2	2	-	-	50	-	-	50
AEC	SH107	Communication and Linguistic Skills	2	-	-	2	-	-	50	-	-	50
CCC	SH108	Co-curricular Course-I	-	-	4	2	-	-	50		-	50
		TOTAL	**13**	**1**	**14**	**21**	**200**	**200**	**300**	**-**	**-**	**700**

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Curriculum Structure
First Year B. Tech. (Semester-II)
Group-2

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
BSC	SH109	Differential Equation & Integral Calculus	3	1	-	4	50	50	25	-	-	125
BSC	SH102	Engineering Chemistry	2	-	2	3	50	50	25	-	-	125
ESC	SH103	Fundamentals of Electrical Engineering	2	-	2	3	50	50	25	-	-	125
ESC	SH104	Engineering Mechanics	2	-	2	3	50	50	25	-	-	125
VSEC	SH106	Design Thinking	1	-	2	2	-	-	50	-	-	50
IKS	SH114	Indian Knowledge System	2	-	-	2	-	-	50	-	-	50
PCC	SH115	Python Programming	1	-	2	2	-	-	50	-	-	50
CCC	SH116	Co-curricular Course-II	-	-	4	2	-	-	50	-	-	50
TOTAL			**13**	**1**	**14**	**21**	**200**	**200**	**300**	**-**	**-**	**700**

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Department Specific Exit Courses

(To award UG Certificate in Technology)

First Year B. Tech. (Semester II)

Course Category	Course Code	Course Title	Teaching Scheme			Credits	Theory Examination Scheme (Marks)		Laboratory Examination Scheme (Marks)			Total
			Lecture	Tutorial	Practical		CCE	ESE	TW	PR	OR	
EXIT	-	Internship	-	-	16	8	-	-	50	-	50	100
		Total	-	-	16	8	-	-	50	-	50	100

CCE: Comprehensive Continuous Evaluation

ESE: End Semester Evaluation

TW: Term Work

OR: Oral

PR: Practical

Program	F. Y. B. Tech							
Course	Linear Algebra & Differential Calculus (Common)					Semester		I
Code	BSC SH101	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	4	L	T	P	CCE	ESE	TW	PR	OR
		3	1	--	50	50	25	--	--

Course Prerequisites:

Basic knowledge of Differentiation, Maxima and Minima, Determinants and Matrices

Course Objectives:

To familiarize the students with concepts and techniques in Linear Algebra and Calculus. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power useful in their disciplines.

Course Outcomes:

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

CO1. Solve a system of linear equations using matrices for applications in engineering field.
CO2. Determine Eigen values and Eigenvectors and their applications in engineering fields.
CO3. Apply mean value theorems and its generalizations leading to Taylors and Maclaurin's series used in the analysis of engineering problems.
CO4. Evaluate the partial derivative of functions with several variables.
CO5. Apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives to estimate errors and approximation and find extreme values.

Syllabus

Unit No.	Description	Hrs.
1	**Matrices and System of linear Equations** Rank of a Matrix, System of Linear Equation, Linear Dependence and Independence, Orthogonal Matrix, Application of Matrices to Engineering.	8
2	**Eigen Values and Eigen Vectors, Diagonalization** Eigen values and Eigen vectors, Cayley Hamilton Theorem, Diagonalization of a matrix, Reduction of quadratic forms to Canonical form by Linear transformations.	8
3	**Limit and Expansion of function** Mean value theorem, Taylor's and Maclaurin's series, Expansion of functions using standard expansions, Indeterminate forms, L'Hospital rule, Evaluation of Limits and Applications	8
4	**Partial Differentiation** Introduction to functions of several variables, Partial Derivatives, Euler's Theorem on Homogeneous Functions, Composite Functions, Total Derivatives.	8
5	**Applications of Partial Differentiation** Jacobian and its applications, Error and Approximations, Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.	8

Learning Resources

Text Books:

1. B. V. Ramana Higher Engineering Mathematics. India, Tata McGraw Hill, 2010.
2. Erwin Kreyszig, Advanced Engineering Mathematics. United Kingdom, Wiley, 2011.
3. B. S. Grewal, Higher Engineering Mathematics. India, Khanna Publication, 1996.

Reference Books:

1. P.N. Wartikar and J.N. Wartikar (Vidyarthi Griha Prakashan, Pune), Applied Mathematics (Vol. I & Vol. II)
2. P. V. O'Niel, Advanced Engineering Mathematics, Thomson Learning.
3. M. D. Greenberg, Advanced Engineering Mathematics, Pearson Education.
4. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson)

List of Tutorials:

(Sr. *No. 1 & 2 are compulsory. Any 10 tutorials from Sr. No. 3 to 15)*

Tutorial for the subject shall be engaged in minimum three batches per division.

1. Activity-I ("Revision of Prerequisites for the course".)
2. Activity-II ("Matrix operations by using MATLAB")
3. Rank of a Matrix, System of Linear equation
4. Orthogonal Matrix, Application of Matrices to Engineering.
5. Find Eigen Values and Eigen vectors
6. Cayley Hamilton Theorem
7. Diagonalization of a matrix
8. Mean value theorem
9. Expansion of function
10. Evaluation of Limits and Applications
11. Example on Partial derivatives
12. Euler theorem and composite function
13. Jacobian and its applications
14. Error and Approximations
15. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

Online Courses:

Linear algebra and Calculus, Prof. Jitendra Kumar, IIT Kharagpur, NPTEL IIT Kharagpur, https://archive.nptel.ac.in/courses/111/105/111105121/

CO-PO Mapping (Linear Algebra & Differential Calculus)

Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	2	-	-	-	-	-	2
CO2	3	2	-	1	2	-	-	-	-	-	2
CO3	3	2	-	1	2	-	-	-	-	-	2
CO4	3	2	-	1	2	-	-	-	-	-	2
CO5	3	2	-	1	2	2	-	-	-	-	2

CO-PSO Mapping (Linear Algebra & Differential Calculus)

Course Out comes (CO)	Program Specific Objectives																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	2	-	-	1	-	1	-	-	1	1	-	-	1	-	1	2	-
CO2	2	2	-	-	1	-	2	-	1	2	1	-	-	1	-	1	2	-
CO3	1	-	-	-	1	-	1	-	-	1	1	-	-	1	-	1	1	-
CO4	2	2	-	1	2	-	1	-	1	2	1	-	-	1	-	2	2	-
CO5	2	2	-	1	2	-	2	-	1	1	1	-	-	1	-	2	2	-

Program	F. Y. B. Tech.							
Course	Engineering Chemistry (Common)					Semester		I/II
Code	BSC SH102	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	--	2	50	50	25	--	--

Course Pre requisites:
Basics of Chemistry

Course Objectives:

1. To impart knowledge of water quality analysis techniques and electroanalytical methods for chemical analysis.
2. To explore specialty polymers and nanomaterials.
3. To study energy conversion devices and fuels, and to understand corrosion mechanisms and prevention methods.

Course Outcomes:

After successful completion of the course, the learner will be able to:

CO1: **Apply** practical approaches and techniques required for water quality monitoring.
CO2: Select appropriate electro-analytical techniques for material **analysis.**
CO3: **Apply** suitable corrosion prevention and control methods in engineering applications.
CO4: **Distinguish** various new materials and energy conversion devices.
CO5: **Demonstrate** understanding of the structure and properties of advanced engineering materials for technological applications.

Syllabus

Unit No.	Description	Hrs.
1	**Water Technology** Introduction, Impurities in water, Types of hardness of water, Units (mg, ppm), and Numerical. Determination of hardness (by EDTA method using molarity concept), Ill effects of hard water in boilers- scale, sludge, Priming, and foaming. Water treatment: i) Zeolite and numerical ii) Demineralization method. Purification of water: Reverse osmosis, Aerobic and Anaerobic Oxidation- Dissolved oxygen [OD], Biochemical oxygen demand [BOD], Chemical oxygen demand [COD], Numerical based on it.	6
2	**Instrumental Methods of Analytical Techniques** Introduction: Thermodynamic functions and Electrochemical Cells -Nernst Equation, Applications, Numerical. Gibbs free energy and E.M.F of cell Numerical Types of reference electrode, indicator electrode (glass electrode), ion selective electrode (solid membrane ex, F_2, Cl_2), Gas Sensing electrode (ex, CO, NH_3)) pH Metry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve and its applications. Biosensors and Bio membranes	6
3	**Corrosion and its Prevention** Introduction, Types of corrosion – Dry corrosion, mechanism of dry corrosion films and Pilling-Bedworth's rule, Wet corrosion mechanism – mechanism: hydrogen evolution and oxygen absorption, Factors influencing corrosion rate. Methods of corrosion control and prevention: Cathodic Protection (Sacrificial Anode and Impressed Current), metallic coatings and their types, surface preparation, methods to apply metallic coatings- hot dipping, Electroplating. Corrosion Resistant / Anti-Corrosive paints.	6

4	**Energy Devices** Fuels-HCV, LCV, Bomb calorimeter, Numerical Fuel combustion, Numerical. Electrode-electrolyte Interface-Chemistry of Li-ion secondary batteries. Fuel Cells-H_2, O_2 fuel cell, Polymer membrane or oxide fuel cell. Solar Cells-Photovoltaic cell [silicon base], Photo electrochemical cell and dye-sensitized cell.	6
5	**Advanced Engineering Materials** Polymers: Introduction, Definition, Polymer, Monomer, Functionality of monomers. Polymers (ABS and BAKELITE)- synthesis and application. Specialty polymers: Conducting polymers, polyacetylene, and the effect of doping. Nanomaterials: Introduction, nanomaterial properties, Bulk Vs Nano (Gold), Quantum dots and application. Top-down and bottom-up approaches for synthesis.	6

List of laboratory experiments: (*Any Ten practical from Sr. No. 1 to 13. Any One from Mini Project from Sr. No. 14 and 15)*

1. To determine the hardness of water by the EDTA method.
2. To determine the strength of a strong acid using a pH meter
3. Thermodynamics functions from EMF Measurements, Zn-Cu System [https://vlab.amrita.edu/?sub=2&brch=190&sim=361&cnt=1]
4. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin.
5. To coat copper and zinc on an iron plate using electroplating.
6. Preparation of biodiesel from oil.
7. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles.
8. Computational optimization of molecular geometry using Avogadro software
9. Determination of dissolved oxygen in the given sample of water
10. Effect of salt concentration on voltage generation. [Sea water]
11. To determine the ion-exchange capacity of a given cation exchanger or anion exchanger.
12. Determination of moisture and ash content in a coal by Proximate analysis.
13. To determine the maximum absorption wavelength of $KMnO_4$ and verify Beer's law, apply it to find the concentration of the given unknown solution by Colorimeter.

Mini projects

14. Corrosion and prevention
15. Water quality management

Learning Resources:

Text Books:

1. Dr. S. S. Dara, Dr. S. S. Umare, Textbook of Engineering Chemistry S. Chand & Company Ltd 21st Edition.
2. O. G. Palanna, Engineering Chemistry by, Tata McGraw-Hill Education Pvt. Ltd.
3. Dr. Sunita Rattan Textbook of Engineering Chemistry S. K. Kataria& Sons Publisher, 1st Edition.

Reference Books:

1. G. R. Chatwal & S. K. Anand Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
2. V. R. Gowarikar, N. V. Viswanathan, Jayadev Sreedhar Polymer Science, Wiley Eastern Limited.
3. Dr. S. K. Kulkarni Nanotechnology: Principles and Practices, Capital Publishing.

Online Resources:

1.Corrosion, NPTEL-IIT Delhi, Prof. (HAG) Harish Hirani IIT Delhi, https://onlinecourses.nptel.ac.in/noc25_mm68/course

2. Polymer science, Prof. Dibakar Dhara, https://onlinecourses.nptel.ac.in/noc25_cy56/course

CO-PO Mapping (Engineering Chemistry)											
Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	-	2	-	1	2	1	2
CO2	3	2	2	2	-	2	-	1	2	-	2
CO3	3	2	2	2	-	2	-	1	2	1	2
CO4	3	-	-	-	-	2	-	-	2	-	2
CO5	3	2	2	2	-	2	-	-	2	-	2

CO-PSO Mapping (Engineering Chemistry)																		
Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	–	–	-	1	1	1	-	1	–	1	-	-	1	1	1	-	-
CO2	–	1	1	-	1	-	1	-	1	–	1	-	-	-	-	1	-	-
CO3	1	–	1	-	-	1	1	-	1	–	1	-	-	1	1	1	-	-
CO4	–	1	1	1	-	-	1	-	1	–	1	-	-	-	-	-	-	-
CO5	1	1	–	1	-	1	1	-	1	-	1	-	-	-	-	1	-	-

Program	F. Y. B. Tech.							
Course	Fundamentals of Electrical Engineering (Common)					Semester		I/II
Code	ESC SH103	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	-	2	50	50	25	--	--

Course Pre requisites:

Applicants should possess good knowledge in basic mathematics and physics as well as in electrical, electronic, and electromagnetic technology.

Course Objectives:

1. To impart the fundamental knowledge of Electrical Engineering to all the students of various disciplines.
2. To provide the comprehensive basics about AC and DC circuit.
3. To impart the knowledge of working principles and applications of battery energy storage system.

Course Outcomes:

After successful completion of the course, learner will be able to:

CO1: Analyse Kirchhoff's Laws and network simplification techniques for DC circuit analysis.

CO2: Calculate the magnetic circuit parameters, self-Inductance, mutual Inductance and Electromotive Forces (EMF's) and its application in transformer.

CO3: Compute AC quantities using mathematical equations, waveforms, and phasor diagrams of single phase and three phase circuits.

CO4: Determine the voltage, current and power of the given 3-phase AC circuits.

CO5: Differentiate between types of Batteries and DC machines based on application.

Syllabus

Unit No.	Description	Hrs.
1	**DC Circuits** Concepts of Resistance, EMF, current, potential difference, Ohm's law, effect of temperature on resistance, Introduction of circuit active and passive parameter of electrical circuit, Source Transformation, Current and Voltage division rule, Network reduction techniques using series-parallel combinations, star delta & delta star transformation technique, Kirchhoff's Laws and their applications, Network solutions using loop analysis and nodal analysis.	6
2	**Electromagnetism** **Magnetic Circuit:** Concept of flux density, field strength, permeability, MMF, reluctance, their units, and relationships. Magnetic leakage and fringing, simple series magnetic circuit. **Electromagnetic Induction:** Faradays Laws of electromagnetic induction, Fleming's right-hand rule, statically and dynamically induced emf, self and mutual inductance, coefficient of coupling. **Single Phase Transformer:** Construction, working principle, EMF equation, transformation ratio, rating, types, losses, regulation and efficiency at different loading conditions. (Descriptive treatment only)	6
3	**AC Circuits – I** Representation of Sinusoidal Waveforms, Concept of cycle, period, frequency, instantaneous, peak, average and RMS values, peak factor, and form factor. Phase, Phase difference, concept of lagging, leading and in phase quantities, phasor representation. Concept of active, reactive, and apparent power, Impedance triangle and power triangle, Performance analysis of AC circuits consisting of R, L, C, RL, RC and RLC combinations. Resonance in RLC series circuits.	6
4	**AC Circuits – II** Concept of three-phase AC symmetrical system, phase sequence, balanced and unbalanced load. Voltage, current and power relations in three phase balanced star and delta connected loads along with phasor diagrams.	5

5	**Introduction to Battery Energy Storage Systems** **a) Types of storage battery** (Lead Acid, Lithium Battery etc.), Charging & Discharging of a cell, SoC, Capacity of the Cell, Depth of Discharge (DOD), Efficiency. Rechargeable batteries, Applications of batteries. Introduction to UPS and SMPS. **b) D.C. Machines**: Construction, working principle, types & applications **c) BLDC machines**: Constructions, Working principle & applications	7

List of Laboratory Experiments (Sr. No. 1 to 4 are compulsory. Any 8 experiments from Sr. No. 5 to 15**)**

1. Use of a series test lamp, continuity tester, Megger, mustimeter, phase sequence indicator, lux meter, etc.
2. Identify different types of cables/wires and switches, types of fuses & fuse carriers, MCB and ELCB, MCCB with ratings and usage.
3. Wiring of simple light circuit for controlling light/fan point (PVC conduit wiring) and staircase wiring.
4. Service and repair of domestic appliances like electric iron & electric kettle.
5. To study safety precautions while working on electrical systems, handling of various equipment's such as rheostat, multi-meter, ammeters, voltmeters, watt meters etc.
6. To verify Kirchhoff's laws experimentally.
7. Connect a simple DC circuit with two loops and more than one source and measure all the branch currents and node voltages.
8. To analyse the effect of temperature on resistance of conducting material.
9. Study of Megger and Measurement of the insulation resistance of cable/equipment using Megger.
10. To measure steady state response of series RL circuits.
11. To measure steady state response of series RC circuits.
12. To perform experiment for measurement of current, voltage and power in R-L-C series exited by single phase AC supply.
13. To verify the relation between phase and line quantities in three phase balanced star and delta connections of load.
14. Direct Load test on single phase transformer.
15. To study DC shunt motor and reversing the direction of rotation.

Learning Resources:

Text Books:

1. Bhattacharya. S. K, "*Basic Electrical and Electronics Engineering*", First edition, Pearson Education, 2011.
2. B.L. Theraja, A. K. Theraja, "A Textbook of Electrical Technology" - Volume I: Basic Electrical Engineering: Part 1 and 2. S Chand Publication.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill,
4. V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.
5. Dr. Devendra Potnuru, "BLDC Motor Drive- Simulation and Control", Sankalp Publication.

Reference Books:

1. Kothari D. P, Nagrath I. J., Basic Electrical Engineering, Tata McGraw Hill, 2010.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.
3. H. Cotton, "Electrical Technology", 7th Edition, CBS Publications and distributors.

Online Resources:

Fundamentals of Electrical Engineering, Prof. Debpriya Das, IIT Kharagpur, NPTEL IIT Kharagpur, ,
https://archive.nptel.ac.in/courses/108/105/108105112/

CO-PO Mapping (Fundamentals of Electrical Engineering)											
Course Outcomes (CO)	Program Outcomes (PO)										
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	1	-	1	1	-	-	1	2
CO2	3	2	2	2	-	1	1	-	-	1	2
CO3	3	2	2	1	-	1	1	-	-	1	2
CO4	3	2	2	1	-	1	1	-	-	1	2
CO5	3	2	2	1	-	3	2	-	-	2	2

CO-PSO Mapping (Fundamentals of Electrical Engineering)																	
Course Out comes (CO)	Program Specific Objectives (PSO)																
	EL			PP			ET		ME		CE			IT		AI	
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	1	2	2	2	-	2	2	2	1	1	1	2	1	1	2	-	-
CO2	3	2	2	2	1	-	2	2	3	2	1	1	2	1	1	2	-	-
CO3	2	1	2	2	1	-	2	3	2	2	1	1	2	1	1	2	-	-
CO4	3	1	2	2	2	-	2	3	2	1	1	1	2	1	1	2	-	-
CO5	3	3	3	2	-	1	2	1	2	1	2	2	3	1	1	-	-	2

Program	F. Y. B. Tech.							
Course	Engineering Mechanics (Common)					Semester		I/II
Code	ESC SH104	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	--	2	50	50	25	--	--

Course Pre requisites:

Basic Calculus, Trigonometry, Geometry, Fundamental knowledge of Engineering Mathematics and Physics.

Course Objectives:

1. To provide the fundamental knowledge about Force, Moment, Centroid, Moment of Inertia and Equilibrium of forces to solve the problems
2. To expose learners to applications of Friction and Equilibrium in real life.
3. To impart the knowledge of various types of motion and their analysis for real life problems.

Course Outcomes:

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

CO1: Determine the resultant of various force systems.

CO2: Compute the unknown forces in Equilibrium Force system and support reactions for beam using concept of equilibrium, and compute centroid, Moment of Inertia for composite lamina**.**

CO3: Solve the truss and friction-based problems.

CO4: Calculate different parameters of 2-D rectilinear motion and curvilinear motion using various coordinate systems for a particle.

CO5: Analyse engineering problems on motion of a particle using Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principles etc.

Unit No.	Description	Hrs.
1	**Force & Force Systems** Force, Force system, Resolution and composition of forces, Moment of a force, Equivalent force systems, Couple, Varignon's theorem, Resultant of 2D concurrent forces, Resultant of parallel force system, Resultant of general force system	6
2	**Equilibrium & Distributed Forces** Free-Body Diagrams, Equilibrium of 2D concurrent force system & General force System. Beams, Moment of area, Centroid of plane lamina and wire bends, Moment of Inertia.	6
3	**Friction & Equilibrium of Structures** Friction-Laws of friction, Application of friction on inclined planes, Ladder friction, Trusses	6
4	**Motion of a Particle** Study of rectilinear Motion, Study of Curvilinear Motion	6
5	**Forces, Mass, and Acceleration** Newton's second law, Work-Energy Principle, Impulse-Momentum Principle, Impact	6

List of laboratory experiments: *(Any Five from Sr. No. 1-6 and Any Five from Sr. No.7-13. Sr. No. 14 and 15 are compulsory))*

1. Verification of the polygon law of forces
2. Determination of support reaction of beam.
3. Determination of coefficient of friction
4. Demonstration of curvilinear motion

5. Demonstration of direct central impact
6. Study of space force system
7. Graphical solution for finding resultant of concurrent force system
8. Graphical solution for finding resultant of General/Parallel force system
9. Graphical solution for finding unknown reaction/force in concurrent force system in equilibrium
10. Graphical solution for finding unknown reaction/force in General/Parallel force system in equilibrium
11. Graphical solution for finding forces in members of pin jointed truss.
12. Graphical solution for finding various parameters of rectilinear motion using motion diagrams.
13. Graphical solution for finding various parameters in relative motion

2. Mini-Project: *(One Mini Project)*

14. Mini Project based on Engineering Mechanics.

3.Assignment: (One assignment)

15. Assignment on Estimation of unknown forces using C-Programming / Python Programming.

Learning Resources:

Text Books:

1. Hibbeler R. C., "Engineering Mechanics - Statics", 14th Ed., Prentice Hall, Hibbeler R. C., Engineering Mechanics - Dynamics", 14th Edition, Prentice Hall
2. Beer F. P., Johnston E. R. et al., "Vector Mechanics for Engineers: Statics & Dynamics", 12th Ed., McGraw-Hill Publication
3. Engineering Mechanics, R. S. Khurmi, S. Chand Publications, 3rd Edition (2019)

Reference Books:

1. Engineering Mechanics, F.L. Singer Harper & Row, Hill Publishers, 3rd Edition (1975)
2. Engineering Mechanics, Meriam and Crage, Wiley Publications, 9th Edition (2020)
3. Engineering Mechanics, Timoshenko and Young, McGraw-Hill Publications, 5th Edition (2013)
4. Introduction of Engineering Mechanics, S. Rajasekaran and G Sankarasubramanian, Vikas Publications, 1st Edition, (2011)
5. Vector Mechanics for Engineers-STATICS, Beer & Johnston, Tata McGraw-Hill Publications, 12th Edition, (2018)
6. Vector Mechanics for Engineers-DYNAMICS, Beer & Johnston, Tata McGraw-Hill Publications, 12th Edition, (2018)
7. Engineering Mechanics: Statics and Dynamics, A. K. Tayal, Unmesh Publications,11th Edition, (2000)

Online Resources:

Engineering Mechanics, Prof. K. Ramesh, IITM, NPTEL-NOC-IITM
https://archive.nptel.ac.in/courses/112/106/112106286/

CO-PO Mapping (Engineering Mechanics)											
Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	-	-	1	-	2
CO2	3	2	2	-	1	-	-	-	1	-	2
CO3	3	2	2	-	1	1	1	1	1	-	2
CO4	3	2	-	-	1	-	-	-	1	-	2
CO5	3	2	-	-	-	-	-	-	1	-	2

CO-PSO Mapping (Engineering Mechanics)																		
Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	-	1	-	2	-	-	-	1	3	1	-	-	-	-	-	-	-	-
CO2	-	1	-	2	-	-	-	1	3	2	1	-	-	-	1	1	-	-
CO3	-	-	-	-	-	-	-	-	3	2	1	-	-	-	1	1	-	-
CO4	-	1	-	2	-	-	-	1	3	1	1	-	-	-	1	1	-	-
CO5	-	-	-	2	-	-	-	-	3	1	-	-	-	-	-	-	-	-

Program	F. Y. B. Tech.							
Course	C Programming (Common)					Semester	I	
Code	ESC SH105	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme	
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		1	--	2	--	--	50	--	--

Course Pre requisites:

- Basics of Computers
- Basic Mathematics

Course Objective

1. To introduce the fundamental Concepts of C Programming and problem Solving.
2. To impart knowledge of Operators and Control Flow in C Programming.
3. To familiarize learners with Arrays and String Arrays in C programming.
4. To extend the use of User Defined Functions and pointers to solve simple computational problems using C Programming.
5. To expose learners to Structures and file handling concept.

Course Outcomes: The students will be able to

CO1: **Solve** simple computational problems using algorithms and flowcharts.
CO2: **Apply** operators and control flow structures for decision-making in programming.
CO3: **Demonstrate** the fundamentals of arrays in problem-solving.
CO4: **Develop** programs using user-defined functions and pointers for modular programming.
CO5: **Implement** structures and file handling techniques for efficient data management.

Syllabus

Unit No.	Description	Hrs.
1	**Introduction of Problem solving & C Programming** **General Problem-Solving Concepts**- Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem-solving, problem-solving aspects, top-down design. Problem Solving Strategies **Program Design Tools:** Art of Programming through Algorithms, Flowcharts. **Overview of C:** History and importance C, Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data types.	3
2	**Operators and Control flow** **Operators and Expressions:** Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators. Arithmetic Expressions, Precedence of Arithmetic Operators, Operator Precedence and Associativity, Mathematical Functions. **Decision Making and Branching:** Simple If Statement, If-Else, Else-If, Switch Statement, Goto Statement **Decision Making and Looping:** While Statement, Do-While, For Statement, Break and Continue	3
3	**Arrays and String** **Arrays:** One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Two dimensional Arrays, Initialization of Two- dimensional Arrays. **Character Arrays and Strings:** Declaration and Initialization String Variables, Reading Strings from Terminal, Writing Strings to Screen, Putting Strings Together, Comparison of Two Strings, Introduction to String handling Functions	3

4	**User Defined Function and Pointers** **User Defined Functions:** Need for User-defined Functions, A Multi-Function Program, Elements of User defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of **Functions:** No Arguments and no Return Values, Arguments but No Return Values, Arguments with Return values, No Arguments but Returns a Value, Functions that Return Multiple Values, Nesting of Functions, Recursion **Pointers:** Call by value, call by reference, Pointer type and their sizes, back to function calls, Utility of call by reference	3
5	**Structures:** What is a Structure? Structure Type Declarations, Structure Declarations, Referencing Structure Members, Referencing Whole Structures, Initialization of Structures. **File Handling:** File operations, counting characters, spaces, File opening modes, Text file, Binary file, Record I/O in files, Modifying records	3

List of laboratory experiments: *(Any Ten from Sr. No. 1-13 and Any One from Sr. No.14-16)*

1. Write a C program for employee salary calculation given: Basic pay, H.R.A. 20 % of Basic Pay and D.A.150 % of Basic Pay.
2. To accept the number and Compute a) factorial of number, b) check for prime
3. To accept number from user, the number of Fibonacci numbers to be generated and print the Fibonacci series.
4. To accept a student's marks for five subjects, compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the Grade of first class. If aggregate is 50>= and <60, then the grade is second class. If aggregate is 40>= and <50, then the grade is third division.
5. To accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
6. Write a C Program to find a) Find given element in array b) Find Max and Min element
7. Write a C Program to find a) Find frequency of given element in array b) Find Average of elements in Array.
8. Write a C program that accepts a string from the user and performs the following string operations-a) Calculate length of string b) String reversal
9. Write a C program that accepts a string from the user and performs the following string operations- a) Equality checks of two Strings b) Check substring
10. Write a program in C to find the maximum number between two numbers using a pointer.
11. Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary), and store the data and update the data in structure.
12. Create Structure STORE to keep track of Products (Product Code, Name and price). Display menu of all products to users. Generate bills as per order.
13. Write a program in C to create and store information in a text file.

Mini Projects:

14. To calculate the salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employees pay professional tax as 2% of total salary. Calculate net salary payable after deductions using user define function.
15. Program that simulates rolling dice. When the program runs, it will randomly choose a number between 1 and 6 (Or other integer you prefer). Print that number. Request user to roll again. Set the min and max number that dice can show. For the average die, that means a minimum of 1 and a maximum of 6.

16. Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user's guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear. Write functions to check if the user input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.

Learning Resources:

Text Books:

- Balagurusamy, E. Programming in Ansi C. India, Tata McGraw-Hill, 2000.
- Kanetkar, Yashavant. Let Us C: Authentic Guide to C Programming Language, 18th Edition (English Edition). India, Bpb Publications, 2020.

Reference Books:

1. B. S. Gottfried, Programming with C (Schaum's Outline Series), 2nd ed. McGraw-Hill, 1996.
2. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd ed. UK: Prentice Hall, 1988.
3. P. Prinz & T. Crawford, C in a nutshell: The definitive reference, 2nd ed., O'Reilly Media, 2016

Online Resources:

C Programming for Problem Solving, Prof. Satyadev Nandakumar, Dept of Computer Science and Engineering IIT Kanpur
https://archive.nptel.ac.in/courses/106/104/106104128/#

CO-PO Mapping (C Programming)

Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	2	-	-	-	-	-	2
CO2	2	2	1	1	2	-	-	-	-	-	2
CO3	2	2	1	1	2	-	-	-	-	-	2
CO4	2	2	1	1	2	-	-	-	-	-	2
CO5	2	2	1	1	2	-	-	-	-	-	2

CO-PSO Mapping (C Programming)

Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	1	2	-	1	-	-	1	-	1	1	1	1	1	1	2	1	1
CO2	1	1	2	-	-	-	-	1	-	1	1	1	1	1	-	2	1	1
CO3	1	1	2	-	-	-	-	1	-	1	1	1	1	1	-	2	1	1
CO4	1	1	2	-	-	-	-	2	-	1	1	1	1	1	-	1	1	1
CO5	-	-	1	-	-	-	-	2	-	1	1	1	1	1	1	2	1	1

Program	F. Y. B. Tech.							
Course	Design Thinking (Common)					Semester		I/II
Code	VSEC SH106	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		1	--	2	--	--	50	--	--

Course Objectives:

1. To introduce the fundamental concepts and frameworks of Design Thinking and human-centred problem-solving.
2. To develop empathy and problem-analysis skills for real-world challenges.
3. To foster creativity and innovation through structured ideation techniques and rapid prototyping.
4. To enable learners to iteratively test, refine, and validate solutions using user feedback.
5. To cultivate effective communication and pitching skills for implementing and presenting design-driven solutions.

Course Outcomes:

Upon successful completion of this course, the students will be able to ...

CO1. **Explain** the core principles, phases, and importance of Design Thinking in engineering and societal contexts.

CO2. **Apply** empathy-building and problem-definition techniques to frame user-centric problem statements.

CO3. **Employ** structured ideation methods (e.g., brainstorming, Six Thinking Hats) to generate creative solutions.

CO4. **Demonstrate** knowledge of prototyping and testing strategies to validate ideas and gather user feedback.

CO5. **Evaluate** and refine solutions based on iterative feedback and effectively communicate the final concepts.

Syllabus

Unit No.	Description	Hrs.
1	**Unit I: Introduction to Design Thinking** 1. **Definition and Importance** of Design Thinking 2. **Overview of the 5-Phase Process:** Empathise, Define, Ideate, Prototype, Test 3. **Design Thinking vs. Traditional Problem-Solving** 4. **Key Mind-sets:** User-centric approach, Collaboration, Iteration	2
2	**Unit II: Empathise and Define** 1. **Empathise Phase:** Methods of user research (observation, interviews),Tools: AEIOU Framework, Empathy Maps, Persona Creation, Stakeholder Mapping. 2. **Define Phase:** Synthesising insights from Empathise, Identifying root causes (5 Whys), Crafting clear problem Statements and POV Statements	3
3	**Unit III: Ideate** 1. **Divergent Thinking Techniques:** Brainstorming, Dot Voting, Mind Mapping, Six Thinking Hats Method, SCAMPER Technique (optional/additional) 2. **Convergent Thinking:** Selecting and prioritising ideas	2
4	**Unit IV: Prototype & Test** 1. **Prototype Phase:** Types of Prototypes (paper prototypes, digital mock-ups, service blueprints), Rapid Prototyping: Low-fidelity vs. High-fidelity.	3

	2. **Test Phase:** Gathering User Feedback (Feedback Capture Grid), Structured Usability Testing, Iteration Cycle: Refining prototypes based on test results	
5	**Unit V: Implementation, Pitching & Reflection** 1. **Refinement and Implementation:** I Like, I Wish, I Wonder for feedback, Planning final deployment or handover 2. **Pitching and Communication:** Structuring a compelling pitch (Create a Pitch Template),Visual and verbal communication strategies. 3. **Reflection & Lifelong Learning:** Lessons Learned, Roadmap for Implementation, Importance of iteration and continuous improvement	2

List of laboratory experiments: *(All laboratory experiments are compulsory)*

1. Warm-Up & Introduction (2 Hrs)
- Icebreaker Activities (e.g., Bingo Card, 30 Circles Exercise)
- Overview of the course project and group formation
- Learning through LMS with deAsra Inspire Life about Entrepreneurship (Self-paced 7 hrs)

2. Problem Identification & Brainstorming (2 Hrs)
- Individual Brainstorming
- Group discussion, Dot Voting to prioritise problems

3. Problem Statement & 5 Whys (2 Hrs)
- Refine problem statement using 5 Whys
- Finalise the specific challenge for each group

4. Empathise Tools (Part 1) (2 Hrs)
- AEIOU Framework
- Empathy Map creation
- Stakeholder Map

5. Empathise Tools (Part 2) & Define (2 Hrs)
- Persona/User Profile creation
- Revisit Problem Statement & POV Statement

6. Ideation Session (2 Hrs)
- Brainstorming exercises
- Six Thinking Hats
- Dot Voting for idea selection

7.Advanced Ideation & Concept Selection (2 Hrs)
- SCAMPER (optional)
- Consolidate top ideas and form concept directions

8. Prototyping Methods (2 Hrs)
- Paper Prototypes / Low-Fidelity Prototypes
- Prototype Sketch

9: Testing & Feedback (2 Hrs)
- Structured Usability Testing
- Feedback Capture Grid

10: Refinement & Iteration (2 Hrs)
- "I Like, I Wish, I Wonder" framework
- Incorporate feedback into updated prototype

11: Pitch Preparation (2 Hrs)
- Create a Pitch Template
- Visual aids, storytelling techniques

12: Final Pitch & Reflection (2 Hrs)
- Final presentation of solutions (pitch)
- Reflection: Lessons Learned Template, Roadmap for Implementation

- Evaluation and feedback

Learning Resources:

Text Books:

1. The Field Guide to Human-centred Design: Design Kit. United Kingdom, IDEO, 2015.
2. Kelley, David, and Kelley, Tom. Creative Confidence: Unleashing the Creative Potential Within Us All. United Kingdom, HarperCollins Publishers, 2013.

Reference Books:

1. Rouxelle de Villiers – "The Handbook of Creativity & Innovation in Business_ A Comprehensive Toolkit of Theory and Practice for Developing Creative Thinking Skills", Springer Nature (2022)
2. Nitin Shekapure, "Design Thinking and Idea", Study Max Publications (2024).
3. Tim Brown, "Change by Design, Revised and Updated_ How Design Thinking Transforms Organizations and Inspires Innovation" Harper Business (2019)
4. George W. Anderson, "Design Thinking for Tech_ Solving Problems and Realizing Value in 24 Hours", Pearson (2023)

CO-PO Mapping (Design Thinking)

Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	1	1	3	2	1	1	1	1	2
CO2	1	3	2	2	2	2	1	2	2	1	2
CO3	1	2	3	1	2	1	1	3	2	2	2
CO4	1	2	3	3	3	1	1	2	2	2	2
CO5	1	2	2	1	1	1	1	3	3	3	3

CO-PSO Mapping (Design Thinking)

Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	-	2	2	1	-	1	1	2	1	1	1	-	1	1	-	-	1
CO2	2	-	2	1	-	2	1	1	2	-	2	1	-	1	1	-	-	1
CO3	2	-	1	2	2	1	2	2	2	-	2	1	-	2	2	-	-	1
CO4	2	-	1	2	2	1	2	2	2	-	2	1	1	2	2	-	2	1
CO5	2	-	2	2	2	2	2	2	2	-	2	1	1	2	2	-	2	1

Program	F. Y. B. Tech.							
Course	Communication and Linguistic Skills (Common)					Semester		I
Code	AEC SH107	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	02	L	T	P	CCE	ESE	TW	PR	OR
		2	-	--	--	--	50	--	--

Course Objectives:

1. The objective of the course is to enrich students' linguistic competence, along with the four language skills, listening, speaking, reading and writing.
2. It aims at enhancing the learners' grammatical skills, word power, listening, speaking, reading and writing skills.

Course Outcomes:

Upon successful completion of this course, the students will be able to ...

CO1: **Apply** the fundamentals of communication skills in daily life.

CO2: Identify the nuances of phonetics, intonation and enhance pronunciation skills

CO3: Impart basic grammar and essentials of important language skills.

CO4: Use all types of vocabulary and language proficiency

CO5: Adopt the technique of making effective presentations and writing effectively

List of Effective Communication Skills in National & International Languages

National Languages	International Languages
1. Hindi 2. Sanskrit 3. Marathi	1.English 2. Japanese 3. German 4. French 5. Spanish

Sample Syllabus of English

Unit No.	Description	Hrs.
1	**Introduction to Communicative English** • The Significance of English today • What is Effective Communication • Fundamentals of Communicative English	3
2	**Introduction to Phonetics** • Vowels, Consonants and Diphthongs in English: Phonetic transcription • Structure of the syllable and Word stress • Intonation	3
3	**Basic English Grammar** • Tenses • Active and Passive Voice • Indirect Speech • Prepositions	3
4	**Developing Word Power in English** • Synonyms and Antonyms • Prefixes and Suffixes • One-word substitutes • Word games	3
5	**Towards Effective Oral and Written presentations** • Developing listening skill	3

	• Role playing and Public Speaking • Writing short paragraphs and essays	

Guidelines to conduct language Course & continuous evaluation:

- Language Course (National/International) will be offered based on student choice & resources availability for conduction
- Every student must choose any one language course National or International.
- Language laboratory to be used to develop Grammar and Vocabulary skills, LSRW (Listening, Speaking, Reading, Writing) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems. Teacher must impart knowledge about language laboratory like its need, tasks and writing of workbook.

Term-Work assessment shall base on following parameters… (Any 10 from list given)

1. Fluency-focused activities like JAM (Just a Minute),
2. Conversational Role Plays, speaking using Picture/Audio Visual inputs.
3. Group Discussions
4. Giving a presentation (With aid or without aid)
5. Activities for enhancement of Listening-Speaking Skills:
   - Introduction of self and others, Instructional conversation
   - Inquiries at various public places, Cross-Cultural Communication
6. Writing a Book / small article/ Film Review
7. Situational Writing, Storytelling
8. SWOT analysis
9. Public Speaking Exercises
10. Greetings for different occasions
11. Speech/Seminar presentation
12. Observation of a recorded seminar and its improvement methodology

Learning Resources:

Text Books:

1. Kumar, Sanjay & Pushp Lata, “Communication Skills”, Oxford University Press, 2011
2. A Textbook of English Language Communication Skills, Infinite Learning Solutions, Bengaluru, 2022.

Reference Books:

1. D Praveen Sam, KN Shoba, “A Course in Technical English”, Cambridge University Press, 2020.
2. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt. Limited, 2019.
3. Quirk & Randolph, “A University Grammar of English”, Pearson,2006
4. Raymond Murphy, “Essential English Grammar (Elementary & Intermediate)”
5. Sasikumar et al., “A Course in Listening and Speaking”, Foundation Books, 2005.
6. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.
7. Michael Swan, “Practical English Usage”, Oxford University Press, 2016.

Online Courses:

- https://nptel.ac.in/courses/109104031
- https://onlinecourses.swayam2.ac.in/nou21_lb11/preview
- https://onlinecourses.nptel.ac.in/noc23_hs13/preview
- https://onlinecourses.swayam2.ac.in/cec22_cm03/preview

**The Principal of the Institute and HOD can take decision about incorporating language Course considering students' timely need and response.*

***Syllabus of remaining languages will be provided to the students at the time of course conduction*

CO-PO Mapping (Communication and Linguistic Skills)											
Program Outcomes (PO)											
Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	1	1	-	1
CO2	-	-	-	-	-	-	-	-	1	-	1
CO3	-	-	-	-	-	-	-	-	1	-	1
CO4	-	-	-	-	-	-	-	-	1	-	1
CO5	-	-	1	-	-	-	-	1	1	1	1

Program	F. Y. B. Tech.							
Course	Co-Curricular Course-I (Common)					Semester	I	
Code	CCC SH108	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		--	--	4	--	--	50	--	--

Course Objectives:

1. The objective of co-curricular course is to make learning a joyful experience for students. The course contents planned to raise the bar of academic standards with the active involvement and cooperation from students, academic and administrative units.
2. As per NEP-2020 statements "Education thus, must move towards less content, and more towards learning about how to think critically and solve problems, how to be creative and multidisciplinary, and how to innovate, adapt, and absorb new material in novel and changing fields. Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. **The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values**, in addition to science and mathematics, to develop all aspects and capabilities of learners; and make education more well-rounded, useful, and fulfilling to the learner. Education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment."

Course Outcomes:

The students will be able to…

CO1: **Recognise** and look within in search of own interests and hobbies.

CO2: Identify the meaning while exploring various fields.

CO3: Identify specific learning skill.

CO4: Adopt the techniques for balancing his regular schedule.

List of Co-Curricular Course Activities

Activity List-1	Activity List-2
1. Sketching & Painting 2. Dancing, Rhythm & Movement 3. Theatre Arts 4. Short Film Making 5. Sports and Physical Fitness 6. Art of Living 7. Garden Design and Maintenance 8. Personality Development 9.Classical Singing 10. Photography 11.Basics of Percussion Instruments 12.Culinary Arts: Basics of Cooking 13. Yoga 14. Interior Design 15. Principle Centered Leadership 16. Digital Wellness	1. Industrial Safety 2. Disaster Management 3. Empowerment Through Self-defense (Women safety) 4.Mentoring of School Children 5.Work life balance holistic Health 6.Values in Healthcare 7.Cyber Security 8.Introduction to Rajyoga meditation 9.Self-management & Life skill management 10.Holistic Approach for Positive Powerful Inner Health 11.Creativity & Utilization 12.NSS (National Service Scheme) 13.Yoga for Wellbeing 14.Entrepreneurship (Govt Schemes & Opportunity) 15.Financial Schemes for Business 16.Sports training & conditioning 17.Corporate Event Management

* *The Principal of the Institute and Chairman BoS and Dean Academics can take decision about incorporating Co-Curricular Course activities considering students' timely need and response.*

Term-Work Assessment:

- Active participation during the activity = 15 Marks
- Submission of reflections or assignment = 15 Marks
- Final test at the end of activity = 20 Marks
- **Total Marks = 50**

Guidelines of Co-Curricular Course Conduction:

- Course will be offered based on student choice & resources availability for conduction
- **Every student of Group-I** must choose any one activity from Activity List -1 in Semester-1 and any one activity from Activity List -2 in semester-2
- **Every student of Group-II** must choose any one activity from Activity List -1 in Semester-1 and any one activity from Activity List -2 in Semester-2
- Availability of activity is first come first serve basis.
- Once the maximum student capacity becomes full for any course, per activity = 30
- Every CCC activity is of two hours in a week and two hours for self-study in a week.
- Student must complete the schedule assigned by mentor of chosen activity.
- Syllabus for each course designed to provide a comprehensive overview, but it can be adapted and expanded based on the specific needs & interests of the students and professional experience of the instructor.
- As each course is unique in its nature and content, course mentor can adopt their own teaching methodologies and there are no hard constraints from the college as far as expected learning outcomes delivered.

CO-PO Mapping (Co-Curricular Course-I)											
	Program Outcomes (PO)										
Course Outcomes (CO)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	-	-	-	-	-	1	1	-	-	-	1
CO2	-	1	-	-	-	1	1	-	-	-	1
CO3	1	-	-	-	-	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	1	1

Program	F. Y. B. Tech.							
Course	Differential Equation & Integral Calculus (Common)					Semester		II
Code	BSC SH109	Teaching Scheme (Hrs./Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	4	L	T	P	CCE	ESE	TW	PR	OR
		3	1	--	50	50	25	--	--

Course Prerequisites: Basic knowledge of Integration, Differential Equation and Three-dimensional coordinate systems.

Course Objectives:

To make the students familiarize with Mathematical Modelling of physical systems using differential equations advanced techniques of integration, Fourier Series, multiple integrals and their applications. The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance thinking power useful in their disciplines.

Course Outcomes:

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

CO1: Solve first order differential equations by using various methods.

CO2: Apply ordinary differential equation to the Problem of Newton's law of cooling, electrical circuit, rectilinear motion, heat transfer etc.

CO3: Determine the Fourier series representation and harmonic analysis of periodic continuous and discrete systems.

CO4: Apply advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions that are useful in evaluating multiple integrals.

CO5: Evaluate multiple integrals to find area bounded by curves, volume bounded surfaces, Centre of gravity and Moment of Inertia.

Syllabus

Unit No.	Description	Hrs.
1	**First Order Ordinary Differential Equations** Definition, Order and Degree of DE, Solutions of Variable Separable DE, Exact DE, Linear DE and Equation Reducible to the Linear DE form.	8
2	**Application of Differential Equations** Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Rectilinear Motion and Heat Flow.	8
3	**Fourier series** Definition, Dirichlet's conditions. Full range Fourier series, half range Fourier series and Harmonic analysis.	8
4	**Integral Calculus** Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error functions	8
5	**Multiple Integral** Double and Triple integration, Change the order of integration, Applications to find Area, Volume, Centre of gravity and Moment of inertia.	8

Learning Resources:

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill, 2010
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd , 2011
3. B.S. Grewal, 'Higher engineering Mathematics', *Khanna publishers, Delhi (*40th edition),(2008).

Reference Books:

1. P.N. Wartikar and J.N. Wartikar, Applied Mathematics (Vol. I & Vol. II), Vidyarthi Griha Prakashan, Pune
2. P. V. O'Niel, Advanced Engineering Mathematics, Thomson Learning.
3. M. D. Greenberg, Advanced Engineering Mathematics, Pearson Education.
4. Thomas' Calculus by George B. Thomas, Addison-Wesley, Pearson

Online Resources:

1. Calculus, Prof. Jitendra Kumar, IIT Kharagpur, NPTEL IIT Kharagpur, https://archive.nptel.ac.in/courses/111/105/111105121/

Tutorials:

Tutorial for the subject shall be engaged in minimum three batches per division.

(Sr. *No. 1 & 2 are compulsory. Any 10 tutorials from Sr. No. 3 to 15)*

1. **Activity-I** ("Revision of Prerequisites for the course")
2. **Activity-II** ("Solving Differential Equations using MATLAB")
3. Exact and reducible to exact Differential Equation
4. Linear and reducible to linear Differential Equation
5. Applications of Differential Equation to NCL and Kirchhoff's Law
6. Applications of Differential Equation to Rectilinear Motion and Heat Flow
7. Full range Fourier series
8. Half range Fourier series
9. Harmonic analysis
10. Reduction formulae and Gamma & Beta function
11. DUIS and Error function
12. Tracing of Cartesian Curve
13. Tracing of Polar Curve
14. Double and Triple Integration
15. Application of Double and Triple Integration

CO-PO Mapping (Differential Equation & Integral Calculus)

Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	1	2	-	-	-	-	-	2
CO2	3	3	-	2	2	2	-	-	-	-	2
CO3	3	2	-	1	2	-	-	-	-	-	2
CO4	3	2	-	1	2	-	-	-	-	-	2
CO5	3	2	-	1	2	2	-	-	-	-	2

CO-PSO Mapping (Differential Equation & Integral Calculus)

Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	2	-	-	1	-	1	-	1	2	1	-	-	1	-	1	1	-
CO2	2	2	-	1	2	-	2	-	2	1	1	-	-	1	-	1	1	-
CO3	1	2	-	-	2	-	2	-	2	1	1	-	-	1	-	2	2	-
CO4	-	1	-	-	1	-	1	-	1	2	1	-	-	1	-	1	1	-
CO5	-	-	1	1	1	-	1	-	2	2	1	-	-	1	-	-	-	-

Program	F. Y. B. Tech.							
Course	Engineering Physics (Common)					Semester		I/II
Code	BSC SH110	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	--	2	50	50	25	--	--

Prerequisites: Fundamental of Optics, Interference, Diffraction, Polarisation, Bohr's Atomic model, Wave Particle Duality, Semiconductor, Calculus, trigonometry

Course Objectives:

The course aims to provide a comprehensive understanding of key concepts in lasers, fiber optics quantum physics, semiconductors, non-destructive testing, nanotechnology, sustainable energy, superconductivity and emphasizing the application of these principles in real-world technologies.

Course Outcomes:

After successful completion of this course, learner will be able to:

CO1: Explain the basics and other aspects of lasers and fibre optics along with few applications.

CO2: Solve problems related to bound states using Schrödinger's wave equations and apply quantum tunneling in electronic devices.

CO3: Classify the materials based on band theory, apply Fermi Level concept to study the behaviors of PN diode and Solar cell, understand phenomenon of Hall effect and its applications.

CO4: Interpret sustainable energy concepts, principles, renewable sources & Various Non Destructive Testing (NDT) for material and structural integrity.

CO5: Describe properties of nanoparticles some synthesis methods and with their applications in Nanotechnology and Various aspects of Superconductivity and potential applications.

Syllabus

Unit No.	Description	Hrs.
1	**Laser & Fibre optics:** **Lasers**: Introduction of laser, Spontaneous and stimulated emission, population inversion, pumping, active medium & active center, resonant cavity, coherence length and coherence time; Characteristics of lasers, CO2 laser: construction and working, Heterojunction laser diode: construction and principle, advantages of laser, engineering, and industrial applications; Holography: recording, reconstruction **Fibre optics:** Principle of optical fibre, Single mode & multimode, step index & graded index, attenuation, attenuation coefficient, factors affecting attenuation; parameters of optical fibre: critical angle, Numerical aperture, acceptance angle, acceptance cone numerical problems on parameters of optical fiber, Optical fibre communication system. Advantages of optical fiber communication	6
2	**Quantum Physics:** de Broglie hypothesis, de Broglie wavelength for a particle accelerated by KE "E" and a charged particle accelerated by PD "V", problems; Heisenberg's Uncertainty Principle, Wave function and probability density, mathematical conditions for wave function, Need and significance of Schrödinger's equations, Schrödinger's time independent and time dependent equations; Energy of a particle enclosed in a rigid box and related numerical problems; Quantum mechanical tunnelling, Tunnel diode Principles of quantum computing: concept of qubit, superposition and entanglement, comparison of classical & quantum computing	7
3	**Semiconductor Physics:** Formation of energy bands; classification of solids on the basis of band theory, FD distribution function, Fermi level and Fermi energy for metal, position of Fermi level in intrinsic semiconductors (derivation); Fermi level for extrinsic	6

	semiconductors, working of PN junction diode on the basis of Fermi energy; conductivity of conductors and semiconductors, Hall effect: derivation for Hall voltage and Hall coefficient and related numerical problems Solar cell: principle, working, IV-characteristics, efficiency and fill factor, measures to improve efficiency of solar cell, Design a simple solar home lighting system	
4	**Physics of Sustainable energy & Non-Destructive Testing:** **Sustainable Energy**: Fundamental of energy and work, Energy Density, Energy efficiency, Embodied Energy, Principles for choosing sources of energy, Different types of Energy sources: Solar Energy, Wind Energy, Hydroelectricity geo Thermal, Bio mass energy, Geo thermal energy, tidal energy, fuel cells technology, Bio fuels **Non-Destructive Testing:** Classification of Non-destructive testing methods - Principles of physics in Non-destructive Testing - Advantages of Non-destructive testing methods - Acoustic Emission Testing - Ultrasonic flaw detection) - Radiography testing.	5
5	**Nanotechnology & Superconductivity:** **Nanomaterials:** Introduction to nanotechnology**,** surface to volume ratio &Quantum confinement and its effect on properties of nanoparticles, synthesis methods - ball milling and Physical Vapor Deposition; Properties of nanoparticles (optical, electrical, mechanical, magnetic); Applications of nanotechnology: Electronics, automobiles, environmental & energy, medical field (targeted drug delivery) **Superconductivity**: Introduction of superconductivity, critical magnetic field, critical current, Meissner effect and perfect diamagnetism; Type I and Type II Superconductors, Numerical problems on critical magnetic field, BCS theory and Josephson effect, Applications of superconductors: SQUIDS	6

A: List of laboratory experiments: *(Any Ten from Sr. No. 1-15 and Any One from Sr. No.14-16)*

1. An experiment based on Laser: To determine the divergence of a laser beam or to determine diameter of a thin wire or to perform beam profile analysis of a laser beam.
2. An experiment based on optical fibre: To determine the numerical aperture or attenuation coefficient or critical angle of incidence for given a glass slab or any experiment to calculate parameters of optical fibre.
3. Newton's rings - to understand the interference and determine radius of curvature of a given plano-convex lens or determine wavelength of given monochromatic light.
4. An experiment based on diffraction: determine the wavelength of light using transmission grating using spectrometer
5. Determination of number of lines per cm on diffraction grating using Laser setup.
6. An experiment based on polarization: To verify cosine square law of Malus Law for plane polarized light.
7. An experiment based on polarization: To determine the specific rotation of the given sample with the help of a polarimeter or to determine refractive indices of extraordinary and ordinary rays using double refractive prism.
8. An experiment based on polarization: to determine refractive indices of extraordinary and ordinary rays using double refractive prism.
9. To determine the band gap energy of a semiconductor sample using a PN junction diode.
10. To plot I-V characteristics and determine fill factor and efficiency of a given solar cell.
11. Determination of Planck's constant using available experimental setup.
12. To determine Hall coefficient and charge carrier density of a given semiconductor sample.
13. Determination of velocity of ultrasonic waves and compressibility of given liquid by using Ultrasonic Interferometer
14. An experiment based on physical measurements developed using Arduino interface for Hall effect sensor or Ultrasonic sensor.
15. An Experiment on Noise analysis using FFT Analyzer.

B: Mini project

Exploring Natural Physics: Exploration and investigation of various Physics-related real-world phenomenon/ applications and demonstrating through modelling and case study.

Text Books:

1. M. N. Avadhanulu, P. G. Kshirsagar & Arun Murthy, A Textbook of Engineering Physics, S. Chand Publications.
2. R. K. Gaur and S. L. Gupta, Engineering Physics, Dhanpat Rai Publications.

Reference Books:

1. Ajoy Ghatak, Optics, Tata Mc Graw Hill
2. C. Kittel, Introduction to Solid State Physics, Wiley, and Sons.
3. A. K. Ghatak, S. Lokanathan, Quantum Mechanics, Laxmi Publications.
4. Dr. S. K. Kulkarni, Nanotechnology: Principles and Practices, Capital Publishing.
5. Serway and Jewett, Physics for Scientists and Engineers with Modern Physics, Cengage Publications.

Online Resources:

1. Lectures by Walter Lewin:
https://www.youtube.com/channel/UCiEHVhv0SBMpP75JbzJShqw
2. Quantum Mechanics
Lecture Series by Prof. H. C. Verma:
https://www.youtube.com/playlist?list=PLWweJWdB_GuISnGkAafMpzzDBvTHg02At

E-Books:

1. Feynman Lecture series: https://www.feynmanlectures.caltech.edu/
2. Concepts of Modern Physics, Arthur Beiser:
https://nitsri.ac.in/Department/PHYSICS/Beiser_Modern_Physics.pdf

CO-PO Mapping (Engineering Physics)

Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	-	-	-	-	-	1	1	-	2
CO2	3	2	1	1	1	-	-	-	-	-	2
CO3	3	2	1	-	-	-	-	1	1	-	2
CO4	3	2	1	1	1	-	-	1	1	-	2
CO5	3	1	-	-	1	-	-	-	-	-	2

CO-PSO Mapping (Engineering Physics)

Course Out comes (CO)	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	1	-	-	1	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	1	-	-	1	1	-	-	1	-	1	-	-
CO3	1	-	1	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
CO4	2	-	1	-	1	-	-	-	1	1	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-

Program	F. Y. B. Tech.							
Course	Fundamentals of Electronics Engineering (Common)					Semester		I/II
Code	ESC SH111	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	-	2	50	50	25	--	--

Course Pre requisites: Basic Physics and Mathematics, Semiconductor Physics, Circuit Theory Fundamentals, BJT Fundamentals, Digital Electronics Fundamentals.

Course Objectives:

1. To expose students to working principles of semiconductor devices such as PN junction diode, Zener diode, BJT & MOSFET & explore their characteristics & applications in rectifier & voltage regulators.
2. To impart knowledge of the fundamental principles, characteristics, and configurations of op-amp and apply them in basic analog circuits design including summing & difference amplifier applications.
3. To develop foundational understanding of digital electronics including number system, logic gates, Boolean algebra for combinational circuit design and evolution of Integrated circuits.
4. To introduce fundamental concepts of communication systems including electromagnetic spectrum, modulation techniques and overview of mobile & satellite communication systems.

Course Outcomes:

After successful completion of this course, learner will be able to:

CO1: Analyze the working of Rectifier circuits, Zener diodes, Voltage regulator ICs, and special-purpose diodes like LEDs and photodiodes.

CO2 Analyze the characteristics, configurations, and applications of BJT and MOSFETs as amplifiers and switches.

CO3: Analyze operational amplifiers in various configurations & solve numerical problems related to Op-amp gain.

CO4: Apply number system conversions, binary arithmetic, Boolean algebra, and K-map for circuit design, implement combinational and sequential circuits using flip-flops and explore integrated circuits and Moore's Law.

CO5: Analyze the key concepts & techniques in communication systems including modulation, analog and digital communication, Mobile and satellite communication.

Syllabus

Unit No.	Description	Hrs.
1	**Diode and its applications.** Diode: Working & V-I Characteristics, Types of Rectifiers - HWR, FWR & BR, parameters and their comparison, Numerical on Rectifiers, Filter-Capacitor filter, Analysis of with & without Filter, Regulator, Zener Diode as a Regulator, Fixed Voltage Regulator-78XX & 79XX series. Special purpose diodes- LED, Photo-diode & its application	6
2	**BJT & MOSFET** BJT: Working, Configurations of BJT- Introduction to CB, CE & CC Configurations, V- I Characteristics of CE Amplifier, BJT as a CE Amplifier, Single Stage CE Amplifier, BJT as a switch, DC Load Line, relationship between alpha and beta, Numerical based on alpha and beta. MOSFET: Construction, Working, V-I characteristics (D MOSFET & E MOSFET), MOSFET as a switch, Compare BJT & MOSFET	6
3	**Operational Amplifiers** Block Diagram of Op-amp, Ideal and Practical Parameters of Op-amp, Open loop mode of Op-amp- Comparator, Closed loop mode of Op-amp- Inverting and Non-Inverting Op-amp, Voltage Follower, Applications of Op-amp- Summing and Difference Amplifier, numerical on Op-amp gain.	6

4	**Fundamentals of Digital Electronics** Number System Conversions, Binary Arithmetic, Introduction to Logic gates, Boolean Algebra, SOP & POS form, K-map, Combinational Circuits- Realization of Half adder & Full adder, Sequential Circuits-Introduction to F/F's- D, T, SR & JK F/F's, Introduction to Integrated Circuits- SSI, MSI, VLSI, ULSI & Moore's laws.	6
5	**Introduction to Communication system** Electromagnetic Spectrum, Block Diagram of Communication system, Introduction to Analog & Digital Communication Systems, Types of Communication system, Need of Modulation, **Analog communication** - Introduction to AM, FM & PM, **Digital communication** - PWM, Introduction to Mobile & Satellite Communication.	6

A. List of Practicals: (*Any Ten from Sr. No. 1-14 and Sr. No.15 is compulsory*)

1. Study of Active and Passive Electronic Components.
2. Analysis of V-I Characteristics of P-N Junction Diode, Zener Diode.
3. To implement Half-wave, Full-wave (Centre-tap), and Bridge rectifiers using diodes and observe the effect of a capacitor filter on the rectifier output.
4. To implement a Zener diode as a voltage regulator.
5. Determination of Gain and Bandwidth of a BJT Common-Emitter (CE) Amplifier.
6. To simulate the frequency response of a BJT amplifier using Simulation Software.
7. To study and implement a BJT transistor as a switch.
8. To determine and analyze the VI characteristics of an N-channel MOSFET.
9. Design and Implementation of Inverting & Non-Inverting Applications of Op-Amp.
10. Verification of Truth Tables of Various Logic Gates.
11. Design & Implementation of Half Adder and Full Adder Using Logic Gates.
12. Verification of SR Flip-Flop Characteristics and application as a Toggle & Delay F/F.
13. To construct a JK flip-flop using basic logic gates and verify its characteristic behavior through its truth table.
14. To generate an AM signal and observe waveform using DSO with the help of Simulation software.

Compulsory for All

B. Mini Project:

15. Design, construction and testing of any Electronic Circuit Using BJT's/MOSFET's/ Operational Amplifiers/and Logic Gates on Breadboard or PCB.

Learning Resources:

Text Books:

1. Theraja, B.L. Basic Electronics: Solid State. India, S. Chand Limited, 2010.
2. Mehta, V. K. Principles of Electronics [LPSPE]. India, S Chand & Company Limited, 2022.
3. Kennedy, George, and Davis, Bernard. Electronic Communication Systems. Singapore, Glencoe, 1993.

Reference Books:

1. Thomas. L. Floyd, Electronics Devices, 9th Edition, Pearson
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill
3. "Op-Amps and Linear Integrated Circuits" – Ramakant A. Gayakwad

Online Resources:

1. Semi-conductor Materials, Prof. Chitralekha Mahanta, IIT Guwahati https://nptel.ac.in/courses/117103063
2. Digital Electronics, Prof. Goutam Saha, IIT Kharagpur., https://onlinecourses.nptel.ac.in/noc20_ee32/preview

CO-PO Mapping (Fundamentals of Electronics Engineering)											
Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	1	-	-	-	-	-	2
CO2	3	3	2	2	1	-	-	-	-	-	2
CO3	3	3	2	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	1	-	2
CO5	2	2	2	1	1	1	-	-	-	-	2

CO-PSO Mapping (Fundamentals of Electronics Engineering)																		
Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	-	1	-	1	-	1	-	1	-	-	-	1	-	1	-	-	1
CO2	1	1	1	1	1	-	1	-	1	1	-	-	1	-	1	-	-	1
CO3	1	-	-	1	-	-	1	-	-	-	-	-	1	-	1	-	-	-
CO4	1	-	-	1	1	1	1	1	1	-	1	1	1	1	1	-	-	1
CO5	1	1	-	1	1	1	1	-		1	-	-	1	-	1	-	-	1

Program	F. Y. B. Tech.							
Course	Engineering Drawing (Common)					Semester		I/II
Code	ESC SH112	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	3	L	T	P	CCE	ESE	TW	PR	OR
		2	--	2	50	50	25	--	--

Pre-requisites:

Basic understanding of different geometrical shapes such as line, square, rectangle, triangles, circle and polygons such as pentagon, hexagon etc. and their geometrical constructions. Strong imagination skill for visualization of different shapes of an object in three and two dimensions.

Course Overview:

1. Engineering Graphics is a basic course for all undergraduate engineering programs. This course is introduced to provide the basic understanding of the fundamentals of Engineering Drawing, mainly visualization, standards and conventions of drawing, the tools of drawing and the use of drawings for engineering applications.
2. Drawing is commonly used mode of communication in engineering industry as it is brief and clearer. Appropriate exposure to drawing helps the students to translate different ideas into practical applications. Acquisition of drafting skills as per standard conventions is used to make the drawing of a given object or component so that others can understand and interpret the drawing as intended by the draftsman. Hence drawing is regarded as a pre- requisite for engineering graduates.
3. The ability to interpret drawings is the most important requirement of all technical People in engineering profession. The potentialities of drawing as an engineer's language may be made use of as a tool for imparting knowledge and providing information on various aspects of engineering. Some of the applications of Engineering drawing are building drawing for civil engineers, machine drawing and production drawing for mechanical engineers, circuit diagrams for electrical and electronics engineers, computer graphics for one and all.

Course Objectives:

1. To create awareness and emphasize the need of Python Programming and drafting, among the students from all branches of engineering.
2. To enable students to understand the concepts of dimensioning, conventions and international & Indian standards related to engineering drawing.
3. To develop imagination of physical objects, to be presented on paper / on computer screen.
4. To explain about the standard principles of orthographic projections of objects.
5. To visualize and represent isometric view of an object.

Course Outcomes (COs):

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

1. **Explain** the fundamentals of Engineering Drawing conventions as per international standards using basic principles of geometric construction and apply the method of Projections to draw projections of points and lines.
2. **Apply** the method of Projections, to solve problems on plane geometrical figures.
3. **Construct** various engineering curves with practical illustrations and draw the development of the lateral surface of different solids.
4. **Apply** the concept of orthographic projection of an object to draw several 2D views for visualizing the physical state of the object, using first angle method of projection.
5. **Apply** the visualization skill to draw an isometric (3-dimensional pictorial drawing) from given orthographic views.

Syllabus		
Unit No.	**Description**	**Hrs.**
1	**Projection of Points and Lines:** **Theory of projection**- Concept of object, observer, and plane of projection. Principle planes of projection- Horizontal plane (HP), Vertical Plane (VP), Profile plane (PP), Quadrant system, Projection of point in all four quadrants, and detail analysis of a point in 1st quadrant-all possible cases. **Projection of Lines**: Projection of line in first quadrant only-all cases viz. Line parallel to both reference planes, Line parallel to one and perpendicular to other reference plane, Line inclined to one and parallel to other reference plane, and Line inclined to both reference plane (Oblique Line). Traces of a line (To locate only H.T and V.T). **Note:** **1) Location of H.T and V.T are to be included only in practical assignments.** **2) Numerical on oblique lines only are to be asked in examination**	6
2	**Projection of Planes:** **Basic geometric construction:** To divide a line in equal parts, to divide a circle in equal parts, to draw regular triangles (right angled, equilateral and isosceles) and regular polygons such as square, rectangle, rhombus, pentagon, hexagon etc. Projection of different types of planes (such as circle, triangle, rectangle, square, pentagon & hexagon) by **first angle method of projection**, using **Reference plane method (also called as Change of position method)** and **Auxiliary plane method.** Planes resting on H.P only and also inclined to both reference planes (Oblique Plane). Finding True shape of a plane and angles made by a plane surface with both reference planes i.e. HP & VP. **Note**: **Problems on true shape of a plane will be covered in practical assignment only**	6
3	**Engineering Curves & Development of Lateral Surfaces of solids** **(A) Conics:** Construction of Ellipse, Parabola and Hyperbola by Focus-Directrix method and Rectangle method only. Helix on a cylinder and cone-for one convolution only, Involute, cycloid for a circle and Archimedean spiral- for one convolution only. **(B) Development of Lateral Surfaces of solids:** Introduction to different solids such as cone, cylinder, pyramid, prism, and their related terminology. Development of lateral surfaces of **cut sections** of above solids, using **parallel line** and **radial line method**.	6
4	**Orthographic Projections** Theory of projections- First angle and Third angle method of projections, types of projections, and Orthographic projection of simple objects placed in first quadrant only, using 1st angle method of projection. Types of sections and sectional orthographic projections. **Note: Only full sectional orthographic view to be asked in examination**	6
5	**Isometric Projections** Introduction to Isometric Projections-Concept of Isometric axes, origin, isometric and non-isometric lines, isometric and non-isometric surfaces, isometric scale, difference between isometric view and isometric projection, Construction of isometric plane surfaces such as square, rectangle, triangle, pentagon and hexagon (using dimension transfer technique) and circle (using 4-center method). Problems on Isometric views of simple solids and objects-consisting features such as corner radius or fillets, through/blind holes, ribs, slots – rectangular and dovetail etc.	6

List of practical assignments (Term work):

Two numerical each, on every unit, is to be solved on **A2 size (half imperial) sheet**, to be submitted as **term work**, by the students.

Fundamentals of Engineering Drawing: (2 Hrs)

Introduction to **ISO, BIS (SP 46:2003) and ASME standards** for engineering drawings, various drawing instruments, Drawings sheets and sheet layout-with details of Title block, Type of lines and their applications, Dimensioning- Terminology, Systems of dimensioning (Aligned and Uni-directional), Methods of dimensioning (Parallel, chain, and combined dimensioning), Rules of dimensioning. **Introduction to any drafting software.**

Assignment Sheet no.1: **(2 Hrs)**

Two numerical on projection of Lines (**Oblique lines only with traces**)

Assignment Sheet no.2: **(2 x 2 Hrs = 4 Hrs)**

Two numerical on projection of Planes (One **numerical on true shape is mandatory**)

Assignment Sheet no.3: **(2 x 2 Hrs = 4 Hrs)**

Two numerical on development of lateral surface of cut sections of solids (**one numerical using parallel line development method and one using Radial line development method**).

Assignment Sheet no.4: **(3 x 2 Hrs = 6 Hrs)**

Two numerical on Orthographic projections of solids (**One view compulsory to be drawn as sectional view.**) Introduction to Auto-CAD and its basic commands with solution of any one problem using Auto-CAD

Assignment Sheet no.5: **(3 x 2 Hrs = 6 Hrs)**

Two numerical on Isometric projections (containing **all standard features of solid objects**) Solution of any one problem using Auto-CAD.

Learning Resources:

Text Books:

1. Bhatt N.D, and Panchal, V.M (2016)," Engineering Drawing", Charotar publications, Anand, India.
2. K. Venugopal., (2015)," Engineering and Graphics", New Age International, New Delhi.
3. Jolhe, D. A., (2015)," Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi.

Reference Books:

1. Madsen, D. P. and Madsen, D. A., (2016), "Engineering Drawing and design", Delmar Publishers Inc., USA.
2. Dhawan, R. K., (2000), "A Textbook of Engineering Drawing", S. Chand, New Delhi.
2. Luzadder, W. J. and Duff, J. M., (1992), "The Fundamentals of Engineering Drawing: with an introduction to Interactive Computer Graphics for Design and Production", Peachpit Press, USA.

Online Resources:

1. Engineering Graphics and Design, Prof. Naresh Varma Datla, Prof. S. R. Kale, IIT Delhi https://onlinecourses.nptel.ac.in/noc21_me128/preview
2. Introduction and Geometric Construction https://archive.nptel.ac.in/content/storage2/courses/112103019/module1/lec3/1.html
3. Computer Aided Design and Manufacturing, Dr. Anoop Chawala, Dept of Mechanical, IIT, Delhi https://archive.nptel.ac.in/courses/112/102/112102101/

CO-PO Mapping (Engineering Drawing)											
Program Outcomes (PO)											
Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	1	1	1	2	1	2
CO2	3	3	2	2	1	1	1	1	2	1	2
CO3	3	2	3	2	1	1	1	1	2	1	2
CO4	3	2	3	2	3	1	1	1	3	1	2
CO5	3	3	3	2	3	1	1	1	3	1	2

CO-PSO Mapping (Engineering Drawing)																		
Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	1	2	3	2	1	2	1	2	1	1	1	2	1	1	1	1	1
CO2	1	2	2	3	3	1	2	1	2	2	1	2	2	2	1	1	1	1
CO3	2	3	3	3	3	2	3	2	3	1	2	2	1	2	1	2	2	1
CO4	3	3	3	3	3	2	3	3	3	2	2	3	2	3	2	2	3	1
CO5	3	3	3	3	3	3	3	3	3	2	2	3	2	3	2	2	3	1

Program	F.Y. B. Tech.							
Course	Engineering Practices (Common)					Semester		I/II
Code	VSEC SH113	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		1	--	2	--	--	50	--	--

Course Pre requisites:

Basic Sciences, Drawing

Course Objectives:

1. To acquire the basic knowledge of workshop safety, machine tools and basics of various manufacturing processes.
2. To impart basic understanding of 3D printing machine and its operations.
3. To get acquainted with the concept of electrical wiring.
4. To impart the basics of printed circuit boards (PCBs) and electronic components
5. To learn about computer hardware components, their compatibility, and the practical skills required to assemble a fully functional PC.

Course Outcomes:

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

CO1: Illustrate workshop safety measures and different types of tools, machinery commonly found in a workshop to develop proficiency in various cutting techniques such as sawing, shearing, and laser cutting.

CO2: Apply 3D Printing Technology including setup, operation, and post-processing to print simple mechanical component.

CO3: Construct the simple residential electrical wiring system.

CO4: Apply different fabrication techniques to build PCB and test the functionality of a simple electronics circuit.

CO5: Explain computer hardware components and successfully assemble a PC based on specific configurations.

Syllabus

Unit No.	Description	Hrs.
1	Introduction of Workshop safety practices, Causes of Accidents, General Safety Rules, Safety Signs and symbols, First aids, Basic of manufacturing operations/processes, Classifications of operations and their types, Equipment's for operations (its Demonstration).	3
2	Introduction of additive manufacturing, Construction and operation of 3D printers, types of additive methodologies, CAD modelling & Programming for model making.	3
3	Components and accessories for electrical wiring, Types of insulated wires & wiring systems, concealed conduit electrical wiring systems, Introduction to single light and fan wiring circuits, Types of illumination System.	3
4	Introduction to PCB: Definition and components of a PCB, Types of PCB. PCB design process. Introduction to design software, placing electronic components on PCB, different types of soldering techniques and materials, safety precautions while soldering, Testing and debugging using a multimeter and oscilloscope to analyze signals and troubleshoot the circuits. Basics of printed electronics, Simple electronic circuit fabrication using screen printing process.	3
5	Hardware understanding of computers, dual-booting, memory partitioning between the 2 Operating systems, Basic Software Installations	3

List of laboratory experiments:

(Any four experiments from Sr. No. 1 to 6. Any Two experiments from Sr. No. 7 to 10. Experiments Sr. No. 11, 12 and 20 are compulsory. Any Two experiments from Sr. No. 13 to 15. Any Two experiments from Sr. No. 16 to 19)

1. Draw a typical layout of workshop with arrangement of equipment is considering a specific application. Identify and explain the following safety related consideration,
   - Potential hazards present in workshop
   - General workshop safety rules and guidelines
   - List various safety devices used in workshop
2. Develop any Mechanical Component using the tools available in the workshop OR develop any 2 jobs related to Fitting/Carpentry/Sheet metal Fabrication.
3. Demonstration (construction and operation) of any one advanced machine tool such as CNC turn / mill, VMC, plasma arc machining, Laser cutting, CNC wood router etc.
4. Demonstration of different joining processes for metal rods, plates and sheet metal. To make Lap joints, butt joints or T joints using metal joining techniques.
5. Create simple 3D models using CAD software and print using 3D printer including pre and post processes (Component manufactured should be related to specific branch)
6. Demonstration of different piping connections, plumbing techniques in GI, PVC, UPVC, CPVC fittings.
7. Control of Two Lamps (one tube and one fan) by two switches independently.
8. Wiring of 40 W tube, LED lamps and Fan regulator.
9. Prepare the test board/extension board and mount accessories like lamp holders, various switches, sockets, MCBs, indicating lamps, etc.
10. To build the circuit of ±12 V or ±5 V regulated power supply.
11. Design and fabricate a printed circuit board (PCB) using standard Simulation tool and manufacturing technique
12. Assemble electronic components on a PCB using soldering techniques.
    A small Project: Build and test a Simple electronic Circuit on PCB (e.g. a simple LED blink circuit, a voltage divider circuit etc)
13. KYC (Know Your Computer) —
    - Detailed understanding about computer hardware.
    - How to assemble a PC as per your required configuration
14. Configure your PC - OS (Operating system) Installation (Windows and Linux), Dual booting by adding Linux.
15. Necessary Software Installation and Evaluation
16. Designing a Basic Circuit Board
17. Lithography Practical: Creating a Pattern
18. Prepare Simple circuit on Flexible substrate using Conductive ink and using screen printing technique.
19. Prepare Simple circuit on Flexible substrate/rigid using Conductive ink and inkjet printing machine.

Learning Resources:

Text Books:

1. H.S.Bawa, "Workshop Practice", Tata McGraw Hill Education (Publisher)
2. S. K. Hajra Choudhary, Nirjhar Roy, "Element of Workshop Technology: Vol.1 and 2", Media Promoters and Publishers Pvt. Ltd., 15th Edition, 2012
3. Uppal S. L. Electrical Wiring - Estimating & Costing. India, Khanna, 1987.
4. Printed Circuit Board Design, Fabrication, Assembly, and Testing – R. S. Khandpur
5. Computer Organization – V. Rajaraman & T. Radhakrishnan- PHI publication

Reference Books:

1. Mikell P. Groover, "Introduction to Manufacturing Processes", Wiley Publications
2. John, K. C., "Mechanical Workshop Practice", Prentice Hall Publication, New Delhi
3. Chua Chee Kai, Leong Kah Fai, "3D Printing and Additive Manufacturing: Principles & Applications", 4th Edition, World Scientific, 2015.
4. Automation, Production system & Computer Integrated manufacturing, M. P. Groover Person India, 2007, 2nd edition.
5. Arora B.D. Electrical Wiring - Estimating & Costing. New Heights Publication, New Delhi, 1992.
6. Schroeder, Chris., PCB Design for Real-World Design. Switzerland, Newnes, 1998.
7. Sinha, Pradeep K., and Sinha, Priti. Computer Fundamentals. India, BPB Publications, 2004.

Online Resources:

1. NPTEL Course on Fundamentals of Additive Manufacturing Technologies by Prof. Sajan Kapil, IIT Guwahati https://onlinecourses.nptel.ac.in/noc21_me115/preview
2. NPTEL Course on Fundamentals of Industrial safety by Prof. Thomas, IIT Madras https://www.youtube.com/watch?v=3VReVbsmjKI
3. NPTEL Course on Computer Numeric Control of Machine Tools and Processes by Prof. A. Roy Chaodhary, IIT Kharagpur https://www.youtube.com/watch?v=ImtSsDLgAaI&list=PLSGws_74K01KX9YtVZACpOoFYy6oaJIC
4. Computer Organization and Architecture, IIT Guwahati https://nptel.ac.in/courses/106103068
5. Installing windows: https://www.youtube.com/watch?v=djqrTRA9v0E
6. Dual booting by adding Linux: https://www.youtube.com/watch?v=tEh1RfmbTBY

CO-PO Mapping (Engineering Practices)

Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	-	2	-	2	1	2	1	-	-	2
CO2	3	1	3	1	3	-	1	1	-	-	2
CO3	1	-	-	-	-	1	1	1	2	-	2
CO4	2	-	-	-	-	1	-	1	1	1	2
CO5	1	-	-	1	-	1	1	1	-	-	2

CO-PSO Mapping (Engineering Practices)

Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	1	-	2	1	-	-	-	-		-	-	-
CO2	-	-	1	-	1	-	2	2	2	1	-	-	-	-	1	-	-	-
CO3	-	-	2	-	-	-	3	2	1	-	-	-	-	-	-	-	-	-
CO4	-	-	1	-	-	-	3	3	1	-	-	-	-	-	-	-	-	-
CO5	-	-	1	-	-	--	2	3	1	-	-	1	-	-	1	-	-	-

Program	F. Y. B. Tech.							
Course	Indian Knowledge System (Common)					Semester		II
Code	IKS SH114	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme	
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		2	--	--	--	--	50	--	--

Course Objectives:

1. Introduce students to the foundational concepts of Indian knowledge systems and their significance.
2. Familiarize students with key historical events and timelines in Indian history.
3. Provide an overview of Indian philosophical traditions and their contemporary relevance.
4. Explore significant scientific achievements of ancient India through the study of texts, discoveries, and inventions.
5. Examine the contributions of ancient Indian engineering in metallurgy, materials science, and architectural techniques.

Course Outcomes:

CO1: Analyze historical sources to interpret India's scientific legacy and to collaborate on structured research projects.

CO2: Identify India's scientific advancements to evaluate their global influence using research-based methods.

CO3: Apply ancient Indian mathematical and astronomical concepts to solve practical problems using modern tools or simulations.

CO4: Investigate the scientific achievements of the Sindhu-Saraswati Civilization to evaluate their impact on modern science through collaborative inquiry.

CO5: Examine ancient Indian urban planning and military strategy to evaluate their influence on governance and defense systems through team-based projects.

Syllabus

Assignment No.	Description	Hrs.
1	**Key Events in Indian Scientific History:** **Task:** • Research and present on a key date or event in Indian history related to astronomy, mathematics, geometry, or science. • Explain its significance and how it contributed to the Indian Knowledge System. **Example Topics:** • Aryabhata's discovery of zero and planetary motion (499 CE) • Varāhamihira's astronomical contributions (6th century CE) • The construction of Jantar Mantar and its importance in observational astronomy (1724 CE) • Boudhayan's Sulba Sutras and their role in early geometry (800 BCE) • Metallurgical advancements: The Iron Pillar of Delhi and rust-resistant iron (4th century CE) **Deliverable:** A PowerPoint presentation (8-10 slides) summarizing the event, historical significance, and scientific impact. **Learning Outcome:** Enhances research skills and historical understanding of India's scientific legacy.	6

2	**Scientific Inventions/ Discoveries from Ancient India:** **Task:** • Research and prepare a presentation or report on a significant scientific discovery or technological invention from ancient India. • Discuss who discovered it, how it was applied, and its impact on later scientific developments. **Example Topics:** • Brahmagupta's contributions to algebra and the concept of zero • Sushruta's pioneering work in surgery and medicine • The concept of infinite series in Indian mathematics (Madhava series) • The construction techniques behind stepwells and ancient water management systems • Panini's grammatical rules as an early form of computational linguistics **Deliverable:** A detailed report (5-7 pages) OR a PowerPoint presentation (8-10 slides). **Learning Outcome**: Enhances knowledge of India's scientific advancements and their global influence.	6
3	**Geometry s Astronomy in Ancient India:** **Task:** • Explore the geometric and astronomical knowledge of ancient Indian scholars. • Select a specific mathematical or astronomical concept and explain: - How ancient Indian scholars formulated it - How it was applied in temples, architecture, or timekeeping - Modern relevance of the concept **Example Topics:** • The role of the Sulba Sutras in early geometry • The trigonometric advancements by Aryabhata and Bhaskara • Astronomical observations and planetary motion in Surya Siddhanta • The use of Pi (π) in ancient Indian calculations • The alignment of ancient Indian temples with celestial bodies **Deliverable:** A hands-on model, an infographic, OR a video explanation (3-5 min) demonstrating the concept. **Learning Outcome:** Improves analytical skills and practical application of ancient Indian mathematics and astronomy.	6
4	**Exploration of the Sindhu-Saraswati Civilization:** **Task:** • Students will research and analyze different aspects of the Sindhu-Saraswati Civilization (Indus Valley Civilization) focusing on urban planning, architecture, water management, metallurgy and mathematics. • Each student or group must select one of the following topics and prepare a detailed report, presentation, or model showcasing their findings. **Topics to Choose from:** • Urban Planning and Architecture • Water Management and Hydraulic Engineering • Metallurgical and Technological Advancements • Mathematics and Standardized Measurement Systems **Deliverable Options (Choose One):** • Detailed Report (5-7 pages): Must include diagrams, references, and analysis of the chosen topic. • Presentation (8-10 slides): Should explain key findings with visuals, maps, and comparisons to modern advancements.	6

	• Physical or Digital Model: A 3D representation (physical or software-based) of city planning, water management, or an artifact reconstruction. • Infographic or Timeline Poster: Visually represents key developments and contributions of the civilization. **Learning Outcome:** • Understand the scientific and technological achievements of the Sindhu-Saraswati Civilization. • Develop research and analytical skills in engineering, mathematics, and archaeology. • Improve presentation, teamwork, and problem-solving skills. • Foster appreciation for ancient Indian contributions to modern science and technology.	
5	**Kautilya's Artha Shastra – Warfare and Town Planning** **Task:** • Study Arthashastra's key principles related to warfare and urban planning. • Identify and summarize at least three key concepts that influenced ancient Indian cities and military strategies. • Choose a historical Indian city (e.g., Takshashila, Pataliputra, or Jaipur) and analyze its fortification, zoning, and infrastructure. • Compare Kautilya's principles with modern urban planning concepts, such as smart cities, military defense strategies, or economic hubs. • Analyze Kautilya's military strategies such as espionage, psychological warfare, and fortification techniques. • Apply these concepts to a modern or historical battle, demonstrating their relevance in contemporary defense strategies. • Present findings as a PowerPoint presentation, infographic, or strategic model. **Example Topics:** • Arthashastra's Fortification Strategies vs. Modern Defensive Architecture • Espionage in Ancient Warfare: Kautilya's Spying Techniques Compared to Modern Intelligence Agencies • Water Management and Sanitation Systems in Ancient Cities vs. Smart Cities Today • Trade and Economic Planning in Ancient Indian Cities vs. Modern Special Economic Zones (SEZs) • Urban Zoning and Road Networks in Ancient India and Their Impact on Modern City Planning • Deliverables: **Written Report (1500-2000 words):** Must include diagrams, historical references, and modern comparisons. **Presentation or Model:** 3D town layout, strategic simulation, or city planning analysis. **Learning Outcome:** • Develops critical thinking in urban planning and military strategy. • Strengthens research and analytical skills. • Enhances understanding of ancient Indian contributions to governance and defense.	6

Activities: (Any Two)

Activity 1: Mathematical Engineering of the Indus Valley Civilization
Activity 2: Astronomy and Timekeeping in Ancient India
Activity 3: Decoding Zero – The Evolution of Indian Mathematics
Activity 4: The Engineering Behind Stepwells and Ancient Water Management
Activity 5: Ancient Indian Metallurgy – The Science of Rust-Free Iron
Activity 6: Ancient Indian Algorithms and Computational Thinking

Case Studies for Indian Knowledge System (IKS) for Engineering Students (Any One)

- Case Study 1: Jantar Mantar – India's Astronomical Engineering
- Case Study 2: Lost-Wax Casting in Ancient Indian Metallurgy
- Case Study 3: Vedic Fire Altars – Geometrical Precision in Rituals
- Case Study 4: Water Harvesting in Stepwells and Tank Systems
- Case Study 5: Indian Shipbuilding and Maritime Innovations
- Case Study 6: Temple Building Techniques – Location, Materials, and Architectural Planning

Learning Resources:

Text Books:

1. Exploring the Indian Knowledge System: Insights from Prof. B Mahadevan, Prof. B Mahadevan, 1. IIM Bengaluru Press Curriculum Structure & Syllabi (R-2024) - B. Tech in Information Technology 149 Kapur K and Singh A. K (Eds) 2005).
2. Indian Knowledge Systems, Vol. 1. Indian Institute of 2. Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay,1995.
3. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008

Reference Books:

1. Reshmi ramdhoni, Ancient Indian Culture and Civilisation, star publication ,2018
2. Supriya Lakshmi Mishra, Culture and History of Ancient India (With Special Reference of Sudras), 2020.
3. DK Chakrabarty, Makkhan Lal, History of Ancient India (Set of 5 Volumes), Aryan book Internation publication, 2014

CO-PO Mapping (Indian Knowledge System)											
	Program Outcomes (PO)										
Course Outcomes (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	3	-	2	-	2	1	1	2	2	2
CO2	3	2	-	-	-	2	1	-	1	1	2
CO3	3	3	2	2	2	-	-	-	1	1	2
CO4	2	2	-	2	-	2	1	1	2	2	3
CO5	2	3	-	2	-	3	1	1	1	2	2

Program	F. Y. B. Tech.							
Course	Python Programming (Common)					Semester		II
Code	PCC SH115	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme		
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		1	-	2	-	-	50	--	--

Course Pre requisites:

- Basics of Computers and Basic Mathematics
- Fundamentals of Programming Languages

Course Objectives:

1. To introduce the fundamental concept of Python programming.
2. To impart knowledge of decision-making statements and looping statements in Python.
3. To familiarized about Functions, Modules and Packages in Python.
4. To acquaint with the use and benefits of string and files handling in Python.
5. To expose learners to various features of Object-Oriented Programming using Python.

Course Outcomes: The students will be able to

CO1: **Use** basic Python syntax and Data types.
CO2: **Illustrate** Decision control statements.
CO3: **Construct** functions and Modules.
CO4: Make **Use** of String and File concepts in python programming.
CO5: **Apply** Object Oriented concepts in Python.

Syllabus

Unit No.	Description	Hrs.
1	**Fundamental concept of Python Programming and Advance Data Types** **Basics of Python Programming:** Features of Python, History and Future of Python, Programming Paradigm, Applications of Python Languages. **Advance data types-** Tuples, Lists, Sets and Dictionary.	3
2	**Decision Control Statements** **Decision Control Statements:** Decision control statements, Selection/ conditional branching Statements: if, if-else, nested if, if-elif-else statements. **Basic loop Structures/Iterative Statements:** while loop, for loop, selecting appropriate loop. Nested loops, the break, continue, pass, else statement used with loops.	3
3	**Functions, Modules and Packages** **Function:** definition, call, variable scope and lifetime, the return statement. Lambda or anonymous function, documentation string, good programming practices. **Modules:** Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.	3
4	**String and File Handling** **Strings and Operations-** concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. Slice operation, ord() and chr() functions, in and not in operators, comparing strings, Iterating strings, the string module. **Files**: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. File Positions, Renaming and deleting files, Directory Methods.	3

5	**Structured and object oriented:** Features of Object-oriented programming-classes, objects, methods and message passing, inheritance, polymorphism, containership, reusability, delegation, data abstraction and encapsulation. **Classes and Objects:** classes and objects, class method and self-argument, __init__() method, class variables & object variables,public & private members.	3

List of Practicals (Any 10 laboratory Experiments):

1. Program to convert degree Fahrenheit into degree Celsius.
2. To calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions.
3. Program to calculate the sum and average of first 10 numbers.
4. Program to find whether the given number is an Armstrong number or not.
5. Program to print the multiplication table of n, where n value is entered by user.
6. Program that counts the occurrences of a character in a string. Do not use built in function.
7. Program to reverse of string by user defined function.
8. Write a python program that accepts a string from user and perform following string operations a) Calculate length of string b) String reversal
9. Write a python program that accepts a string from user and perform following string operations a) Equality check of two strings b) Check substring
10. Program to open a file and print its attribute values.
11. Program to append data to an already existing file.
12. Program to illustrating the use of __int__() method.
13. Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a) total number of employees in an organization b) count of male and female employee c) Employee with salary more than 10,000 d) Employee with designation "Asst Manager"

Mini Project (Any One)

1. Program that simulates rolling dice. When the program runs, it will randomly choose a number between1 and 6 (Or another integer you prefer). Print that number. Request user to roll again. Set the min and max number that dice can show. For the average die, that means a minimum of 1 and a maximum of 6.
2. Guess Number: Randomly generate a number unknown to the user. The user needs to guess what that number is. If the user's guess is wrong, the program should return some sort of indication as to how wrong (e.g. the number is too high or too low). If the user guesses correctly, a positive indication should appear. Write functions to check if the user input is an actual number, to see the difference between the inputted number and the randomly generated numbers, and to then compare the numbers.

Learning Resources:

Text Books:

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
2. R. Nageswara Rao, "Core Python Programming", Dream tech Press; Second edition ISBN10:938605230X, ISBN-13: 978-9386052308 ASIN: B07BFSR3LL

Reference Books:

1. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edtn., ISBN:978-93-5213-482-3
2. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN: 10:9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
3. Jeeva Jose, P. Sojan Lal, "Introduction to Computing & Problem Solving with Python", Khanna Computer Book Store; First edition, ISBN-10: 9789382609810, ISBN-13: 978-9382609810

Online Resources:

1.Python for Engineers by Prof. Madhavan Mukund, IIT Madras, NPTEL IIT Madras
https://nptel.ac.in/courses/106106145

CO-PO Mapping											
Course Outcomes (CO)	Program Outcomes (PO)										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	2	-	-	-	-	-	2
CO2	2	2	1	1	2	-	-	-	-	-	2
CO3	2	2	1	1	2	-	-	-	-	-	2
CO4	2	2	1	1	2	-	-	-	-	-	2
CO5	2	2	1	1	2	-	-	-	-	-	2

CO-PSO Mapping (Python Programming)																		
Course Out comes (CO)	Program Specific Objectives (PSO)																	
	EL			PP			ET		ME		CE			IT		AI		
	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO1	PSO2	PSO3	PSO1	PSO2	PSO1	PSO2	PSO3
CO1	1	1	2	-	-	-	-	1	-	1	1	1	1	1	-	2	1	1
CO2	1	1	2	-	-	-	-	1	-	1	1	1	1	1	-	2	1	-
CO3	1	1	2	-	-	-	-	1	-	1	1	1	1	1	-	2	1	-
CO4	-	-	1	-	-	-	-	2	-	1	1	1	1	1	1	2	1	-
CO5	-	-	1	-	-	-	-	2	-	1	1	1	1	1	-	1	1	-

Program	F. Y. B. Tech.							
Course	Co-Curricular Course- II (Common)					Semester	II	
Code	CCC SH116	Teaching Scheme (Hrs/Week)			Theory Examination Scheme		Laboratory Examination Scheme	
Credits	2	L	T	P	CCE	ESE	TW	PR	OR
		--	--	4	--	--	50	--	--

Course Objectives:

The objective of co-curricular course is to make learning a joyful experience for students. The course contents planned to raise the bar of academic standards with the active involvement and cooperation from students, academic and administrative units.

As per NEP-2020 statements "Education thus, must move towards less content, and more towards learning about how to think critically and solve problems, how to be creative and multidisciplinary, and how to innovate, adapt, and absorb new material in novel and changing fields. Pedagogy must evolve to make education more experiential, holistic, integrated, inquiry-driven, discovery-oriented, learner-centred, discussion-based, flexible, and, of course, enjoyable. **The curriculum must include basic arts, crafts, humanities, games, sports and fitness, languages, literature, culture, and values**, in addition to science and mathematics, to develop all aspects and capabilities of learners; and make education more well-rounded, useful, and fulfilling to the learner. Education must build character, enable learners to be ethical, rational, compassionate, and caring, while at the same time prepare them for gainful, fulfilling employment."

Course Outcomes:

The students will be able to…

CO1: **Recognise** and look within in search of own interests and hobbies.

CO2: Identify the meaning while exploring various fields.

CO3: Identify specific learning skill.

CO4: Adopt the techniques for balancing his regular schedule.

List of Co-Curricular Course Activities

Activity List-1	Activity List-2
1. Sketching & Painting	1. Industrial Safety
2. Dancing, Rhythm & Movement	2. Disaster Management
3. Theatre Arts	3. Empowerment Through Self defense (Women safety)
4. Short Film Making	4.Mentoring of School Children
5. Sports and Physical Fitness	5.Work life balance holistic Health
6. Art of Living	6.Values in Healthcare
7. Garden Design and Maintenance	7.Cyber Security
8. Personality Development	8.Introduction to Rajyoga meditation
9.Classical Singing	9.Self-management & Life skill management
10. Photography	10.Holistic Approach for Positive Powerful Inner health
11.Basics of Percussion Instruments	11.Creativity & Utilization
12.Culinary Arts: Basics of Cooking	12.NSS (National Service Scheme)
13. Yoga	13.Yoga for Wellbeing
14. Interior Design	14.Entrepreneurship (Govt Schemes & Opportunity)
15. Principle Centered Leadership	15.Financial Schemes for Business
16. Digital Wellness	16.Sports training & conditioning
	17.Corporate Event Management

* *The Principal of the Institute and HOD can take decision about incorporating Co-Curricular Course activities considering students' timely need and response.*

Term-Work Assessment:

- Active participation during the activity = 15 Marks
- Submission of reflections or assignment = 15 Marks
- Final test at the end of activity = 20 Marks
- **Total Marks = 50**

Guidelines of Co-Curricular Course Conduction:

- Course will be offered based on student choice & resources availability for conduction
- **Every student of Group-I** must choose any one activity from Activity List -1 in Semester-1 and any one activity from Activity List -2 in semester-2
- **Every student of Group-II** must choose any one activity from Activity List -1 in Semester-1 and any one activity from Activity List -2 in Semester-2
- Availability of activity is first come first serve basis. 36
- Once the maximum student capacity becomes full for any course, per activity = 30
- Every CCC activity is of two hours in a week and two hours for self-study in a week.
- Student must complete the schedule assigned by mentor of chosen activity.
- Syllabus for each course designed to provide a comprehensive overview, but it can be adapted and expanded based on the specific needs & interests of the students and professional experience of the instructor.
- As each course is unique in its nature and content, course mentor can adopt their own teaching methodologies and there are no hard constraints from the college as far as expected learning outcomes delivered.

CO-PO Mapping (Co-Curricular Course- II)											
	Program Outcomes (PO)										
Course Outcomes (CO)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	-	-	-	-	-	1	1	-	-	-	1
CO2	-	1	-	-	-	1	1	-	-	-	1
CO3	1	-	-	-	-	-	-	-	-	-	1
CO4	-	-	-	-	-	-	-	1	1	1	1