PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43

An Autonomous Institute affiliated to the Savitribai Phule Pune University
Approved by AICTE & Government of Maharashtra,
Accredited by NAAC (A+) & NBA [All eligible UG Programs]

First Year - Bachelor of Technology (F. Y. B.Tech.)

Department of Basic Sciences and Engineering

Curriculum Structure

(W.e.f. A.Y. 2024-25)

(Approved by the Board of Studies and Academic Council)

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

GROUP-1: Divisions FY-1 to FY-7

2 Weeks Student Induction Program (SIP)

SEMESTER-1

Course Type	Course Code	Name of the Course	Teaching Scheme (Hours/Week)				Credit Scheme				Examination/ Evaluation Scheme and Marks				
			L	P	T	Total	L	P	T	Total	CIE [20*]	ISE [20#]	ESE [60$]	TW	Total
BSC	F-001	Linear Algebra and Calculus (LAC)	3	-	1	4	3	-	1	**4**	20	20	60	25	125
BSC	F-003	Quantum Physics (QP)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
BSC	F-004	Quantum Physics Lab (QPL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
ESC	F-007	Mechanics for Robotics (MFR)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
ESC	F-008	Mechanics for Robotics Lab (MFRL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
ESC	F-009	Integrated Electrical and Electronics Engineering (IEEE)	2	-	-	2	2	-	-	**2**	20	20	60	--	100
ESC	F-010	Integrated Electrical and Electronics Engineering Lab (IEEEL)	-	2	-	2	-	1		**1**	-	-	-	25	25
PC	F-013	C Programming for Problem Solving (CPPS)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
PC	F-014	C Programming for Problem Solving Lab (CPPSL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
VSEC	F-017	FAB Lab (FL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
IKS	F-020	Indian Knowledge System (IKS)	1	-	1	2	1	-	1	**2**	25	-	-	25	50
CC	F-023	Cocurricular Activity-1 (CCA-1)	-	-	-	-	-	-	-	**1**	-	-	-	25	25
		Total	**12**	**10**	**2**	**24**	**12**	**5**	**2**	**20**	**125**	**100**	**300**	**200**	**725**

SEMESTER-2

Course Type	Course code	Name of the Course	Teaching Scheme (Hours/Week)				Credit Scheme				Examination/ Evaluation Scheme and Marks				
			L	P	T	Total	L	P	T	Total	CIE [20*]	ISE [20#]	ESE [60$]	TW	Total
BSC	F-002	Statistics and Integral Calculus (SIC)	3	-	1	4	3	-	1	**4**	20	20	60	25	125
BSC	F-005	Chemical Science and Technology (CST)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
BSC	F-006	Chemical Science and Technology Lab (CSTL)	-	2	-	2	-	1		**1**	-		-	25	25
ESC	F-011	Computer Graphics and Design (CGD)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
ESC	F-012	Computer Graphics and Design Lab (CGDL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
PC	F-015	Object Oriented Programming Using C++ (OOPC)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
PC	F-016	Object Oriented Programming Using C++ Lab (OOPCL)	-	2		2	-	1	-	**1**	-	-	-	25	25
VSEC	F-018	Innovative Idea and Design Thinking Lab (IIDTL)	-	2	-	2	-	1	-	**1**	-	-	-	50	50
VEC	F-019	Environment and Sustainable Engineering (ESE)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
AEC	F-021	Soft Skills	1	-	1	2	1	-	1	**2**	25		-	25	50
CC	F-022	NPTEL / SWAYAM / MOOCS	-	-	-	-	-	-	-	**I**	-	-	-	25	25
CC	F-024	Cocurricular Activity-2 (CCA-2)	-	-	-	-	-	-	-	**1**	-	-	-	25	25
		Total	**12**	**8**	**2**	**22**	**12**	**4**	**2**	**20**	**125**	**100**	**300**	**225**	**750**

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

GROUP-2: Divisions FY-8 to FY-13

2 Weeks Student Induction Program (SIP)

SEMESTER-1

Course Type	Course Code	Name of the Course	Teaching Scheme (Hours/Week)				Credit Scheme				Examination/ Evaluation Scheme and Marks				
			L	P	T	Total	L	P	T	Total	CIE [20*]	ISE [20#]	ESE [60$]	TW	Total
BSC	F-001	Linear Algebra and Calculus (LAC)	3	-	1	4	3	-	1	**4**	20	20	60	25	125
BSC	F-005	Chemical Science and Technology (CST)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
BSC	F-006	Chemical Science and Technology Lab (CSTL)	-	2	-	2		1		**1**	-		-	25	25
ESC	F-011	Computer Graphics and Design (CGD)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
ESC	F-012	Computer Graphics and Design Lab (CGDL)	-	2	-	2		1		**1**	-		-	25	25
PC	F-013	C Programming for Problem Solving (CPPS)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
PC	F-014	C Programming for Problem Solving Lab (CPPSL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
VSEC	F-018	Innovative Idea and Design Thinking Lab (IIDTL)	-	2	-	2	-	1	-	**1**	-	-	-	50	50
VEC	F-019	Environment and Sustainable Engineering (ESE)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
AEC	F-021	Soft Skills	1	-	1	2	1	-	1	**2**	25		-	25	50
CC	F-022	NPTEL / SWAYAM / MOOCS	-	-	-	-	-	-	-	**I**	-	-	-	25	25
CC	F-023	Cocurricular Activity-1 (CCA-1)	-	-	-	-	-	-	-	**1**	-	-	-	25	25
		Total	**12**	**8**	**2**	**22**	**12**	**4**	**2**	**20**	**125**	**100**	**300**	**225**	**750**

SEMESTER-2

Course Type	Course code	Name of the Course	Teaching Scheme (Hours/Week)				Credit Scheme				Examination/ Evaluation Scheme and Marks				
			L	P	T	Total	L	P	T	Total	CIE [20*]	ISE [20#]	ESE [60$]	TW	Total
BSC	F-002	Statistics and Integral Calculus (SIC)	3	-	1	4	3	-	1	**4**	20	20	60	25	125
BSC	F-003	Quantum Physics (QP)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
BSC	F-004	Quantum Physics Lab (QPL)	-	2	-	2		1	-	**1**	-	-	-	25	25
ESC	F-007	Mechanics for Robotics (MFR)	2	-	-	2	2	-	-	**2**	20	20	60	-	100
ESC	F-008	Mechanics for Robotics Lab (MFRL)	-	2	-	2		1	-	**1**	-	-	-	25	25
ESC	F-009	Integrated Electrical and Electronics Engineering (IEEE)	2	-	-	2	2	-	-	**2**	20	20	60	--	100
ESC	F-010	Integrated Electrical and Electronics Engineering Lab (IEEEL)	-	2	-	2		1	-	**1**	-	-	-	25	25
PC	F-015	Object Oriented Programming Using C++ (OOPC)	2	-	-	2	2	-	-	**2**	20	20	60	--	100
PC	F-016	Object Oriented Programming Using C++ Lab (OOPCL)	-	2	-	2		1	-	**1**	-	-	-	25	25
VSEC	F-017	FAB Lab (FL)	-	2	-	2	-	1	-	**1**	-	-	-	25	25
IKS	F-020	Indian Knowledge System (IKS)	1	-	1	2	1	-	1	**2**	25	-	-	25	50
CC	F-024	Cocurricular Activity-2 (CCA-2)	-	-	-	-	-	-	-	**1**	-	-	-	25	25
		Total	**12**	**10**	**2**	**24**	**12**	**5**	**2**	**20**	**125**	**100**	**300**	**175**	**725**

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

ABBREVIATIONS:

BSC	Basic Science Course	**L**	Lecture
ESC	Engineering Science Course	**P**	Practical
PCC	Program Core Course	**T**	Tutorial
VSEC	Vocational and Skill Enhancement Course	**CIE**	Continuous Internal Evaluation
AEC	Ability Enhancement Course	**ISE**	In semester Examination
VEC	Value Education Course	**ESE**	End-Semester Examination
IKS	Indian Knowledge Systems	**TW**	Term Work
CC	Co-curricular / Liberal learning Courses	**OR**	Oral
MOOCS	Massive Open Online Course		
SWAYAM	Study Webs of Active Learning for Young Aspiring Minds		
NPTEL	National Programme on Technology Enhanced Learning		
FY	First Year B.Tech.		

CIE [20*]	***Continuous Internal Evaluation:*** (Weightage for Attendance: 5, Activity Based Learning Evaluation: 15) The department shall declare the set of all applicable activities such as Problem Based Learning, Quizzes, Small Project, field work, group discussion, but not limited to etc. The course coordinator, in consultation with course teachers, shall select any of three to four activities suitable for the course (not less than two) from the list declared by the department and get the selected activities approved from HoD. The Course teacher shall get the activities carried out by students, evaluate the student performance based on the prescribed rubrics. Department shall prepare the rubrics for all the activities and display the same before the commencement of academics.
ISE [20$^{\#}$]	***In-Semester Examination:*** Written examination shall be conducted for one hour duration on First Module for 30 marks and will be converted to 20 marks while calculating the final result.
ESE [60$^{\$}$]	***End-Semester Examination:*** Written examination shall be conducted for two- and half-hour duration on Modules II, III, IV for 70 marks and will be converted to 60 marks while calculating the final result.

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

CREDIT DISTRIBUTION:

COURSE CATEGORY	COURSE TYPE	COURSE NAME	CREDITS
BSC / ESC [23]	Basic Science Course (BSC) [14]	Linear Algebra and Calculus (LAC)	4
		Statistics and Integral Calculus (SIC)	4
		Quantum Physics (QP)	2
		Quantum Physics Lab (QPL)	1
		Chemical Science and Technology (CST)	2
		Chemical Science and Technology Lab (CSTL)	1
	Engineering Science Course (ESC) [09]	Mechanics for Robotics (MFR)	2
		Mechanics for Robotics Lab (MFRL)	1
		Integrated Electrical and Electronics Engineering (IEEE)	2
		Integrated Electrical and Electronics Engineering Lab (IEEEL)	1
		Computer Graphics and Design (CGD)	2
		Computer Graphics and Design Lab (CGDL)	1
Program Courses [06]	Program Core Course (PCC) [06]	C Programming for Problem Solving (CPPS)	2
		C Programming for Problem Solving Lab (CPPSL)	1
		Object Oriented Programming Using C++ (OOPC)	2
		Object Oriented Programming Using C++ Lab (OOPCL)	1
Skill Courses [02]	Vocational and Skill Enhancement course (VSEC) [02]	Innovative Idea and Design Thinking Lab (IIDTL)	1
		FAB Lab (FL)	1
Humanities, Social Science and Management (HSSM) [06]	Ability Enhancement Course (AEC) [02]	Soft Skills (SS)	2
	Indian Knowledge System (IKS) [02]	Indian Knowledge System (IKS)	2
	Value Education Course (VEC) [02]	Environment and SustainableEngineering (ESE)	2
Liberal Learning Courses [03]	Co-curricularcourses (CC) [03]	NPTEL / SWAYAM / MOOCS	1
		Cocurricular Activity-1 (CCA-1)	1
		Cocurricular Activity-2 (CCA-2)	1
		TOTAL CREDITS	**40**

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

LINEAR ALGEBRA AND CALCULUS (LAC)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-001	CIE	20* M
TEACHING HRS. / WK	03	ISE	30 M [20# M]
TUTORIAL HRS./WK	01	ESE	70 M [60$ M]
CREDITS	04	TW	25 M
		TOTAL	125 M

PREREQUISITES

Derivatives, System of Linear Equations, Matrix Algebra.

COURSE OBJECTIVES

1. To make the students familiarize themselves with concepts and techniques in Matrices and Calculus.
2. To equip students with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in their disciplines.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F001-1: Solve system of linear equations, **examine** linear dependence of vectors, **express** linear and orthogonal transformations in matrix form and discuss its nature.

F001-2: Find eigenvalues and eigenvectors which are useful in the study of diagonalization. **Classify** quadratic forms as definite, semi-definite and indefinite.

F001-3: Determine the partial derivatives of functions of several variables and **discuss** its applications.

F001-4: Perform vector differentiation and **analyze** the vector fields.

COURSE CONTENTS

MODULE-I: MATRICES AND SYSTEM OF LINEAR EQUATIONS (10 Hrs)

Rank of a Matrix, System of Linear Equations, Linear Dependence, and Independence, Linear and Orthogonal Transformations, Applications to Electric Networks, Traffic Flow problems, Applications to Cryptography.

MODULE-II: EIGEN VALUES AND EIGEN VECTORS, DIAGONALIZATION (11 Hrs)

Eigen Values and Eigen Vectors, Cayley-Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal Transformations, Introduction to Singular Value Decomposition and its applications, Page Rank Algorithm.

MODULE-III: FUNCTIONS OF SEVERAL VARIABLES (10 Hrs)

Introduction to functions of several variables, Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivatives of Composite Function and Total Derivative using Chain Rule, Jacobian and its applications, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

MODULE-IV: VECTOR DIFFERENTIAL CALCULUS (08 Hrs)

Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

LIST OF TUTORIAL ASSIGNMENTS

1. Matrices and System of Linear Equations
2. Activity-1
3. Eigen Values and Eigen Vectors, Diagonalization
4. Functions of Several Variables
5. Activity-2
6. Vector Differential Calculus

Tutorial for the subject shall be engaged in minimum three batches per division. Term work shall consist of four assignments, one each on Module-I to Module-IV and two activities based on the performance and continuous internal assessment. Each assignment must contain a minimum of 5 and maximum 10 questions covering each topic from the module. Assignment must be written on the pages provided and in prescribed format only for uniform representation among students. Some of the assignments shall be solved using Python programming and simulation softwares.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, New Delhi.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th Edition.
4. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2nd Edition.
5. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition.
6. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).
7. Applied Mathematics (Vol. I & Vol. II) by P. N. Wartikar and J. N. Wartikar, Vidyarthi GrihaPrakashan, Pune.
8. Applications to Linear Algebra by Gilbert Strang, 4th Edition, Brooks/Cole Thomson Learning
9. Elementary Linear Algebra, Ron Larson, David C. Falvo (Houghton Mifflin Harcourt Publishing Company).

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. NPTEL Course on "Engineering Mathematics-I" https://nptel.ac.in/courses/111105121/ 2. NPTEL Course on "Basic Calculus-1" https://nptel.ac.in/courses/111/106/111106146/ 3. NPTEL Course on "Basic Linear Algebra" https://nptel.ac.in/courses/111/101/111101115/ 4. Faculty video lecture link https://docs.google.com/document/d/1QihJemWIqjy3K-m9CV4Pzzo2ZnyRO5-2/edit 5. PageRank Algorithm video lecture links https://www.youtube.com/watch?v=JGQe4kiPnrU
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Flipped Classroom 2. Online Interactive Tool 3. Collaborative and Individual Problem based learning 4. Quizzes/Assignment 5. Surprise Test, Open Book Test 6. Seminar, Presentation

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First Year B. Tech. Curriculum Structure
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STATISTICS AND INTEGRAL CALCULUS (SIC)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-002	CIE	20* M
TEACHING HRS. / WK	03	ISE	30 M [20# M]
TUTORIAL HRS./WK	01	ESE	70 M [60$ M]
TOAL CREDITS	04	TW	25 M
		TOTAL	125 M

PREREQUISITES

Permutation and Combination, Integration of standard functions, Partial derivatives.

COURSE OBJECTIVES

1. To build a strong foundation in statistics and probability theory.
2. To understand the theoretical foundations of hypothesis testing.
3. To develop an understanding of Fourier series.
4. To use advanced techniques for evaluating definite integrals.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F002-1: Explain statistical methods for data interpretation and data analysis, t**est** acceptance of hypothesis and **determine** differences between research results using ANOVA.

F002-2: Discuss probability theory for analysis and prediction of a given data.

F002-3: Express periodic functions in terms of Fourier series which will be useful for design and analysis of continuous and discrete systems.

F002-4: Use advanced techniques for evaluating definite integrals, **evaluate** multiple integrals in various coordinate systems and **apply** it to find area, volume, moment of inertia, and centre of gravity.

COURSE CONTENTS

MODULE-I: DESCRIPTIVE AND INFERENTIAL STATISTICS (12 Hrs)

Descriptive Statistics: Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Curve fitting: fitting of straight line, parabola, and related curves.

Inferential Statistics: Hypothesis Testing, Z-test, F-test, Chi-square test using single mean and variance, Point Estimate and Confidence Intervals for Sample Mean, Estimators for Sample Mean, Analysis of Variance (ANOVA), Removal of outliers using Median.

MODULE-II: PROBABILITY AND PROBABILITY DISTRIBUTIONS (09 Hrs)

Bayes' Theorem, Mathematical Expectation, Probability mass/density function,

Probability distributions: Binomial, Negative Binomial, Poisson, Normal, Gamma, Beta, Exponential Distributions.

MODULE-III: FOURIER SERIES (07 Hrs)

Definition, Dirichlet's conditions, Full range Fourier series, Half-range Fourier series, Harmonic analysis, Parseval's identity and Applications to problems in Engineering.

MODULE-IV: INTEGRAL CALCULUS (11 Hrs)

Special Functions of Integral Calculus: Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign and Error Functions.

Multiple Integrals and Their Applications: Double and Triple integrations, change of order of integrations, Applications to find Area,Volume, Mass, Center of Gravity, and Moment of Inertia.

LIST OF TUTORIAL ASSIGNMENTS

1. Descriptive and Inferential Statistics
2. Activity-1
3. Probability and Probability Distributions
4. Fourier Series
5. Integral Calculus
6. Activity-2

Tutorial for the subject shall be engaged in minimum three batches per division. Term work shall consist of four assignments, one each on Module-I to Module-IV and two activities based on the performance and continuous internal assessment. Each assignment must contain a minimum of 5 and maximum 10 questions covering each topic from the unit. Assignment must be written on the pages provided and in prescribed format only for uniform representation among students. Some of the assignments shall be solved using Python programming and simulation software's.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, New Delhi.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 10th Edition.
4. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2nd Edition.
5. Peter V. O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition.
6. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Elsevier Academic Press.
7. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).
8. Applied Mathematics (Vol. I & Vol. II) by P. N. Wartikar and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune.

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First Year B. Tech. Curriculum Structure
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WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
1. NPTEL Course on "Foundation of Data Science" https://onlinecourses.swayam2.ac.in/imb24_mg31/announcements?force=true 2. NPTEL Course on "Data Science for Engineers" https://onlinecourses.nptel.ac.in/noc24_cs53/announcements?force=true 3. NPTEL Course on "Multivariable Calculus" https://onlinecourses.nptel.ac.in/noc24_ma33/preview
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Flipped Classroom 2. Online Interactive Tool 3. Collaborative and Individual Problem based learning 4. Quizzes/Assignment 5. Surprise Test, Open Book Test 6. Seminar, Presentation

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QUANTUM PHYSICS (QP)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-003	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Theories of light, Dual nature of radiation & matter, basics of magnetism and semiconductors.

COURSE OBJECTIVES

1. Identify different types of lasers and optical fibers, explaining their operating principles, characteristics, and applications in different sectors.
2. Insight into Magnetism, Superconductivity, and Data Storage principles, wireless charging, and the concepts related to superconductivity, including zero electrical resistivity.
3. Understanding the principles of quantum mechanics, covering quantum tunnelling, superposition, entanglement, and their applications in quantum computing.
4. Understand key concepts in Nanotechnology

COURSE OUTCOMES

After completion of this course, student shall be able to:

F003-1: Apply principles of lasers and optical fibers for transmission of data in fibre optic communication system.

F003-2: Discuss technological developments in magnetism and superconductors and their emerging applications.

F003-3: Associate superposition and quantum entanglement with quantum computing.

F003-4: Describe quantum confinement effect and its role in size-dependent properties at nanoscale and **explain** its applications in quantum information science.

COURSE CONTENTS

MODULE-I: LASER & OPTIC FIBRE **(07 Hrs.)**

Interaction of radiation with matter, Einstein's coefficients A & B, Pumping, population inversion with Boltzmann equation, metastable state, optical cavity, characteristics of the laser, Applications ofthe laser. Principle of light transmission in optical fibre, its types, Numerical aperture, acceptance cone, Optical fibre communication system, and advantages.

MODULE-II: MAGNETISM AND SUPERCONDUCTIVITY **(06 Hrs.)**

Origin of magnetism in materials, Magnetic moment, Bohr magneton, Choice of materials for data storage, Magnetic data storage, wireless charging, Superconductivity, zero electrical resistivity, four probe arrangement for its confirmation, Types, The Meissner effect, perfect diamagnetic behavior of superconductors. Superconducting magnetic energy storage, electromagnets

MODULE-III: QUANTUM COMPUTING **(07 Hrs.)**

Principles of quantum mechanics, Quantum tunnelling, tunnel diode, Superposition and entanglement, Qubits, quantum gates and circuits, Building blocks of Quantum Computer, Quantum information theory and cryptography, Applications of quantum computing.

MODULE-IV: NANOTECHNOLOGY **(06 Hrs.)**

Definition of nanotechnology, Quantum confinement effect, surface-to-volume ratio, Quantum dots andwires, their synthesis and applications, Optical properties, optoelectronics, SET Quantum dot solarcell and QLED displays, Magnetic properties, spintronic devices, and Quantum Dots as Platforms for Quantum Information Science.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Engineering Physics by M. N. Avadhanulu
2. Quantum Physics of atoms, molecules, and nuclei by Resnik & Iceberg
3. Nanotechnology: Principles & Practices by Sulbha Kulkarni
4. Introduction to Quantum Computing by Ray LaPierre
5. Introduction to Quantum Computing: From a Layperson to a Programmer in 30 Steps by Todd Wildey.
6. Quantum Computing for Everyone by Chris Bernhardt

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL
2. Phys.org
3. The Physics Classroom
4. HyperPhysics Concepts (gsu.edu)
5. Virtual Labs | Physical Sciences (vlab.co.in)

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

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QUANTUM PHYSICS LAB (QPL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-004	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Atomic energy levels, total internal reflection, black body emission spectrum, Plank's law.

COURSE OBJECTIVES

1. To impart knowledge of particle nature of light.
2. To study the quantum theory of light.
3. To learn electrical properties of semiconductors.
4. To study the arrangement of energy bands in the solid.
5. To understand photovoltaics effect and its role in optical to electrical energy conversion.

COURSE OUTCOMES

After completion of this course, student shall be able to

F004-1: Apply the laws of diffraction to calculate the thickness of a wire/hair and the emission wavelengths of mercury.
F004-2: Calculate the numerical aperture and measure attenuation in optical fiber.
F004-3: Calculate the Plank's constant.
F004-4: Calculate the charge carrier concertation, mobility and energy band gap of a given semiconductor and **analyze** the I-V characteristics of a solar cell.

COURSE CONTENTS

PART-A: LIST OF EXPRIMENTS (Any 8)

1. To study the emission spectrum of mercury using diffraction grating.
2. To determine thickness of wire by using Laser Diffraction.
3. To determine numerical aperture of optical fibre (virtual Lab).
4. To determine attenuation in optical fibre.
5. To determine the value of Planck's constant.
6. To determine Hall coefficient and charge carrier density.
7. To determine the energy band gap of a given semiconductor.
8. To study I-V characteristics of Solar Cell and determine fill factor.
9. To determine beam diversions of diode laser.
10. To determine the radius of curvature of plano convex lens.

PART-B: ASSIGNMENTS

1. Assignment on LASER & Optic fiber
2. Assignment on Magnetism and superconductivity
3. Assignment on quantum computing
4. Assignment on Nanotechnology.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
2. F.A. Jenkins, H.E. White "Fundamental of optics", Tata McGraw Hill
3. Resnick, Halliday "Fundamentals of Physics" John Wiley and Sons
4. C. Kittel "Introduction to Solid State Physics" John Wiley and Sons
5. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)
6. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni (Capital Publishing Company
7. T. Pradeep "Nano: The Essentials" McGraw Hill
8. M. N. Avadhanulu, P. G.Kshirsagar "A Textbook of Engineering Physics" S. Chand Publication
9. R. K. Gaur, S. L. Gupta "Engineering Physics" Dhanpat Rai and Sons Publication

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://www.youtube.com/watch?v=ylC-uB3KgJk
2. https://www.youtube.com/watch?v=b7dLcINlvwE
3. https://www.youtube.com/watch?v=zX54Ju3sMPo

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Virtual lab
2. Collaborative and Individual Problem based learning.
3. Quizzes/Assignment.

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

CHEMICAL SCIENCE & TECHNOLOGY (CST)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-005	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

- Basics of electrochemistry
- Basic knowledge of mole concept
- Balancing of the various types of reactions
- Basic knowledge about polymers & polymerization processes

COURSE OBJECTIVES

1. Importance of conventional and non-conventional energy storage systems
2. Core concepts of modern-analytical techniques that facilitate rapid and reliable measurements.
3. An insight into memory materials, advanced engineering materials and nanomaterials.
4. Technology involved in improving the quality of water for domestic and industrial use.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F005-1: Compare different types of conventional and non-conventional energy systems.

F005-2: Apply the appropriate modern analytical techniques.

F005-3: Illustrate structure, properties, and applications of advanced materials.

F005-4: Analyze water softening parameters.

COURSE CONTENTS

MODULE-I: ENERGY SYSTEMS (07Hrs.)

Core concepts of batteries, Lithium Battery: Construction, working & applications, Fuel Cell: H_2-O_2 fuel cell. Proximate Analysis of Coal & numerical, Combustion- Theoretical air requirement of solids, liquid /gaseous fuels & numericals. Alternative Fuels: Power Alcohol, Biodiesel & H_2 as a future fuel

MODULE -II: MODERN ANALYTICAL TECHNIQUES (06Hrs.)

Electroanalytical Titrations: Acid-Base Conductometric titrations, pH metric Titration UV-Visible Spectroscopy: Introduction, principle, Lambert-Beers laws, numericals, Instrumentation of spectrophotometer, applications.

MODULE -III: ADVANCED MATERIALS (07Hrs.)

Introduction, Organic semiconductor memory materials: p-type (Pentacene), n-type (perfluoropentacene), Structure, properties and applications of: Polycarbonate, Polyacetylene, polymer composites, Nanomaterials: Graphene, CNT & Semiconducting nanomaterials.

MODULE -IV: WATER SOFTENING TECHNOLOGY **(06 Hrs.)**

Testing Parameters: Hardness-its determination by EDTA method, Alkalinity-its determination
Softening Methods: Zeolite Method, Reverse Osmosis, Electrodialysis.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Engg. Chemistry, Wiley India Pvt Ltd, First Edition 2011
2. Inorganic Chemistry by Shriver & Atkins, Oxford University Press.
3. University General Chemistry - An introduction to chemical science, edited by C. N. RRao, Macmilan
4. Concepts of Analytical Chemistry, 2e, by S.M.Khopkar, New Age International Publishers.
5. Textbook of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & amp; A.C. Arsenault, RSC Publishing, 2005.
7. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
8. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company
9. Engineering Chemistry by O.G. Palanna, Tata McGraw Hill Education Pvt Ltd
10. A Text Book of Engineering Chemistry by Dr.S.S.Dara, Dr.S.S.Umare,S.Chand & Company Ltd
11. S.K. Kulkarni, 'Nanotechnology: principles and practices' (2014).

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

- NPTEL Course on "**Engineering Chemistry-I**" https://nptel.ac.in/courses/122/106/122106028/
- NPTEL Course on **"Fundamentals of Spectroscopy"** https://nptel.ac.in/courses/104/106/104106122/
- https://www.youtube.com/watch?v=x6cK6vtfcnU&t=469s
- https://www.youtube.com/watch?v=xbe4byi2oHM
- https://www.youtube.com/watch?v=3rM-ZDfMnUg&t=21s
- https://www.youtube.com/watch?v=SZuVCXZS2SI&t=622s
- https://youtube.com/playlist?list=PLcggJmXvvYRsToAYsmzuScYJwnvSkDboR&si=OlwG4cLgDNoDqcbr
- https://youtube.com/playlist?list=PLcggJmXvvYRvm8Dg4GvIsV8ZdkWu6QDYr&si=s6iRg9FRlR__jKrS

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Role Play
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning.
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

CHEMICAL SCIENCE & TECHNOLOGY LAB (CSTL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-006	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Basics of titration, mole concepts, Balancing of the various types of reactions.

COURSE OBJECTIVES

After completing this course, the student will have basic knowledge about:

1. Technology is involved in improving the quality of water for its industrial use.
2. Basic concepts of electro-analytical techniques that facilitate rapid and reliable measurements.
3. Chemical structure of polymers and its effects on their various properties when used as engineeringmaterials.
4. Study of fossil and derived fuels with its properties and applications.
5. The principles of chemical and electrochemical reaction causing corrosion and methods used for minimizing corrosion.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F006-1: Perform various experiments in a team, comparing the experimental results with the analytical values and **drawing** conclusions based on the evaluation with effective communication in team.

F006-2: Calibrate and operate the analytical instruments.

F006-3: Solve problems based on the application of various principles of chemistry individually and in team

COURSE CONTENTS

PART-A: LIST OF EXPRIMENTS

1. To determine the moisture, volatile matter, fixed carbon and ash content in a given coal sample by proximate analysis.
2. To find out the strength of a given acid by using pH-meter.
3. Determine the strength of hydrochloric acid solution by titrating it against standard sodium hydroxide solution conductometrically.
4. To determine λ max (wavelength of maximum absorption) of solution of $KMnO_4$
5. Verify Beer's law and apply it to find the concentration of the given unknown solution.
6. Determination of total Hardness by complexometric titration method.
7. Determination of alkalinity of a given water sample.
8. Preparation of Phenol formaldehyde resin (Bakelite).
9. To determine the molecular weight of a polymer by Viscometric method

10. Synthesis of quantum dots (semiconductor nanoparticles)

PART-B: ASSIGNMENTS

1. Assignment on Energy Systems
2. Assignment on modern analytical techniques
3. Assignment on advanced materials
4. Assignment on water softening technology.

PART-C: ADVANCED TOPICS

- Petrol & Diesel: Latest trends like BS6, Octane Number, Cetane Number, Knocking and anti-knocking in IC engine.
- Analysis of water: Chloride content, BOD and COD, Dissolved oxygen content
- Ultra filtration: Process and Materials used.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Engg. Chemistry, Wiley India Pvt Ltd, First Edition 2011
2. Inorganic Chemistry by Shriver & Atkins, Oxford University Press.
3. University General Chemistry - An introduction to chemical science, edited by C. N. R Rao, Macmilan
4. Concepts of Analytical Chemistry, 2e, by S.M.Khopkar, New Age International Publishers.
5. Textbook of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & amp; A.C. Arsenault, RSCPublishing, 2005.
7. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
8. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company
9. Engineering Chemistry by O.G. Palanna, Tata McGraw Hill Education Pvt Ltd
10. A Text Book of Engineering Chemistry by Dr.S.S.Dara, Dr.S.S.Umare, S.Chand & Company Ltd
11. S.K. Kulkarni, 'Nanotechnology: principles and practices' (2014).

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. http://chemistryvl.pict.edu/#/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN THE PRACTICAL)

1. Role Play
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment
5. Seminars/Presentations

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

MECHANICS FOR ROBOTICS (MFR)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-007	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Force and Force systems, Moment of force, Moment of couple, Components of force, Basic Trigonometry.

COURSE OBJECTIVES

1. To impart knowledge about the resultant and equilibrium of force systems
2. To study the motion of a particle using equations of kinematics
3. To learn how to apply Newton's second law for solving problems of practical significance.
4. To study the kinematics and kinetics of a rigid body
5. To understand the concept of robot kinematics

COURSE OUTCOMES

After completion of this course, student shall be able to:

F007-1: Determine the resultant of a given 2D force system and **analyze** the equilibrium of the frames under different loading conditions.

F007-2: Analyze the motion of a particle using equations of kinematics and **apply** Newton's second law of motion to **solve** problems of practical significance.

F007-3: Locate the position of Instantaneous Centre of Rotation (ICR) and **determine** the angular velocity of the member in each mechanism.

F007-4: Classify different types of robots, **find out** the degrees of freedom for a robotic system and **explain** the concept of Forward and Reverse kinematics.

COURSE CONTENTS

MODULE-I: RESULTANT AND EQUILIBRIUM OF RIGID BODIES IN PLANE(07 Hrs.)

Principles of Statics, Resultant of Concurrent, Parallel and General Force systems, Free Body Diagram, Equilibrium of Force systems in plane, Types of supports, Types of loads, and Analysis of 2D Frames.

MODULE-II: PARTICLE DYNAMICS (06 Hrs.)

Kinematics of a Particle: Rectilinear motion, Equations of kinematics, curvilinear motion, Cartesian coordinates, Normal and Tangential components, Projectile motion.

Kinetics of a Particle: Application of Newton's second law for rectilinear and curvilinear motion, Concept of D'Alembert's principle.

MODULE-III: RIGIDBODY DYNAMICS **(06 Hrs.)**

Kinematics of a Rigid body: Pure rotational motion, General plane motion, Instantaneous centre of rotation (ICR)

Kinetics of a Rigid body: Mass moment of inertia, Parallel axis theorem, Radius of gyration, D'Alembert's principle, angular momentum of a rigid body.

MODULE-IV: ROBOT KINEMATICS **(07 Hrs.)**

Introduction to Robotics, Applications of Robots, Classification, Laws of Robotics, Structure of Robots: links, joints, sensors, control systems, Arm configurations and its workspace, Degree of freedom (DoF), Concept of Forward kinematics and Reverse or inverse kinematics.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Vector Mechanics for Engineers, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication
2. Engineering Mechanics by R. C. Hibbeler, Pearson Education
3. Engineering Mechanics by S. P. Timoshenko and D. H. Young, McGraw- Hill publication
4. Engineering Mechanics by J. L. Meriam and Craige, John Willey
5. Engineering Mechanics by F L Singer, Harper and Rowe publication
6. Engineering Mechanics by A. P. Boresi and R. J. Schmidt, Brooks/Cole Publication
7. Robotics and Control by Mittal R K & Nagrath, TMH.
8. Introduction to Robotics by S. K. Saha, TMH.
9. Introduction to Robotics by John J Craig, Pearson Edu.
10. Robotics by Fu K.S, McGraw Hill.
11. Introduction to Robotics– Analysis, Control, Applications by Niku SB, JohnWiley & Sons Ltd.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL Course on "Engineering Mechanics- Statics and Dynamics" https://onlinecourses.nptel.ac.in/noc24_me02/preview
2. NPTEL Course on "Kinematics of Mechanisms and Machines" https://onlinecourses.nptel.ac.in/noc24_me44/preview
3. NPTEL Course on "Robotics: Basics and Selected Advanced Topics" https://onlinecourses.nptel.ac.in/noc24_me23/preview
4. NPTEL Course on "Robotics and Control: Theory and Practice" https://onlinecourses.nptel.ac.in/noc24_me18/preview
5. https://www.youtube.com/watch?v=XyZPfi_pd5k
6. https://www.youtube.com/playlist?list=PL245ANWBOJxbNQSnxeyKiK7HHszLoj0Mo
7. https://www.youtube.com/playlist?list=PL245ANWBOJxagbiQHZ0WxfFOYa3dW5E4M
8. https://www.youtube.com/watch?v=dRDXQpQpS0k&list=PL245ANWBOJxZIw3PV01z2B0F2xLDdzF2u
9. https://www.youtube.com/watch?v=x6d-YLnMLaU&list=PL245ANWBOJxZj8KatBebc3XcIcTYEm89w

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Surprise / Open book Test
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning.
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

MECHANICS FOR ROBOTICS LAB (MFRL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-008	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Force and Force systems, Moment of force, Moment of couple, Components of force, Basic Trigonometry.

COURSE OBJECTIVES

1. To acquire the capability to perform the experiments in a team and communicate with the team members.
2. To develop problem solving skills.
3. To develop the ability to write a program for problem solving.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F008-1: Perform the experiments in a team, verify the results and **draw** conclusions based on the evaluation.

F008-2: Solve the problems based on the application of various principles of mechanics.

F008-3: Write an algorithm and a program in python for various engineering problems.

COURSE CONTENTS

PART-A: LIST OF EXPRIMENTS

1. Verification of Law of Parallelogram of Forces
2. Determination of Support reactions of a beam
3. Determination of Moment of Inertia of a Flywheel
4. Study of Curvilinear motion of a particle.

PART-B: ASSIGNMENTS

5. Assignment on Resultant and equilibrium of rigid bodies in plane
6. Assignment on Particle dynamics
7. Assignment on Rigid body dynamics
8. Assignment on Robot kinematics

A minimum of 10 problems are to be solved during practical as instructed by the instructor.

PART-C: PYTHON APPROACH FOR PROBLEM SOLVING (Any Three)

1. To find the resultant of a system of forces
2. To determine the support reactions for a beam

3. To determine the range of a projectile on a horizontal plane.
4. To determine the mass moment of inertia of a flywheel.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Vector Mechanics for Engineers, by F. P. Beer and E. R. Johnson, McGraw-Hill Publication
2. Engineering Mechanics by R. C. Hibbeler, Pearson Education
3. Engineering Mechanics by S. P. Timoshenko and D. H. Young, McGraw- Hill publication
4. Engineering Mechanics by J. L. Meriam and Craige, John Willey
5. Engineering Mechanics by F L Singer, Harper and Rowe publication
6. Engineering Mechanics by A. P. Boresi and R. J. Schmidt, Brooks/Cole Publication
7. Robotics and Control by Mittal R K & Nagrath, TMH.
8. Introduction to Robotics by S. K. Saha, TMH.
9. Introduction to Robotics by John J Craig, Pearson Edu.
10. Robotics by Fu K.S, McGraw Hill.
11. Introduction to Robotics– Analysis, Control, Applications by Niku SB, JohnWiley & Sons Ltd.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL Course on "Programming in Python" https://onlinecourses.swayam2.ac.in/cec24_cs01/preview
2. https://tbc-python.fossee.in/book-details/1106/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN THE PRACTICAL)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

INTEGRATED ELECTRICAL AND ELECTRONICS ENGINEERING (IEEE)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-009	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Knowledge of physics and mathematics taught at higher secondary level.

COURSE OBJECTIVES

1. To introduce the basics of electric circuits and analysis
2. To impart knowledge in the basics of working principles and application of electrical machines
3. To introduce and familiarize yourself with diodes and transistors analog devices and theircharacteristics.
4. To educate on the fundamental concepts of digital electronics
5. Prepare for next-level learning in design aspect

COURSE OUTCOMES

After completion of this course, student shall be able to:

F009-1: Draw and **Analyze** AC & DC circuits.

F009-2: Solve the problems based on the working principle of DC & AC machines with its applications.

F009-3: Explain the construction, working principle and application of diodes, transistors.

F009-4: Compare number systems and **explain** the working of digital circuits using basic gates and flip flops.

COURSE CONTENTS

MODULE-I: ELECTRICAL CIRCUIT ANALYSIS (06 hrs)

Energy sources – Voltage and current sources, Current Division, Voltage Division. Star-Delta transformation. DC circuits analysis using mesh, Thevenin's & superposition theorem.

Concept of Phase and Phase Difference. Phasor Representation, Rectangular and Polar representation of phasor. Analysis of single-phase series AC circuits consisting of RL, RC, RLC combinations. Concept of impedance, concept of active, reactive, apparent, complex power and power factor. Numerical, 3-phase balanced and unbalanced supply, star, and delta connections.

MODULE-II: ELECTRIC MACHINES (09 hrs)

Review of laws of electromagnetism, mmf, flux, and their relation, analysis of magnetic circuits. Single-phase transformer, basic concepts and construction features, EMF equation, transformation ratio, voltage regulation, losses, and efficiency.

Constructional details of DC machine, induction machine and synchronous machine, Working principle of 3-Phase induction motor, Emf equation of 3-Phase induction motor, Concept of slip in

3-Phase induction motor, Explanation of Torque-slip characteristics of 3-Phase induction motor, Single phase AC machines - Types. Principle and working.

MODULE-III: ELECTRONIC COMPONENTS AND CIRCUITS (05 hrs)

Introduction to semiconductors devices, Diodes, V-I characteristics, Bipolar junction transistors (BJT) and their working, CC, CB & CE transistor configurations, modes of operation of BJT, DC biasing of BJT. Characteristics of operation amplifiers (OP-AMP) - application of Op Amps (inverting, non-inverting)

MODULE-IV: DIGITAL ELECTRONICS (06 hrs)

Number systems used in digital electronics, decimal, binary, octal, hexadecimal, their complements, operation and conversion, floating point and signed numbers, Demorgan's theorem, AND, OR, NOT, NOR, NAND, EX-NOR EX-OR gates and their representation, truth table, half and full adder circuits, R-S flip flop, J-K flip flop.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Basic Electrical Engineering by V.K. Mehta.
2. Edward Hughes "Electrical Technology", ELBS, Pearson Education
3. Ashfaq Husain, "Electrical Machines", Dhanpat Rai& Sons.
4. Principles of Electrical Engineering Del Toro
5. Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson
6. Modern Digital Electronics by R.P. Jain, 4th Edition, Tata McGraw Hill
7. Basic Electrical Engineering D.C. Kulshreshtha
8. Smarajit Ghosh, "Electrical Machines", Pearson Education, New Delhi.
9. Charles I Hubert, "Electrical Machines Theory, Application, & Control", Pearson Education, New Delhi, Second Edition
10. Fundamentals of Electrical Engineering‖, Oxford University Press,2011--- L. S. Bobrow.
11. Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson.
12. Modern Digital Electronics" by R.P. Jain, 4th Edition, Tata McGraw Hill.

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105155/
3. https://nptel.ac.in/courses/108/101/108101091/
4. http://www.youtube.com/watch?v=Kp-jS6NHsB8

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

INTEGRATED ELECTRICAL AND ELECTRONICS ENGINEERING LAB (IEEEL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-010	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Knowledge of physics and mathematics taught at higher secondary level.

COURSE OBJECTIVES

1. To Analyze AC and DC circuits
2. To Understand the construction and working of various electrical machines and perform load tests to find its efficiency.
3. To Implement analog and digital circuits.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F010-1: List the basic properties of electrical elements and **solve** DC circuit analysis problems using network theorems.

F010-2: Demonstrate the fundamental behavior of AC circuits and **solve** AC circuit problems.

F010-3: Analyze the basic characteristics of transformers and electrical machines.

F010-4: Implement analog and digital circuits. **Verify** their output (Output waveforms, Truth table, etc). **Plot** V-I characteristics of different Diodes.

COURSE CONTENTS

PART-A: LIST OF EXPERIMENTS

1. To verify KVL and Superposition theorem and Thevenins theorem.
2. To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms on storage oscilloscope
3. To derive resonance frequency and analyze resonance in series RLC circuit.
4. Speed control of DC shunt motor by armature voltage and flux control method.
5. Load test on three phase induction motor.
6. Direct Load test on single phase transformer.
7. V-I characteristics of: a) P-N Junction Diode (Study the datasheet of typical PN junction diode 1N 400X) b) Zener Diode (Study the datasheet of typical Zener diode 1N 4148)
8. Test and verify the truth tables of:
   a) Basic and Universal Gates (Study the data sheet of respective IC's)
   b) Half / Full Adder

c) RS/JK/T/D flip flop

PART-B: ASSIGNMENTS

1. Assignment on Electrical circuit analysis
2. Assignment on Electric machines
3. Assignment on Electronic Components and Circuits
4. Assignment on Digital Electronics

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Basic Electrical Engineering byV.K. Mehta.
2. Edward Hughes "Electrical Technology", ELBS, Pearson Education
3. Ashfaq Husain, "Electrical Machines", Dhanpat Rai& Sons.
4. Principles of Electrical Engineering Del Toro
5.Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson
6. Modern Digital Electronics by R.P. Jain, 4th Edition, Tata McGraw Hill
7. Basic Electrical Engineering D.C. Kulshreshtha
8. Smarajit Ghosh, "Electrical Machines", Pearson Education, New Delhi.
9. Charles I Hubert, "Electrical Machines Theory, Application, & Control", Pearson Education, New Delhi, Second Edition
10. Fundamentals of Electrical Engineering‖, Oxford University Press,2011--- L. S. Bobrow.
11. Electronics Devices by Thomas. L. Floyd, 9th Edition, Pearson. Tata McGraw Hill.
12. Modern Digital Electronics" by R.P. Jain, 4th Edition

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://nptel.ac.in/courses/108108076
2. https://archive.nptel.ac.in/courses/108/105/108105155/
3. https://nptel.ac.in/courses/108/101/108101091/
4. http://www.youtube.com/watch?v=Kp-jS6NHsB8

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Collaborative and Individual Problem based learning.
4. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

COMPUTER GRAPHICS AND DESIGN (CGD)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-011	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Basic geometry

COURSE OBJECTIVES

1. To provide a comprehensive understanding of computer graphics, conic sections, and focusing on 2D and 3D modelling.
2. To develop proficiency in orthographic projection principles, methods, and their practical applications
3. To acquire a thorough understanding of isometric projection for machine components
4. To understand and apply GD&T with practical application using computer graphics.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F011-1: Interpret and **explain** the key aspects of computer graphics, conic sections, and distinguishing between 2D drawing and 3D modeling methods.

F011-2: Examine different approaches to orthographic projection to **evaluate** their suitability for specific graphical representation tasks.

F011-3: Apply isometric projection techniques to **create** detailed and precise visual representations of machine components.

F011-4: Demonstrate the ability to comprehend and apply Geometric Dimensioning and Tolerances (GD&T).

COURSE CONTENTS

MODULE-I: INTRODUCTION TO COMPUTER GRAPHICS AND CONIC SECTIONS (Modelling/Simulation and Analysis) (06 Hrs.)

Basics of Engineering Graphics and Conic sections, Introduction to CAD software, 2D drawing by Auto CAD and 3D modellingby SOLIDWORKS/Fusion 360.

MODULE-II: ORTHOGRAPHIC PROJECTION (07 Hrs.)

Introduction to orthographic projection, principle of projection, Methods of projection, Sectional orthographic projection, Orthographic projection of machine components.

MODULE-III: ISOMETRIC PROJECTION (07 Hrs.)

Introduction, Isometric projection, Isometric views, Isometric scale, Isometric projection of circle, sphere, isometric projection of robotic and automobile components.

MODULE-IV: GD &T USING COMPUTER GRAPHICS **(06 Hrs.)**

Introduction to Geometric Dimensioning and Tolerances, Importance of dimensioning and its rule, Tolerances, Limits, fits and its types, symbolic representations, and their meaning for geometrical objects. Practical application and interpretation of GD &T using computer graphics.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Engineering Graphics & Design (PB) by Dr Mohd Parvez & Osama Khan, S.K. Kataria & Sons Educational Publisher
2. Engineering Graphics and Design as Per Latest Aicte Curriculum, by T Jeyapoovan, Vikas Publishing
3. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
5. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
6. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers.
7. Introduction to SolidWorks: A Comprehensive Guide with Applications in 3D Printing by Godfrey C. Onwubolu, CRC Press

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://onlinecourses.nptel.ac.in/noc21_me125/preview

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Online Interactive Tool
3. Quizzes/Assignment
4. Component Drawing

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

COMPUTER GRAPHICS AND DESIGN LAB (CGDL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-012	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Basic Geometries and familiar with computer system

COURSE OBJECTIVES

1. To provide a comprehensive understanding of computer graphics, focusing on 2D and 3D modelling.
2. To develop proficiency in orthographic projection principles, methods, and their practical applications.
3. To acquire a thorough understanding of isometric projection for machine components.
4. To understand and apply GD&T with practical application using computer graphics.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F012-1: Analyse and **explain** the essential aspects of computer graphics using modern tools, distinguishing and comparing 2D drawing methods with 3D modelling approaches

F012-2: Examine different approaches to orthographic projection using modelling software to **evaluate** their suitability for specific graphical representation tasks

F012-3: Apply isometric projection techniques to **create** detailed and precise visual representations of machine components using CAD software.

F012-4: Demonstrate comprehension and practical application of Geometric Dimensioning and Tolerances (GD&T).

LIST OF EXPRIMENTS / ASSIGNMENTS

1. Geometric drawing construction using CAD software.
2. Orthographic projection - To create detailed technical drawing of objects or systems using CAD software.
3. Isometric Projection-3D modelling using SOLIDWORKS / Fusion 360.
4. Create a drawing with appropriate GD&T symbols, tolerances, and specifications.
5. Design of PCB layout using CAD.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Engineering Graphics & Design (PB) by Dr Mohd Parvez & Osama Khan, S.K. Kataria & Sons Educational Publisher

2. Engineering Graphics and Design as Per Latest Aicte Curriculum, by T Jeyapoovan, Vikas Publishing
3. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
4. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
5. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
6. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publishers.
7. Introduction to SolidWorks: A Comprehensive Guide with Applications in 3D Printing by Godfrey C. Onwubolu, CRC Press

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://onlinecourses.nptel.ac.in/noc21_me125/preview

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN THE LAB)

1. Flipped Classroom
2. Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

C PROGRAMMING FOR PROBLEM SOLVING (CPPS)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F013	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Fundamental mathematical concepts such as algebra, arithmetic, and logic.

COURSE OBJECTIVES

1. To develop a strong foundation in problem solving and computational thinking
2. Become proficient in writing C code with correct syntax and semantics.
3. Understanding of fundamental programming concepts such as variables, data types, operators, control structures (loops and conditional statements)
4. Explain the purpose and functionality of various programming constructs in C like arrays and structure.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F013-1: Apply algorithmic thinking to solve real time computational problems using C language.

F013-2: Design an algorithm using C language concepts.

F013-3: Write well-structured, efficient, C code using fundamental data structures such as arrays, pointer and structures.

F013-4: Apply functions and modular programming for solving problem in C.

COURSE CONTENTS

MODULE-I: INTRODUCTION **(06 Hrs.)**

Problem solving in everyday life, Types of problem: Algorithmic & Heuristic, Problem solving with Computer, Algorithms and Flowcharts.

Introduction to "C" Programming**:** data types, constants, keywords, variables, operators, and expressions, input/output statements, Notion of Assembler, Interpreter and Compiler.

MODULE-II: BRANCHING AND ITERATION **(07 Hrs.)**

Control flow structures: if-then-else, nested if-else, conditional expression, switch, while loop, do-while loop, for loop, break, continue, goto.

Arrays: Need of array, Types of arrays: one dimensional array, two-dimensional array, examples and operations, primitive operations on Strings.

MODULE-III: POINTERS AND STRUCTURES **(07 Hrs.)**

Basics of pointers and declaration, pointer arithmetic and arrays, defining a structure, declaring structure variables, structure initialization and accessing structure members, array of structures, pointer to structure, dynamic memory allocation, comparison of static and dynamic memory allocation.

MODULE-IV: FUNCTION & MODULAR PROGRAMMING **(06 Hrs.)**

Function definition, declaration, invocation, and return - by value & by reference, recursive function and iterative functions.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. "Problem Solving and Programming Concepts" by Maureen Sprankle seventh edition.
2. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie
3. "The complete reference C" by Herbert Schildt, Fourth Edition
4. "C Programming: A Modern Approach" by K. N. King
5. "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

https://www-personal.acfr.usyd.edu.au/tbailey/ctext/ctext.pdf
https://karadev.net/uroci/filespdf/files/a%20book%20on%20c.pdf
https://www.geeksforgeeks.org/c-programming-language/
https://www.freecodecamp.org/news/the-c-programming-handbook-for-beginners/
https://www.w3schools.com/c/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Gamification
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

C PROGRAMMING FOR PROBLEM SOLVING LAB (CPPSL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-014	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Logical thinking and notion of algorithm

COURSE OBJECTIVES

1. To learn fundamental concepts of C programming
2. To understand and use the concept of a loop and conditional statements.
3. To understand Pointers and Memory Management
4. To use an array and a structure for data processing
5. To learn modular programming approach

COURSE OUTCOMES

After completion of this course, student shall be able to:

F014-1: Develop a C program using basic constructs in C.

F014-2: Design a C program by using Decision making statements and branching.

F014-3: Implement a C program using arrays and structures.

F014-4: Build C program using pointers and function.

LIST OF ASSIGNMENTS

GROUP(A) (ANY 5)

1. Write a Program to convert Fahrenheit to Celsius.
2. Write a program to calculate simple and compound interests.
3. Write a program to develop an arithmetic calculator. Add the modulus (%) operator and provision of negative numbers.
4. Write a program to calculate the electricity bill for the given MODULEs.
5. Write a program to check whether a triangle is valid or not, when the three angles of the triangle are entered through the keyboard. A triangle is valid if the sum of all the three angles is equal to 180 degrees.
6. Write a program to read the user given year as an input and determine whether it is a "leap" year or not.
7. Write a program to accept a character from user and check whether entered character is:
    1. alphabet (lower case or upper case)
    2. vowel
    3. digit
    4. special character
8. Write a program to accept a suitable input from the user and count blanks, tabs and newlines.

GROUP(B) (ANY 5)

1. Write a program to print "mirrored half diamond star pattern".
2. Write a program to print all prime numbers from 1 to n. (use nested loop, break and continue)
3. Write a program to count frequency of each element in an array.
4. Write a program to find the smallest and largest elements in an array using pointers and then swap these elements and display the resultant array.
5. Write a program to perform matrix operations - Add, transpose and multiplication.
6. Write a program to count the vowels & consonants in each string using pointers.
7. The instructor has a class of 20 students. Each student is identified by roll no from 1 to 20. and name. The two test scores of each student are to be stored. The instructor would like to enter student roll no, name and test score. Write a program to process this information, grade each student and display the result in pleasing format.

GROUP(C)

1. Write a program in C to swap two numbers using a function. (**use call by value and call by reference**)
2. Write a C program to accept a matrix of order m x n. Implement the following functions:
   i. Find the sum of each row
   ii. Find the sum of each column.

   The sum should be printed inthe main function only.
3. Develop a recursive C function to find the factorial of a given number.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. "Problem Solving and Programming Concepts" by Maureen Sprankle 7th edition.
2. " Let us C" by Yashawant Kanetkar , 13th edition
3. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie
4. "The complete reference C" by Herbert Schildt, Forth Edition
5. "C Programming: A Modern Approach" by K. N. King
   "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://www-personal.acfr.usyd.edu.au/tbailey/ctext/ctext.pdf
2. https://karadev.net/uroci/filespdf/files/a%20book%20on%20c.pdf
3. https://www.geeksforgeeks.org/c-programming-language/
4. https://www.freecodecamp.org/news/the-c-programming-handbook-for-beginners/
5. https://www.w3schools.com/c/

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Gamification
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

OBJECT ORIENTED PROGRAMMING USING C++ (OOPC)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F015	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Fundamental mathematical concepts.

COURSE OBJECTIVES

1. Understand the basic programming constructs of C++
2. Understand built-in and derived C++ data types,
3. Apply object-oriented concepts to solve problems using C++
4. Use file handling and exception handling in C++

COURSE OUTCOMES

After completion of this course, student shall be able to:

F015-1: Implement Object-Oriented Programming paradigm for problem solving.

F015-2: Apply different types of inheritance in C++

F015-3: Apply object-oriented features of C++, including functions and polymorphism

F015-4: **Develop** programs with the help of exception handling and file handling in C++

COURSE CONTENTS

MODULE-I: OBJECT-ORIENTED FUNDAMENTALS (7 Hrs)

Need of Object-Oriented Programming (OOP), Features of OOP, Introduction to C++: Structure of C++ program, Built-in and user defined data types, Access specifiers, Examples illustrating creation of classes and objects, Constructors and Destructors - Default Arguments, Copy Constructors, Default constructors, Parameterized constructors, Destructor.

MODULE-II: INHERITANCE (6 Hrs)

Introduction to inheritance, Relationship between access modifiers and Visibility modes, defining derived classes, Types of inheritance: Single, Multi-level, Multiple, Hierarchical and Hybrid, passing parameters to base class constructors, Function overriding, Friend class, Nested class, Virtual base classes and Abstract classes.

MODULE-III: FUNCTIONS AND POLYMORPHISM (6 Hrs)

Functions: Inline, Friend, Static

Polymorphism: Function overloading, Constructor overloading, Unary and Binary operator

overloading, Overloading insertion and extraction operator, Virtual and Pure virtual function, runtime vs compile time polymorphism

MODULE-IV: ADVANCED CONCEPTS IN C++ (7 Hrs)

Exception Handling: Introduction, Basics of exception handling, Simple exception handling, Multiple catch

File Handling: Introduction to file and its type - Sequential, Random, Classes for file stream operations, Opening and Closing file, Modes of files, Detecting end of file.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Herbert Schildt, "C++ the complete reference", Eighth Edition, McGraw Hill Professional, 2011, ISBN: 978-00-72226805
2. Robert Lafore, "Object oriented Programming in C++", 4th edition, Sams Publishing, ISBN: 0672323087
3. E. Balagurusamy, "Object oriented Programming with C++"7th edition, Mc Graw Hill Publication ISBN: 10: 9352607996
4. Deitel, "C++ How to Program", 4th edition Pearson Education ISBN:81-297-0276-2
5. Bijarne Stroustup, "Object oriented programming", fourth edition, ISBN: 0275967301

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://onlinecourses.nptel.ac.in/noc22_cs103/announcements?force=true History of C++ - C++ Information (cplusplus.com)
2. https://www.tutorialspoint.com/cplusplus/index.html
3. https://www.youtube.com/playlist?list=PLhbrpS8rYbc2HWmhSYatWnKmrxqzLmRnM

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Gamification
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning.
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

OBJECT ORIENTED PROGRAMMING USING C++ LAB (OOPCL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F016	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

C Programming for Problem Solving Lab

COURSE OBJECTIVES

1. Learn and use the basic programming constructs of C++
2. Understand built-in and derived C++ data types,
3. Apply object-oriented concepts to solve problems using C++
4. Use file handling and exception handling in C++

COURSE OUTCOMES

After completion of this course, student shall be able to:

F016-1: Implement a class using encapsulation, constructors and destructor.

F016-2: Implement different types of inheritance using C++.

F016-3: Implement functions and polymorphism in C++ for given problem.

F016-4: Apply exception handling and file handling in C++

LIST OF ASSIGNMENTS

GROUP(A) (ANY 5

1. Write a program to take input of student details (roll no, name and branch) and display it.
2. Write a menu driven program to calculate the area of circle, rectangle and triangle.
3. Write a program that reads a group of members from the user and places them in an array of type float. Once the numbers are stored in the array, the program should average them and print the result. Use pointer notation wherever possible.
4. Imagine a publishing company that markets both book and audiocassette versions of its works. Create a class **publication** that stores the title (a string) a price (type float) of a publication. From this class derive two classes: **book**, which adds a page count (type int) and **tape**, which adds a playing time in minutes (type float). Each of these three classes should have a get data () function to get its data from the user at the keyboard, and a put data () function to display its data.
5. Make a class named Fruit with a data member to calculate the number of fruits in a basket. Create two other classes named Apples and Mangoes to calculate the number of apples and mangoes in the basket. Print the number of fruits of each type and the total number of fruits in the basket.
6. Write a program to find Area of and Volume of 3D objects using Multiple inheritance.

GROUP(B) (ANY 5)

1. Write program to find the sum of squares of first n natural numbers using function without parameter but with return type.
2. Write a program to swap different types of values using function overloading so that changes made in formal parameter should be reflected in actual parameter.
3. Write a program to overload unary operators (++, --) for a complex number.
4. Write a program to overload binary operators (<<, >>) for accepting and displaying complex numbers.
5. Write a program to implement run time polymorphism to calculate areas of different polygons.
6. Create a class employee. Save employees information by using default constructor, parameterized constructor, copy constructor. Handle exceptions if a user enters invalid data e.g. negative age.

GROUP(C)

1. Write a program with the following:

a. A function to read two double type numbers from the keyboard.
b. A function to calculate the division of these two numbers.
c. A try block to throw an exception when a wrong type of data is keyed in.
d. A try block to detect and throw an exception if the condition "divide-by-zero" occurs.
e. Appropriate catch block to handle the exceptions thrown.

2. Write a program to open a student.txt file, read data and also update data from this file by using file pointers.
3. Two files named "Sorce1" and "Source2" contain a sorted list of integers. Write a program that reads the contents of both the files and stores the merged list in sorted form in a new file named "Target".

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. "Object Oriented programming in C++ "by Raajesh K. Shukla Wiley INDIA edition
2. "Object Oriented programming in C++ "by Robert Lafore, 3rd edition

"Object Oriented programming with C++ "by E Balagurusamy , 8th edition

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://ntedu.top/wp-content/uploads/2018/11/Programming-And-Problem-Solving-With- C-Comprehensive-6th-Edition.pdf
2. https://chenweixiang.github.io/docs/The_C++_Programming_Language_4th_Edition_Bjarne_Stroustrup.pdf

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Mock Test
2. Gamification
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning.

Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

FAB LAB (FL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-017	TW	25 M
PRACTICAL HRS. / WK	02		
CREDITS	01		

PREREQUISITES

Computer Literacy

COURSE OBJECTIVES

1. To provide a basic understanding of FAB Lab operations, safety protocols, and basic equipment and tools usage.
2. To design 3D modelling and develop prototype using 3D printer.
3. To make acquainted with the fundamentals of CNC programming.
4. To give insight of fabrication processes.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F017-1. Demonstrate FAB Lab operations, including layout, safety protocols, and proficient usage of basic equipment and tools.

F017-2. Create 3D models using CAD software, 3D prints prototypes, and **evaluate** both design accuracy and print quality.

F017-3. Demonstrate a fundamental understanding of CNC programming, and **execution** of simple CNC programs for basic shapes.

F017-4. Describe the basic principles behind metal joining, metal cutting and forming, and woodworking techniques.

COURSE CONTENTS

MODULE-I: Introduction to FAB Lab and Digital Fabrication

Introduction to FAB Lab: FAB Lab layout, Overview of FAB Lab and its facilities, Safety protocols and basic equipment usage, Introduction to various machine tools in FAB Lab, Introduction to digital fabrication technologies and Industry 4.0 / 5.0.

MODULE-II: 3D Printing and Rapid Prototyping

In-depth exploration of 3D printing technologies, designing 3D models using CAD software, Rapid prototyping, and iterative design processes.

MODULE-III: CNC Machining, Laser Cutting and Engraving

Introduction to G-code and M-code, Basics of CNC programming languages, writing simple CNC programs for basic shapes, understanding laser cutting and engraving equipment, Material selection and preparation, Designing laser-cut components.

MODULE-IV: Conventional Manufacturing Processes

Introduction to manufacturing processes, Metal joining processes (Soldering, Brazing and Welding), Metal cutting and forming processes, Woodworking.

LIST OF PRACTICALS / HANDS ON SESSION

1. Demonstrate the proper usage of safety equipment, FAB Lab tools and draw FAB Lab layout.
2. Design a 3D model using CAD software and 3D print a physical prototype. Evaluate the accuracy of the design and the quality of the printed model.
3. Write and execute simple CNC programs for basic shapes. Evaluate the correctness of the programs and the precision of the machined components.
4. Perform metal joining processes (soldering, brazing, welding) on sample materials. Evaluate the quality of joints.
5. Perform metal cutting/forming operations. Evaluate the accuracy of the operations.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" by Ian Gibson, David Rosen, Brent Stucker.
2. "CNC Programming Techniques: An Insider's Guide to Effective Methods and Applications" by Peter Smid
3. "Mechanical Workshop Practice" by John, K. C.,
4. "Workshop Technology-I & II" by Hajara Chaudhary

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

https://fab-coep.vlabs.ac.in/

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

INNOVATIVE IDEA AND DESIGN THINKING LAB (IIDTL)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-018	TW	50 M
PRACTICAL HR. S/WK	02		
CREDITS	01		

PREREQUISITES

A solid understanding of basic subjects like mathematics, Geometry, Drawing, science, language, and social sciences can provide a good foundation for understanding the concepts and applications of design thinking.

COURSE OBJECTIVES

1. Analyze a problem through diverse viewpoints.
2. Develop skills in formulating design challenges effectively.
3. Learn to come up with ideas, make prototypes, and improve solutions, while also understanding how to create value as entrepreneurs.
4. Acquire skills to design successful products or enterprises, applying higher order thinking.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F018-1: Demonstrate the ability to recognize opportunities within problems.

F018-2: Explain the processes involved in formulating product/service ideas.

F018-3: Analyze customer feedback to identify common themes and areas for improvement.

F018-4: Identify the role of design thinking and **demonstrate** how their idea can work in real life.

COURSE CONTENTS

MODULE-I: INTRODUCTION TO DESIGN THINKING MINDSETS

Introduction to Design Thinking, LRI Assessment, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking.

MODULE-II: DESIGN THINKING METHODOLOGY

The 5 Stages of the Design Thinking Process-Empathize, define (the problem), Ideate, Prototype, and Test.

MODULE-III: STORYTELLING & TOOLS FOR INNOVATION

Empathize- Understand customers, Empathy Maps, Step into customers shoes Customer Journey Maps.

Define- Analysis & Drawing Inferences from Research
Ideation - tools & exercises, Introduction to the Design Challenge Themes, Storytelling and Tools for Innovation.

MODULE-IV: THE DESIGN CHALLENGE BOOTCAMP
Define the Design Challenge, Prototyping & Iteration- Feasibility Study, Testing Documentation and Pitching.

LIST OF ASSIGNMENTS

1. LRI Assessment - An Individual activity
2. Understanding the Design Thinking Mindsets
3. Creative Thinking Strategies
4. The 5 Stages of the Design Thinking Process
5. Sample Design Challenge Exercise
6. Framing the Design Challenge Themes
7. Understanding Users – User Personas
8. Step into User's Shoes – Empathy Mapping
9. Walk a Mile - Customer Journey Maps
10. The Art of the Pitch
11. Process Review
12. The Design Challenge – Testing, Documentation and Pitching

FINAL DELIVERABLE:

1] Case Study Report:

By this stage, Students must be ready with the following materials.

- Research materials and documentation of their process (interview notes, sketches, etc.)
- A clearly defined problem statement
- User Personas
- Empathy Maps
- Customer Journey Maps.
- A proposed solution to the problem statement that has been developed using the mindsets, methodologies, and tools covered in the previous modules.
- A prototype of their solution.

The students are to make their final 20-minute presentation using the 10/20/30 rule. Students are to be assessed on the completeness of their presentation and the quality of their ideas.

2] Lab Journal:

Students will submit journal write up based on above experiments at the end of the term along withphysical model if any.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS/ E-RESOURCES)

1. Change by design, Tim Brown, 2009, Harper Collins
2. Engineering design, George E Dieter,4th Revised edition, 2009 McGraw Hill
3. "Design Thinking: Process and Methods Manual" by Robert A. Curedale.
4. "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value" by Thomas Lockwood and Edgar Papke
5. "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization" by Vijay Kumar.
6. "Design Thinking: Understand – Improve – Apply" by Hasso Plattner, Christoph Meinel, and Larry Leifer
7. E Balaguruswamy (2022), "Developing Thinking Skills (The way to Success)", Khanna Book Publishing Company.
8. "Exploring Engineering: An Introduction for Freshmen to Engineering and to the Design Process". October 2006 by Philip Kosky Dr. (Author), Robert T. Balmer Dr. (Author), William D. Keat Professor (Author), George Wise (Author)
9. "Engineering Design - A Project-Based Introduction", 4e 2014 by CL Dym (Author)
10. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Son
11. Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, First Edition, 2012, Wiley

. Human-Centered Design Toolkit: An Open-Source Toolkit to Inspire New Solutions in the Developing World, IDEO, Second Edition, 2011, IDEO

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://www.linkedin.com/learning
2. www.interaction-design.org
3. https://www.ideou.com/
4. https://dschool.stanford.edu/
5. https://www.coursera.org/learn/uva-darden-design-thinking-innovation
6. https://designsprintkit.withgoogle.com/methodology
7. https://app.knovel.com/kn
8. https://www.howstuffworks.com/
9. **Ethics Centre** https://onlineethics.org/

WEB RESOURCES:

1. Reading of some Indian and international patents.
2. Reading of ASTM, IEEE, BIS standards.
3. Reading of ASME codes
4. Reading of product life cycle issues and environmental issues related to products.

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN THE LAB)

1. Flipped Classroom
2. Gamification
3. Online Interactive Tool
4. Collaborative and Individual Problem based learning
5. Quizzes/Assignment

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

ENVIRONMENT & SUSTAINABLE ENGINEERING (ESE)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-019	CIE	20* M
TEACHING HRS. / WK	02	ISE	30 M [20# M]
CREDITS	02	ESE	70 M [60$ M]
		TOTAL	100 M

PREREQUISITES

Energy resources: Renewable and non-renewable energy sources.

COURSE OBJECTIVES

1. To explain the concepts and strategies related to sustainable development and Principles of Planning
2. To understand the evolution of environmental policies and laws.
3. To explain the concepts behind the interrelations between environment and development.
4. To identify and analyze various conservation methods and their effectiveness in relation to renewable and non-renewable natural resources.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F019-1: Describe the impact of ever-increasing human population on the biosphere with a focus on sustainability and Principles of Planning.

F019-2: Discuss various environmental protection Acts to achieve sustainable development.

F019-3: Identify natural resources and **apply** knowledge to face any disaster.

F019-4: Apply knowledge of LCA (Life Cycle Assessment) for various products which are used in daily life and **explore** new technologies for alternative energy sources.

COURSE CONTENTS

MODULE-I: INTRODUCTION TO ENVIRONMENTAL ENGINEERING & SUSTAINABLE BUILDING PLANNING (07 Hrs.)

Overview of natural and built-up environment, Role of environmental engineers in the society, principles of building planning, building by laws, concept of carpet area, set back distances and FSI. Human population growth and its Impact on environment. Need of sustainable building design, Rainwater harvesting, concept of green building and ecofriendly materials.

MODULE-II: ENVIRONMENTAL LAWS & VARIOUS ACTS FOR SUSTAINABLE DEVELOPMENT (06 Hrs.)

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife protection Act; Forest Conservation Act, International agreements; Montreal and Kyoto Protocols. Conference of Parties (COP). Electronic waste management.

MODULE-III: USE OF NATURAL RESOURCES AND DISASTER MANAGEMENT (07 Hrs.)

Water: Use and over-exploitation of surface and ground water, Conflicts over water (International, Inter-state Conflict and its Case Study), Land Resources and land use change, Land degradation, soil erosion and its effect. Concept of EIA (Environmental Impact Assessment and its Case Study), EIA of the construction of dams. Disaster management: floods and droughts, earthquakes, cyclones, and landslides with Case Studies.

MODULE-IV: LIFE CYCLE ASSESSMENT (LCA) AND SUSTAINABLE TECHNOLOGY FOR HARNESSING ENERGY (06 Hrs.)

Life cycle assessment (LCA) for environmental sustainability and its Case study, Carbon footprint, carbon neutrality, carbon credits for countries. Need of alternate energy sources for increasing demand in India. Solar energy, Ethanol from sugarcane and various crops, Use of Electric vehicles.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. Environmental Studies by Dr.J.P.Sharma
2. Environmental Studies by D.K.Asthana
3. Environmental Studies by Barucha
4. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press
5. Environmental Studies by Manjunath D. L.
6. Carson, R. 2002. Silent spring. Houghton Mifflin Harcourt.
7. Sustainable Engineering – Drivers, Metrics, Tools, and Applications by Krishna R. Reddy, Claudio Cameselle, Jeffrey A. Adams.
8. Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press
9. Pollution Control Law Series: Pollution Control Acts, Rules and Notification Issued
10. There under, Central Pollution Control Board, Ministry of Environment and Forest, Government of India. 2006
11. MoEF-EIA, Notification on EIA under under sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986, Published on 14th September, 2006

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. https://onlinecourses.nptel.ac.in/noc23_ge17/preview
2. www.nptel.ac.in
3. https://prod-drupalfiles.storage.googleapis.com/documents/resource/restricted/carbon-
4. https://www.arsdcollege.ac.in/wp-content/uploads/2020/04/Environment-Movement-in-India_HRGE-BA-II.pdf

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)

1. Flipped Classroom
2. Quizzes/Assignment
3. Field Activity

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

INDIAN KNOWLEDGE SYSTEMS (IKS)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-020	CIE	25 M
TEACHING HRS. / WK	01	TW	25 M
TUTORIAL HRS./WK	01	TOTAL	50 M
CREDITS	02		

COURSE OBJECTIVES

1. To introduce fundamentals of Ancient Indian Knowledge Systems.
2. To familiarize learners with major development in Indian science, engineering, and technology.
3. To provide information about the foundations of Indian arts and its relevance in society.
4. To help to understand the importance of holistic development of physical, mental, and spiritual wellbeing.

COURSE OUTCOMES

After completion of this course, student shall be able to:

F020-1: Discuss the importance of Indian traditional knowledge with modern perspective.

F020-2: Explain ancient Indian Science & Technology

F020-3: Illustrate the Indian Arts and Architecture

F020-4: Describe the importance of holistic development towards life.

COURSE CONTENTS

MODULE-I: INTRODUCTION TO INDIAN KNOWLEDGE SYSTEMS (04 Hrs.)

Vishva Kalyan thru Vasudhaiva Kutumbkam, Caturdaśa Vidyāsthānam, 64 Kalas**,** Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy (Sāṃkhya and Yoga, Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta) etc.

MODULE-II: FOUNDATION OF INDIAN SCIENCE & TECHNOLOGY (03 Hrs.)

Indian S & T Heritage, sixty-four art forms and occupational skills, Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Indian Mathematics: Great Mathematicians and their contributions etc.

MODULE-III: ANCIENT INDIAN ARTS & ARCHITECTURE (03 Hrs.)

Brief introduction to Indian musical instruments like Veena, Flute, Plain-drum, Sitar, Shehnai, Tabla Tambura etc. Indian traditional and folk dances like bharatnatyam, kathakali, Bhangra, Bihu, Ghumu Dance, Garba etc.

Evolution of Hindu Temples in different period, Town & Planning Architecture in India, Temple Architecture, Vastu Sastra etc.

MODULE-IV: HOLISTIC DEVELOPMENT: INDIVIDUAL & SOCIETAL LEVEL (03 Hrs.)

Health, Wellness & Psychology, Ayurveda, Food, Yoga way of life, Indian approach to Psychology.
SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)
1. Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. 2. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru 3. AK Pathak, Science and Technology in India, Anshika prakashan pratapgarh, 2016 4. R P Kulkarni, Glimpese of Indian Engineering and Technology (Ancient & Medieval period, Munshiram Manoharlal Publishers Pvt. Ltd. 2018.
WEB LINKS AND VIDEO LECTURES (E-RESOURCES)
https://iksindia.org/webinars.php
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS)
1. Presentation Participation individually and in teams. 2. Extempore, Impromptu small talks 3. Quizzes/Assignment 4. Seminars 5. Group discussions.

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

SOFT SKILLS (SS)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-021	CIE	25 M
TEACHING HRS. / WK	01	TW	25 M
TUTORIAL HRS./WK	01	TOTAL	50 M
CREDITS	02		

PREREQUISITES

Basic knowledge of reading and writing English.

COURSE OBJECTIVES

1. To refine students English Language
2. To develop reading skills, communication skills, and speaking skills
3. To make the students understand the nuances of effective communication and get acquainted with the critical and logical thinking pattern.
4. To develop important corporate skills of collaboration, team building, and inclusiveness.
5. To give each student a realistic perspective of work and work expectations
6. To guide students in making appropriate and responsible decisions
7. To create a desire to fulfil individual goals.

COURSE OUTCOMES

After completion of this course, students shall be able to:

F021-1: Enhance their overall communication skills which would help them **communicate effectively** on the technical aspects, give proper and **effective presentations**, **design** reports and **write** business emails.

F021-2: Boost their confidence in public speaking, socializing with people & get **understanding** about work ethics, the corporate culture and **developing** people skills.

F021-3: Understand the nuances of non-verbal communication, which includes confident and positive body language, corporate grooming, the importance of **teamwork**, and the personality traits required to work productively in teams.

F021-4: Develop life skills and how these learnings would help them throughout their professional career and personal life. These sessions will make them inquisitive and will help them stay focused on **life-long learning** mode

COURSE CONTENTS

MODULE-1: LANGUAGE DEVELOPMENT MODULE **(03 Hrs.)**

Vocabulary Development, Basic Grammar Concepts, Word Ordering & Sentence Construction, Spot the error & Comprehension skills.

MODULE-2: CRITICAL & LOGICAL THINKING (03 Hrs.)

Idea generation for Extempore & Impromptu Speech, Logical Sequencing of ideas, Problem solving techniques & Logical thinking using activities, Brain Teasers.

MODULE-3: EFFECTIVE COMMUNICATION SKILLS (04 Hrs.)

Listening & Reading Skills, Non-Verbal Communication, Public Speaking & Pronunciation, Urging conversations, Business Writing skills, Email Simulation, Self-Introduction, Telephonic Etiquettes, Goal Setting, Activity Planner.

MODULE-4: PUBLIC SPEAKING AND EFFECTIVE PRESENTATION SKILLS (03 Hrs.)

Business English Vocabulary, Creating Effective Presentations, Public Speaking activities, Team building, Behavior on social media, Group Discussions.

SUGGESTED LEARNING RESOURCES (TEXT / REFERENCE BOOKS)

1. 1. M. Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, New Delhi (2008)
2. Jeff Butterfield, "Soft Skills for Everyone" Cengage Learning India Private Limited, New Delhi (2019)

WEB LINKS AND VIDEO LECTURES (E-RESOURCES)

1. NPTEL Course on "Enhancing Softskills and Personality" https://onlinecourses.nptel.ac.in/noc24_hs26/preview
2. NPTEL Course on "Communication Skills, Modes & Knoeledge" https://onlinecourses.swayam2.ac.in/ntr24_ed26/preview

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS / TUTORIAL)

1. Presentation Participation individually and in teams.
2. Extempore, Impromptu small talks

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

NPTEL / SWAYAM / MOOCS

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-022	CIE	As per the guidelines
CREDITS	01		

GUIDELINES FOR MASSIVE ONLINE OPEN COURSES (MOOCS)

As part of the implementation of autonomy with effective from Academic Year 2024-25 for the UG and PG Programs, MOOCs are to be offered as part of the curriculum. Accordingly, the number of credits are incorporated in curriculum structure.

Following are the guidelines for implementation of MOOCs courses and awarding the credits:

1. Department shall release a list of approved SWAYAM-NPTEL courses before the commencement of every semester.
2. Students shall register for the approved Courses as per the schedule announced by SWAYAM-NPTEL.
3. A student shall undergo the courses only from the list notified by the department through SWAYAM/NPTEL platform, complete all the assignments and examination requirements as specified by the SWAYAM/NPTEL.
4. SWAYAM-NPTEL Courses are considered for transfer of credits only if the concerned student has successfully completed and obtained the SWAYAM-NPTEL Certificate.
5. The credit equivalence for SWAYAM-NPTEL Courses: 12 weeks – 3credits; 8 weeks – 2 credits; 4 weeks – 1 credit.
6. Equivalent marks will be considered for awarding the grades as specified in examination rules and regulations.
7. A student must submit the original SWAYAM-NPTEL Course Certificates to the Head of the Department concerned, with a written request for the transfer of the equivalent credits. On verification of the SWAYAM-NPTEL Course Certificates and approval by the head of the department, credits will be awarded.
8. The Institute shall not reimburse any fees/expenses a student may incur for the SWAYAM-NPTEL Courses.
9. If the SWAYAM/NPTEL course calendar does not align with the institute's calendar, the department shall facilitate and conduct examination of the relevant course of equivalent credits in physical/virtual mode and award the credits accordingly.

SCTR'S PUNE INSTITUTE OF COMPUTER TECHNOLOGY, PUNE-43
First Year B. Tech. Curriculum Structure
With effect from the A.Y. 2024-25

COCURRICULAR ACTIVITY-1 & 2 (CCA-1 & 2)

COURSE DETAILS		EVALUATION SCHEME	
COURSE CODE	F-023 & F-024	CIE	As per the guidelines
ACTIVITY HRS.	30 (MINIMUM)	--	--
CREDITS	01 + 01 = 02	--	--

COURSE OBJECTIVES

1. To provide an opportunity to acquire the skills and competencies in the areas that are not directly part of the curriculum.
2. To promote holistic personality development
3. To prepare for the future

COURSE OUTCOMES

After completion of this course / activity, student shall be able to:

F023/F024-1: Demonstrate the ability to lead and participate in teams.

F023/F024-2: Develop several important life skills such as leadership, organization, confidence timemanagement, and socialization.

F023/F024-3: Improve self-confidence and decision-making abilities.

F023/F024-4: Experience the importance of community involvement.

GUIDELINES FOR CO-CURRICULAR ACTIVITIES

As part of the implementation of autonomy with effective from Academic Year 2024-25 for the UG Co-curricular activities are included as credit courses in the curriculum. Accordingly, the number of credits are incorporated in curriculum structure.

BACKGROUND

SCTR's Pune Institute of Computer Technology believes in wholistic development of student catering to the requirements of engineering attributes (program outcomes) prescribed by Washington Accord and NBA through the implementation of Outcome Based Education. There is a limited scope of attaining all the program outcomes through classroom and laboratory teaching learning process. To expand the scope of learning to acquire all the attributes, PICT proposes to institutionalize and formalize the ongoing extra and co-curricular activities which are being carried out by students by awarding due credits and a certificate at the time of their graduation in addition to the University degree certificate. The purpose of extracurricular activities is primarily the acquisition of skills and competencies in areas that are not directly part of the curriculum.

SCOPE

Co-curricular activity (CCA) is an activity, performed by students, that falls outside the realm of the normal academics of college or university education. Such activities are generally social, philanthropic, and often involve others of the same age. However, as part of autonomy and NEP 2020 guidelines some of the credits are included in the curriculum as mandatory for CCA.

CC Activities Include but not limited to Community Service Organizations (NCC,NSS), Cultural / Ethnic Organizations, Engineering Academic Honor Societies, Engineering Clubs/ Organizations, Orientation Programs, Health Related Organizations, Professional Engineering

Societies – Student Chapters, Research(Voluntary Basis), Sports, educational activities that include, seminars, workshops, project competitions, hackathons, debate competitions, and mathematics, robotics, and engineering teams and contests.

CREDIT SYSTEM

1. A student can earn two credits per year and a maximum of 8 credits in 4 years
2. The activity hours accumulated throughout the year shall be calculated by the Co-Curricular Activity Committee (CCAC) to fix the number of credits to be granted to students at the end of the year. (Note: 30 hours =1credit)

MODE OF IMPLEMENTATION

1. A committee called Co-Curricular Activity Committee (CCAC) consisting of Dean Student Affairs and all the functional in charges of various activities shall facilitate the activities.
2. Identification and inclusion of Co-Curricular Activities to be considered for Credit System.
3. Mapping each activity to the program outcomes, design the assessment methodology.
4. Define the scope, methodology, number of hours required of each activity
5. Announcement of activity calendar
6. Registration and enrollment of interested students
7. Allocation of faculty mentors to interested students based on the activity and expertise/interest.
8. Carry out the activities, submission of weekly report in the form of logbook.
9. Submission of detailed report in prescribed format mentioning all the activities carried out along with certificates, mementoes, photographs etc.
10. End-semester assessment in the form of Term work.

LIST OF VARIOUS CO-CURRICULAR ACTIVITIES

1. Art Circle
2. ADDICTION- Annual Social Gathering
3. Sports
4. Student Welfare & Discipline
5. National Service Scheme (NSS)
6. PICTOREAL
7. Debate Society DEBSOC
8. TEDx PICT
9. Model United Nations (MUN)
10. Game Development Club (Game Utopia)
11. PICT Coders Club
12. Social media Cell
13. Entrepreneurship Development Cell
14. Smart India Hackathon (SIH)
15. Cyber Security Club
16. Training and Placement
17. Alumni Association
18. Career Guidance Cell
19. Impetus & Concepts (INC)
20. TechFiesta (PICT International Hackathon)
21. ACM (PASC)
22. IEEE (PISB)
23. IEEE APS
24. CSI
25. ROBOCON
26. Automobile Club
27. Universal Human Values (UHV)
28. Finance club (PFISOC)
29. FOSS Club
30. Astro Club
31. Ethicraft Club
32. AWS Cloud Club
33. Defense Aspirant Club
34. Startup and Innovation Cell