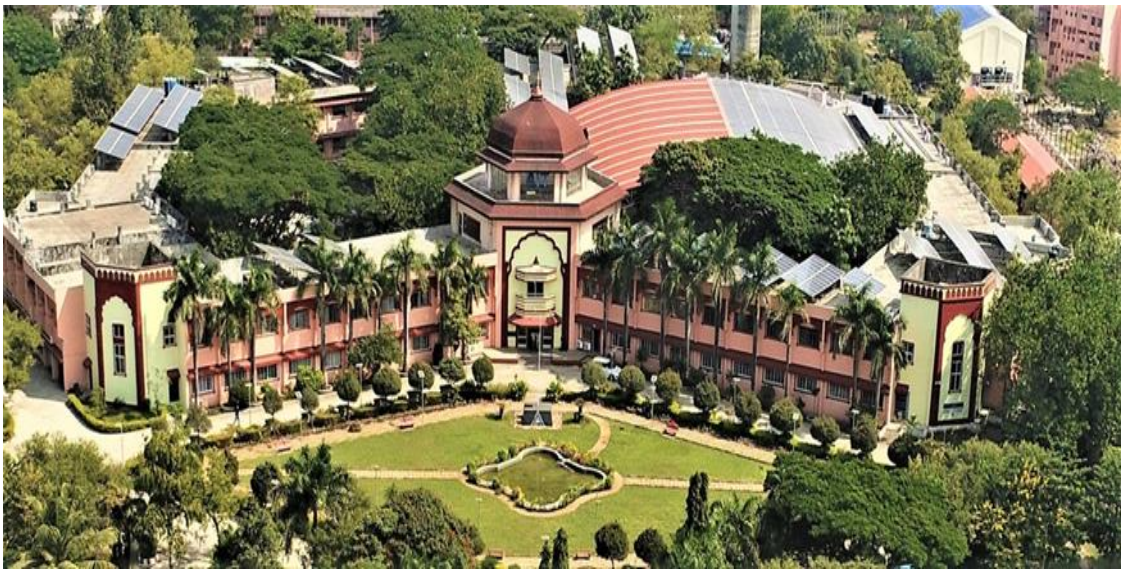
ARMY INSTITUTE OF TECHNOLOGY, PUNE
AUTONOMOUS INSTITUTE
AFFILIATED TO
SAVITRIBAI PHULE PUNE UNIVERSITY, MAHARASHTRA, INDIA



National Education Policy (NEP)-2020 Compliant Curriculum

First Year B. Tech. in Information Technology (2025 Pattern)

(With effect from Academic Year 2025-26)

www.aitpune.com

VISION OF THE INSTITUTE

To become a "Globally Recognised" technical institute providing world class education and research facilities to the wards of Defence personnel.

MISSION OF THE INSTITUTE

(a) Provide the right environment, to the wards of Defence personnel, for development of physical, intellectual, emotional and spiritual quotients, with a view to produce total quality engineers.

(b) Create an ecosystem which can foster the culture of research, innovation, creative thinking and higher studies.

(c) Develop an education system which creates entrepreneurs and technology leaders who are committed towards sustainable development of society and nation building.

CORE VALUES OF THE INSTITUTE

Excellence, Honesty, Integrity, Team Work, Continuous Learning and Innovation.

VISION OF THE DEPARTMENT

Towards providing world class education in Information Technology with societal focus.

MISSION OF THE DEPARTMENT

M1: Empowering students with state of art knowledge and skills to meet global challenges.

M2: To carry out high quality research leading to the creation and commercialization of intellectual property.

M3: To provide a comprehensive quality infrastructure committed to empower students to contribute technological and social development towards the progress of society

THE PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To produce graduates who would have developed a strong background in basic science and mathematics and to demonstrate technical competence in the fields of information Technology and develop solutions to the problems.

PEO2: To produce graduates who would attain professional competence through life-long learning such as advanced degrees, professional registration, and other professional activities.

PEO3: To produce graduates who functions ethically and morally in a multi-disciplinary environment in a global, societal, and environmental context.

PREFACE

The National Education Policy (NEP) 2020 has shown pathway to make India a global knowledge superpower. Army Institute of Technology (AIT) with its new Vision has already started working in that direction. As an important milestone, it has been conferred academic autonomy by UGC and SPPU and has prepared first ever curriculum under autonomy.

The Department of Electronics & Telecommunication Engineering at AIT Pune is committed to the effective and fruitful implementation of NEP 2020 in its true spirits emphasizing holistic and multidisciplinary education as per the directives of Maharashtra government. It emphasizes a multidisciplinary approach, aiming to develop critical thinking and creativity, thereby contributing to the holistic development of individuals.

We are delighted to present the first-year engineering syllabus -2025 pattern, which has been meticulously designed in alignment with the NEP 2020 with effect from academic year 2025-26. This curriculum aims to provide students with a holistic approach to engineering education ensuring a strong foundation in Mathematics and Science courses. This curriculum also includes components of vocational and skill enhancement courses, Indian Knowledge System and Co-curricular courses to shape well-rounded engineers who can adapt to global demands. Also, this document provides information on the credit system, course contents, and examination and evaluation scheme along with guidelines to make best use of the curriculum designed.

The syllabus encourages experiential learning, where theoretical concepts are supported by practical laboratory sessions. It also promotes research and innovation, encouraging students to engage in projects from the early stages of their academic journey. I wish to thank all the Board of Studies members who contributed in designing this curriculum.

We believe that this syllabus, crafted with the essence of the NEP 2020, will equip our students with the necessary skills and knowledge to excel in their future endeavors. We look forward to embarking on this exciting academic journey with our students.

KNOWLEDGE AND ATTITUDE PROFILE (WK)

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

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

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

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

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

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

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

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

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

PROGRAM OUTCOMES

PO1	**Engineering Knowledge**	Apply the knowledge of mathematics, natural science, computing, engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively develop to the solution of complex engineering problems.
PO2	**Problem Analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with considerations for sustainable development.(WK1 to WK4)
PO3	**Design/Development of Solutions**	Design creative solutions for complex engineering problems and design/develop system/components/processes to meet identified needs with consideration for the public health safety, whole life cost, net zero carbon,culture,society and enviourment as required.(WK5)
PO4	**Conduct Investigations of Complex Problems**	Conduct investigations of complex engineering problems using research base knowledge including design of experiments ,modelling,analysis and interpretation of data to provide valid conclusion.(WK8)
PO5	**Engineering Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling recognizing their limitations to solve to complex engineering problems.(WK2 &WK6)
PO6	**The Engineer and The World**	Analyze and evaluate social enviourmental aspects while solving complex engineering problems or its impact on sustainability with reference to economy,health,seafty,legal frameworks, culture and enviourment.(WK1,WK5 & WK7)
PO7	**Ethics**	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion, adhere to national and international laws.(WK9)
PO8	**Individual and Collaborative Team Work**	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	**Communication**	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
PO10	**Project Management and Finance**	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments..
PO11	**Life-long Learning**	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)
PSO1	**Problem Solving Skill**	Graduate will demonstrate an ability to identify, formulate & solve computer science and Information Technology Engineering problems
PSO2	**Software & Data Expertise**	Graduate will demonstrate an ability to investigate, design and develop software programs, analyze & interpret the data and work on multidisciplinary projects
PSO3	**Career & Growth Opportunities**	Enable students to pursue their chosen career paths such as higher education, entrepreneurship and placement in reputed organizations.

ABBREVIATIONS

ABC : Academic Bank of Credit
AEC : Ability Enhancement Course
AI : Artificial Intelligence
AIT : Army Institute of Technology
AWES : Army Welfare Education Society
BSC : Basic Science Course
CBCS : Choice Based Credit System
CCC : Co-Curricular Courses
CCE : Comprehensive Continuous Evaluation
CEP : Common Engineering Project
CO : Course Outcome
CP : Credit Points
ELC : Experiential Learning Courses
ESC : Engineering Science Course
FP : Field Project
GoM :Government of Maharashtra
HEI : Higher Education Institutions
INT :Internship
IKS :Indian Knowledge System
IQAC :Internal Quality Assurance Cell
MDM :Multidisciplinary Minor
MOOC :Massive Open Online Courses
MPUA :Maharashtra Public Universities Act, 2016
MSDE :Ministry of Skill Development and Entrepreneurship
MSFDA :Maharashtra State Faculty Development Academy
NAAC :National Assessment and Accreditation Council
NEP :National Education Policy
NSDC :National Skill Development Corporation
NSQF :National Skills Qualification Framework
NSS :National Service Scheme
NTA :National Testing Agency
OE :Open Elective
OJT :On Job Training

PCC :Program Core Course

PEC :Programme Elective Course

PO :Program Outcomes

PR :Practical

PRN :Permanent Registration Number

PRJ :Project

PSO :Program Specific Outcome

RM :Research Methodology

SPPU :SavitribaiPhule Pune University

SSCs : Sector Skill Councils

TH : Theory

TU :Tutorials

VEC :Value Education Course

VSE :Vocational and Skill Enhancement Course

VC :Vice Chancellor

NEP 2020 COMPLIANT CURRICULUM STRUCTURE
FIRST YEAR BTECH (INFROMATION TECHNOLOGY ENGINEERING)
SEMESTER I
(WEF AY 2025-26)

Level 4.5																
CourseCode	Course Type	CourseName	TeachingScheme(Hrs./week)				Examination SchemeandMarks						Credits			
			Lecture	Practical	Tutorial	Total	CIE	ESE	Termwork	Practical	Oral	Total	Theory	Practical	Tutorial	Total
BCC25411A0A	BSC	Engineering Mathematics-I	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BIT25412A0A	BSC	Applied Sciences For IT-I	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BME25413A0A	ESC	Basic Mechanical Engineering & CAD	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BIT25414A0A	ESC	Foundation of Computer Programming	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BCC25411A0C	BSC	Engineering Mathematics-I Tutorial	-	-	1	1	-	-	25	-	-	25	-	-	1	1
BIT25412A0B	BSC	Applied Sciences For IT-I Lab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BME25413A0B	ESC	Basic Mechanical Engineering & CAD Lab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BIT25414A0B	ESC	Foundation of Computer Programming Lab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BCC25415A0X	VSEC& FP	Design Thinking & Ideation	1	2	-	3	50	-	25	-	-	75	1	1	-	2
BCC25416A0X	IKS	Indian Knowledge System	2	-	-	2	50	-	-	-	-	50	2	-	-	2
BCC25417A0X	VEC	Communication Skills & Human Values	1	-	1	2	50	-	25	-	-	75	1	-	1	2
BCC25418A0X	AC	Environmental Science	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			**16**	**08**	**02**	**26**	**350**	**200**	**150**	**-**	**-**	**700**	**16**	**04**	**02**	**22**

NEP 2020 COMPLIANT CURRICULUM STRUCTURE

FIRST YEAR BTECH (INFORMATION TECHNOLOGY ENGINEERING)

SEMESTER II

(WEF AY 2025-26)

Level 4.5																
CourseCode	Course Type	CourseName	TeachingScheme(Hrs./week)				Examination SchemeandMarks						Credits			
			Lecture	Practical	Tutorial	Total	CIE	ESE	Termwork	Practical	Oral	Total	Theory	Practical	Tutorial	Total
BIT25421A0A	BSC	Engineering Mathematics-II	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BIT25422A0A	BSC	Applied Sciences For IT-II	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BIT25423A0A	ESC	Object Oriented Programming	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BEC25424A0A	ESC	Basic Electrical & Electronics Engineering	3	-	-	3	50	50	-	-	-	100	3	-	-	3
BIT25421A0C	BSC	Engineering Mathematics-II Tutorial	-	-	1	1	-	-	25	-	-	25	-	-	1	1
BIT25422A0B	BSC	Applied Sciences For IT- II Lab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BIT25423A0B	ESC	Object Oriented Programming Lab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BEC25424A0B	ESC	Basic Electrical & Electronics EngineeringLab	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BCC25425A0X	VSEC &PRJ	Design Thinking, Innovation & Prototyping	1	2	-	3	50	-	25	-	-	75	1	1	-	2
BCC25426A0X	HSSM	Entrepreneurship Skills And Professional Ethics	2	-	1	3	50	-	50	-	-	100	2	-	1	3
BCC25427A0X	CC	Life Skills &Liberal Learning	-	2	-	2	-	-	25	-	-	25	-	1	-	1
BCC25428A0X	AC	The Constitution of India	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total			**15**	**10**	**2**	**27**	**300**	**200**	**200**	**-**	**-**	**700**	**15**	**05**	**02**	**22**

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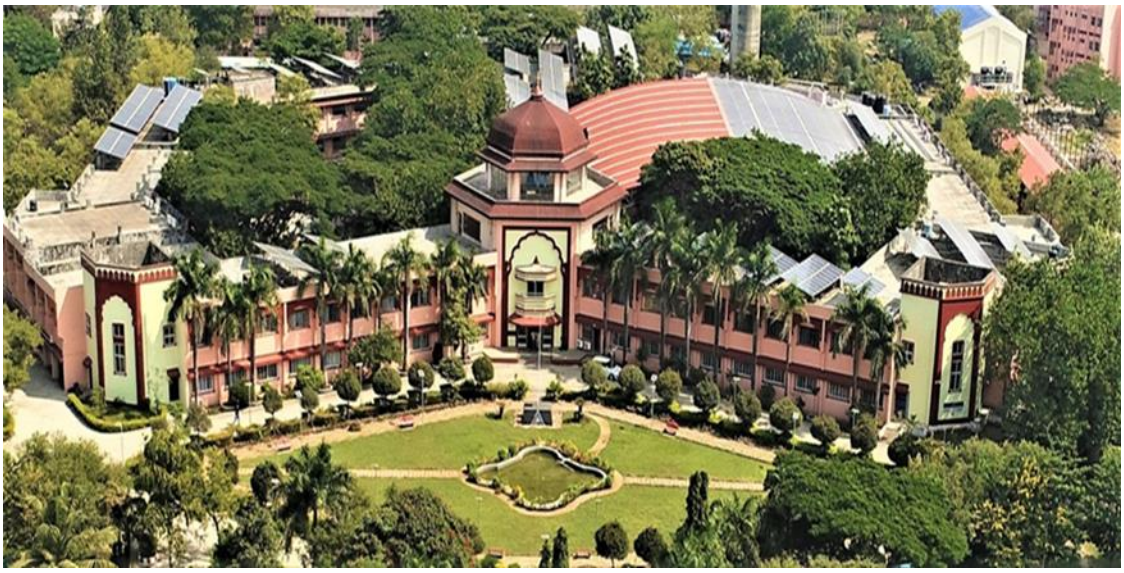
National Education Policy (NEP) Compliant Curriculum

Semester - I



First Year Engineering (2025 Pattern)

www.aitpune.com

COURSE CODE: BCC25411A0A
COURSE NAME: ENGINEERING MATHEMATICS-I

Teaching Scheme:	Credit	Examination Scheme:
Theory: 03 hrs. / week	03	CIE (Theory): 50 Marks ESE (Theory): 50 Marks

Prerequisite Courses, if any:1. Elementary Mathematics 2. Elementary Calculus

Companion Course, if any: NA

Course Objectives:

1. To understand and familiarize with concepts of linear algebra
2. To understand and apply series expansion of functions
3. To understand and apply basics of differential equations
4. To understand and apply basics of vector differentiation
5. To understand basics of vector integration and apply to solve engineering problems

Course Outcomes: On completion of the course, learner will be able to -
CO1:Understand and apply the concept of rank to find Eigen values and Eigen vectors
CO2:Determine the representation of a function in an infinite series using successive differentiation, Taylor's and McLaurin's theorems
CO3:Apply the effective mathematical tools for solving ordinary differential equations
CO4:Applyvector differentiations to **analyze** the vector fields
CO5:Apply vector integration and **analyze** the vector fields

Course Contents

Unit I : Linear Algebra	**(8Hrs)**
Rank, System of linear equations with applications, Linear dependence and independence of vectors, Linear transformations, Eigenvalues, Eigen vectors, applications.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**
Unit II : Calculus	**(8Hrs)**
Successive Differentiation and Leibnitz theorem, Beta and Gamma functions, differentiation under integral sign (DUIS), Taylor's series, McLaurin's series. Time Series Functions.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**
Unit III : Differential Equations	**(9Hrs)**
1. **Ordinary Differential Equations:** Linear Differential Equations, Exact differential equations, Differential equations reducible to Exact form 2. **Linear Differential Equations:**LDEof nth order with constant coefficients, Complementary Function, Particular Integral, General method, short methods, Method of variation of parameters, Cauchy's and Legendre's DE, Simultaneous and Symmetric simultaneous DE.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**
Unit IV : Vector Differentiation	**(7Hrs)**
Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**
Unit V : Vector Integration	**(8Hrs)**
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stokes theorem. Applications to problems in Electro-magnetic fields.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11. PSO1, PSO2, PSO3**

Learning Resources

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi

Reference Books:

1. Erwin Krey zig, “Advanced Engineering Mathematics”, Wiley Eastern Ltd.
2. M. D. Greenberg, “Advanced Engineering Mathematics”, Pearson Education
3. Peter V. O’Neil, “Advanced Engineering Mathematics”, Thomson Learning
4. George B. Thomas, “Thomas’ Calculus”, Addison-Wesley, Pearson.

MOOC / NPTEL Courses/Other Resources:

1. **https://youtu.be/9h_Q-R6sXbM?si=Nqz81D-JajSpAMvl**
2. **https://youtu.be/ksS_yOK1vtk?si=vNsF2s9nG9Ces_1O**
3. **https://youtu.be/NBcGLLU90fM?si=YfonBLq6fG2sopxJ**
4. **https://youtu.be/ksS_yOK1vtk?si=kW_YOORW8RIVRLto**

COURSE CODE: BCC25421A0C
COURSE NAME: ENGINEERING MATHEMATICS-I TUTORIAL

Teaching Scheme:	Credit	Examination Scheme:
Tutorial: 01 Hrs. / Week	01	Term Work: 25 Marks

Prerequisite Courses, if any:1. Elementary Mathematics 2. Elementary Calculus

Companion Course, if any:Engineering Mathematics-I

Course Outcomes: On completion of the course, -

CO1: Understand and apply the concept of rank to find Eigen values and Eigen vectors

CO2: Determine representation of a function in an infinite series using successive differentiation, Taylor's and McLaurin's theorems

CO3: Applythe effective mathematical tools for solving order ordinary differential equations

CO4:Applyvector differentiations to **analyze** the vector fields

CO5:Apply vector integration and **analyze** the vector fields

Guidelines for Student's Tutorials

- Will be given centrally

Guidelines for TW Assessment

For TW assessment - weightage given to

1. Attendance
2. Completion of Assignments(at least one assignment per unit)
3. In time Submission

Guidelines for Conduction

- Will be given centrally

List of Assignments

	Unit I -Linear Algebra
1.	Obtain Eigen values and Eigen vectors using suitable software tools.
	Unit II -Calculus
1.	Find series expansion of functions with the help of successive differentiation and Taylor's series using suitable software tools.
	Unit III- Differential Equations
1.	Solve any one: 1. Solve problems of ordinary differential equations of first order and first degree. 2. Solve problems of linear differential equations.
	Unit IV-Vector Differentiation
1.	Use various vector differentiation techniques to analyze/identify vector fie
	Unit V-Vector Integration
1.	Use various vector integration techniques to analyze/identify vector fields.

Learning Resources

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi

Reference Books:

1. Erwin Krey zig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
2. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education
3. Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson Learning
4. George B. Thomas, "Thomas' Calculus", Addison-Wesley, Pearson

MOOC / NPTEL Courses/Other Resources:

1. https://youtu.be/9h_Q-R6sXbM?si=Nqz81D-JajSpAMvl
2. https://youtu.be/ksS_yOK1vtk?si=vNsF2s9nG9Ces_1O
3. https://youtu.be/NBcGLLU90fM?si=YfonBLq6fG2sopxJ
4. https://youtu.be/ksS_yOK1vtk?si=kW_YOORW8RIVRLto

COURSE CODE: BIT25412A0A
COURSE NO – APPLIED SCIENCES FOR IT -I

Teaching Scheme:	Credit	Examination Scheme:
Theory:03 hrs. /week	03	CIE (Theory): 50 Marks ESE (Theory): 50 Marks

Prerequisite Courses, if any: NA

Companion Course, if any: NA

Course Objectives:

1. To introduce the principles and methodologies of computational approaches for solving chemical problems and provide knowledge of molecular modeling.
2. To enable students to analyze and interpret chemical and biological information through computational methods.
3. To understand the interface of biology and computing for innovations in bioinformatics and computational biology.
4. To highlight recent advancements in smart, functional, and biomaterials in engineering and develop the ability to choose appropriate materials for specific engineering applications.
5. To develop skills in solving real-world problems using advanced instrumentation and enable the application of these techniques in industrial, academic, and research environments.

Course Outcomes: On completion of the course, the learner will be able to -

CO1: Remember fundamental principles of computational chemistry, including molecular modeling, quantum chemistry, and molecular dynamics.

CO2: Understand Fundamental Concepts cheminformatics software and databases for molecular visualization, data retrieval, and chemical informatics applications.

CO3: Apply Biological Data utilize computational techniques to analyze biological data, such as DNA sequencing, protein structures, and biological networks.

CO4: Analyze- Nanomaterials and Polymers, synthesis, properties, and applications of nanomaterials, biomaterials, and polymers in modern engineering.

CO5: Evaluate the role of instrumental techniques in industries such as pharmaceuticals, environmental monitoring, nanotechnology, and food analysis..

Course Contents

Unit I : Computational Chemistry	(08 Hrs)

1. **Computational Chemistry:** Introduction and its importance in modern research and industries. Advantages and limitations of computational methods. Molecular Modelling Concepts: Geometry optimization, Energy minimization.
2. Applications of Computational Chemistry, Molecular structure concepts, Reaction mechanism studies, Drug design and discovery, and Spectroscopic properties. Emerging Trends in Computational Chemistry.

Mapping of Course Outcomes with POs & PSOs	PO1,PO2, PO5, PSO1

Unit II : Cheminformatics	(08 Hrs)

1. **Cheminformatics:** Introduction, Historical development and evolution. Molecular structures and their representations. Chemical Databases. Molecular Descriptors and Fingerprints.
2. Computational Tools in Cheminformatics, Applications of Cheminformatics: Material science and engineering and Environmental chemistry.

Mapping of Course Outcomes with POs & PSOs	PO1, PO2, PO4 , PSO1

Unit III : Biological Computing	(08 Hrs)

1. Introduction to Biological Computing, Historical Development and Milestones in Biological Computing.Differences between Classical Computing and Biological Computing.Biological Systems as Computational Models, Molecular Computing, Bio-computational Hardware.
2. Applications of Biological Computing: Biological data storage: DNA as a medium for high-density information storage. Environmental applications: Biosensors for detecting pollutants, and monitoring ecosystems.

Mapping of Course Outcomes with POs & PSOs	PO1, PO3, PO4, PO5, PO6, PSO1, PSO3

Unit IV : Advanced Engineering Materials	(08 Hrs)

1. **Nanomaterials:** Introduction, and classification of nanomaterialsbased on dimensions. Structure and applications of graphene, fullerene, carbon nanotubes, and quantum dots (semiconductor nanoparticles).
2. **Polymers:** Introduction and classification based on thermal behavior, Specialty polymers: Introduction, properties, and applications. Conducting Polymer,Polymer nanocomposites, and Liquid Crystal Polymer.Applications of polymer in engineering.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO6, PSO3**

Unit V :Advanced Instrumental Technique	**(08 Hrs)**

1. **UV-Visible Spectroscopy:**Introduction, statement of Beer's law and Lambert's law, Electronic transitions in an organic molecule, terms involved in UV-visible Spectroscopy, instrumentation (double beam), and applications.
2. **Infra-red Spectroscopy**: Introduction, Principle, and types of vibrations: Stretching (symmetric and asymmetric) and bending (scissoring, rocking, wagging, and twisting), conditions of absorption of IR radiations, Instrumentation, and Applications.
3. **X-Ray Diffraction:** Introduction, Generation of X-Ray, and Principle. X-ray diffraction Techniques: Single crystal X-ray diffraction, Powder, X-ray diffraction (PXRD), Instrumentation, and applications.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO3, PO5, PO6, PSO3**

Learning Resources

Text Books:

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

Reference Books:

1. . S. M. Khopkar, Basic Concept of Analytical Chemistry, 2ed, New Age-International Publisher.
2. G. R. Chatwal& S. K. Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
3. P. S. Kalsi, Spectroscopy of organic compounds, 2ed, New Age-International Ltd., Publisher.
4. V. R. Gowarikar, N. V. Viswanathan, JayadevSreedhar, Polymer Science, Wiley Eastern Limited.
5. G. L. Hornyak, J. J. Moone, H. F. Tihhale, J. Dutta, Fundamentals of Nanotechnology, CRC press

MOOC / NPTEL Courses/Other Resources:

1. Advanced Computational Techniques
   https://onlinecourses.nptel.ac.in/noc25_ma01/preview
2. Computational process design
   https://onlinecourses.nptel.ac.in/noc25_ch47/preview
3. Polymer Reaction Engineering
   https://onlinecourses.nptel.ac.in/noc25_ch38/preview
4. Chemical Process Technology
5. https://onlinecourses.nptel.ac.in/noc25_ch15/preview

Course Code:BIT25412A0B Course Name - Applied Sciences For IT-ILab		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Practical: 02 hrs. /week	**01**	**Term Work:25 Marks**
Prerequisite Courses, if any:		
Companion Course, if any:		

Course Outcomes:

On completion of the course, learner will be able to–

CO1:Correlate principles of chemistry to everyday and complex engineering problems.

CO2: Think out of box with the solid foundation of p chemistry to solve engineering problems.

Guidelines for Student's Lab Journal

1. Draw the diagram on the left side of the first page, in front of aim in pencil, on a blank page.
2. The observations will be written on blank age with a pencil, followed by the calculations on the same page.
3. The graph will face the observation table. Show the slope and any related calculations on the graph, in pencil.

Guidelines for Lab /TW Assessment

1. 10 marks for the lab/journal work, which includes 5 marks for timely submission/practical completion, 05 interests shown while, perform the practical and calculations etc.
2. 05 marks for file writing.
3. 05 marks for theory attendance.
4. 05 marks for class seminars/viva.

Guidelines for Laboratory Conduction

1. Come with completed file in the laboratory.
2. Ensure the file is checked regularly.
3. Do not enter the lab/work in the lab without instructor.

List of Laboratory Experiments

Group A (Any two)	
1.	Molecular Structure Visualization and Optimization using Chemdraw software
2.	Synthesis and characterization of Polystyrene polymer.
3.	Basic Reaction Mechanism and its Simulation using Chemdraw software
Group B (Any two)	
1.	Synthesis of Quantum dots nanoparticles (2-6 or 3-5 semiconductor).
2.	Synthesis and Characterization of Conducting Polymer (polyaniline or polypyrrole).
3.	Compute and analyze molecular descriptors of given organic molecules using computational tools.
Group C (Any three)	
1	Characterization of the Optical Properties of Nanomaterials Using UV-Vis Spectroscopy
2	Synthesis and characterization of Phenol Formaldehyde polymer.
3	Protein Folding and Structural Stability
4	Biosensor Development for sustainability
Group D (Any three)	
1	Structure-Activity Relationship (SAR) Studies.
2	DNA Hybridization and Detection.
3	Spectroscopic Calculations (IR and UV-Vis).
4	Practical on Biological Computing

Useful Links/Resources:

1. MERLOT Virtual Labs: Chemistry
2. https://nptel.ac.in/courses/103107206
3. https://nptel.ac.in/courses/103107207

COURSECODE: BME25413A0A
COURSE NAME: BASIC MECHANICAL ENGINEERING AND CAD

Teaching Scheme:	Credit	Examination Scheme:
Theory: 03 Hrs./ Week	03	CIE (Theory): 50 Marks ESE (Theory): 50 Marks

Prerequisites: Physics, Chemistry, Mathematics

Course Objectives:

1. To know the principle, methods, possibilities and limitations of Thermal Engineering and its applications.
2. To understand the importance of products, their Design considerations with respect to the applications.
3. To understand the basic concepts and various mechanisms related with design engineering.
4. To be familiar with the characteristics of the different materials those are used in Manufacturing technologies and the machine tools used.
5. To explore the potential of Computer Aided Design and Drafting (CADD) and its applications..

Course Outcomes:

On completion of the course the learner will be able to;

CO1. Articulate the fundamentals of thermodynamics and Heat transfer
CO2. Understand the applications of Thermal Engineering.
CO3. Apply the Design Engineering and its applications.
CO4. Explain the Production Engineering and its applications.
CO5. Explore the Computer Aided Design and Drafting (CADD) and its applications.

Course Contents

Unit 1:Thermal Engineering — **6 Hrs**

1. **Thermodynamics:**Laws of thermodynamics, Heat engine, Heat pump and Refrigerator
2. **Heat Transfer:** Modes of heat transfer with applications, Fourier's law, Newton's law of cooling, Stefan Boltzmann's law
3. **Transportation**:Two stroke and Four stroke engines (Petrol, Diesel and CNG engines), Electric and Hybrid Vehicles

Mapping of Course Outcomes with POs & PSOs — **PO1, PO2, PO3, PSO1**

Unit 2:Applications of Thermal Engineering — **8 Hrs**

1. **Energy Sources:** Thermal energy, Hydropower energy, Nuclear energy, Solar energy, Geothermal energy, Wind energy, Hydrogen energy, Biomass energy and Tidal energy. Grades of Energy
2. **Energy Conversion Devices:** Boiler, Pump, Compressor, Turbine, I.C. engines, Fans, Blowers, HVAC System, Household Refrigerator, Window Air Conditioner
3. **Power Plants:** Thermal, Hydroelectric, Nuclear, Solar, Geothermal, Wind, Hydrogen, Tidal, Biomass and Hybrid Power Plants.

Mapping of Course Outcomes with POs & PSOs — **PO1, PO2, PO3, PSO1**

Unit 3:Design Engineering — **9 Hrs**

1. **Machine elements**: Power transmission elements (shafts, axles, keys, bush and ball bearings, Joint, universal joint, Springs and Dampers, Valves, Levers), Flywheel and Governors
2. **Power Transmission Devices**: Belts drives, Chain drive, Gears, Couplings, Clutch, Brakes, Applications of these devices
3. **Mechanisms**: Slider crank/ IC Engine mechanism, Four bar chain mechanism and its inversions, Geneva mechanism, Ratchet and Paul mechanism, Mobility/Transportation Mechanisms

Mapping of Course Outcomes with POs & PSOs — **PO1, PO2, PO3, PSO1**

Unit 4:Production Engineering — **9 Hrs**

1. **Material Science**: Materials used in Engineering and their applications, Metals (Ferrous and Non-Ferrous), Nonmetallic materials, Material selection criteria
2. **Manufacturing Science**: Introduction to manufacturing processes and their applications, Carpentry, Casting, Sheet metal work, Forging, Metal Forming, Metal Joining, Machining

3. **Machine Tools**: Working principle and types of operations of Lathe Machine, Milling Machine, Drilling Machine, Power saw, Grinding machine, NC and CNC machines, 3D Printers

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PSO1**

Unit 5:Computer Aided Design and Drafting (CADD)	**10 Hrs**

Sketching of engineering objects and interpretation of drawings as a visualization and communication tool, Introduction to Computer aided Graphics, Introduction to Computer Aided Drafting (CAD) packages application for both 2D and 3D computer-aided design (CAD) and drafting, Basic Operations/Commands, Principal Views, Dimensioning, Editing, Modifying, Printing/Plotting CAD entities/Drawing sheets, Introduction to 3D primitives, Creating 3D components through the use of a CAD package. Simple assemblies, generation of assembly views from part drawings, animation of simple assemblies.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PSO1**

Books and other resources

Text Books:

1. Nag, P. K., “Engineering Thermodynamics," Tata McGraw-Hill Publisher Co. Ltd.
2. Chaudhari and Hajra, “Elements of Workshop Technology”, Volume I and II, Media Promoters and Publishers, Mumbai
3. Agrawal,Basant and Agrawal, C. M., (2008), “Basics of Mechanical Engineering”, John Wiley and Sons, USA
4. Rajput, R.K., (2007), “Basic Mechanical Engineering”, Laxmi Publications Pvt. Ltd.
5. Pravin Kumar, (2018), “Basic Mechanical Engineering, 2nd Ed.”, Pearson (India) Ltd.
6. Moran, M. J., Shapiro, H. N., Boettner, D. D., and Bailey, M. “Fundamentals of Engineering Thermodynamics”, Wiley
7. Surinder Kumar, (2011), “Basic of Mechanical Engineering”, Ane Books Pvt. Ltd. New Delhi
8. Bethune, J.D., “Engineering Graphics with AutoCAD,” Prentice Hall, Englewood Cliffs, First Edition, 1995

References Books:

1. Khan, B. H., “Non-Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.
2. Boyle, Godfrey, “Renewable Energy”,2nd Ed., Oxford University Press
3. Khurmi, R.S. ,and Gupta, J. K.,“A Textbook of Thermal Engineering”, S. Chand & Sons
4. Incropera, F. P. and Dewitt, D.P., (2007), “Fundamentals of Heat and Mass Transfer, 6th Ed., John Wiley and Sons, USA
5. Groover,Mikell P., (1996), “Fundamentals of Modern Manufacturing: Materials, Processes, and Systems”, Prentice Hall, USA
6. Norton, Robert L., (2009), “Kinematics and Dynamics of Machinery”, Tata McGrawHill
7. Cleghorn, W. L., (2005), “Mechanisms of Machines”, Oxford University Press
8. Juvinal, R. C., (1994), “Fundamentals of Machine Component Design”, John Wiley and Sons, USA
9. Ganeshan, V., (2018), “Internal Combustion Engines”, McGraw Hill
10. Anderson, Curtis Darrel and Anderson,Judy, (2010), “Electric and Hybrid Cars: A History”, 2nd Ed., McFarland
11. Jolhe, D. A., (2015), “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill, New Delhi
12. Lani Tran, (2024), “Mastering Modern CAD Drawings with SOLIDWORKS 2024: Applying ASME Standards to Engineering Drawings”, SDC Publications

COURSE CODE: BME25413A0B
COURSE NAME: BASIC MECHANICAL ENGINEERING AND CAD LAB

Practical Scheme	Credits	Examination Scheme
Practical: 02 hrs. / week	01	Term Work: 25 Marks

Prerequisites: Physics, Chemistry, Mathematics

Course Objectives:

1. To know the principle, methods, possibilities and limitations of Thermal Engineering and its applications.
2. To understand the importance of products, their Design considerations with respect to the applications.
3. To understand the basic concepts and various mechanisms related with design engineering.
4. To be familiar with the characteristics of the different materials those are used in Manufacturing technologies and the machine tools used.
5. To explore the potential of Computer Aided Design and Drafting (CADD) and its applications..

Course Outcomes:

On completion of the course the learner will be able to;

CO1. Articulate the fundamentals of thermodynamics and Heat transfer
CO2. Understand the applications of Thermal Engineering.
CO3. Apply the Design Engineering and its applications.
CO4. Explain the Production Engineering and its applications.
CO5. Explore the Computer Aided Design and Drafting (CADD) and its applications.

Term Work

The student shall complete **any 10** of the following activity as a term work.

1. Study of Energy sources (Minimum one Conventional and one Nonconventional source).
2. Study and demonstration of energy conversion devices.
3. Study and demonstration of Electric and Conventional IC engine vehicles, their specifications and systems
4. Study and demonstration of Power Plants.
5. Study and demonstration of Domestic appliances viz. refrigerator, air-conditioner, washing machine, cold storage.
6. Study and demonstration of power train/gear box system in the vehicle or machine tool.
7. Study and demonstration of Power Transmission Devices.
8. Study and demonstration of vehicle systems (automobile chassis, steering system, suspension system, braking system - Any Two).
9. Study and demonstration of additive manufacturing / rapid prototyping techniques and machines.
10. Study and demonstration of CNC machines.
11. Visit to any Manufacturing Industry.
12. 2D Drafting of PCB / Heat Sinks / any Electrical/Electronic components.
13. 3D Modeling of PCB / Heat Sinks / any Electrical/Electronic components.
14. Visit to any Service Industry.

References Books:

1. Khan, B. H., “Non-Conventional Energy Sources, Tata McGraw-Hill Publisher Co. Ltd.
2. Boyle, Godfrey, “Renewable Energy”,2nd Ed., Oxford University Press
3. Khurmi, R.S. ,and Gupta, J. K.,“A Textbook of Thermal Engineering”, S. Chand & Sons
4. Incropera, F. P. and Dewitt, D.P., (2007), “Fundamentals of Heat and Mass Transfer, 6th Ed., John Wiley and Sons, USA
5. Groover,Mikell P., (1996), “Fundamentals of Modern Manufacturing: Materials, Processes, and Systems”, Prentice Hall, USA
6. Norton, Robert L., (2009), “Kinematics and Dynamics of Machinery”, Tata McGrawHill
7. Cleghorn, W. L., (2005), “Mechanisms of Machines”, Oxford University Press
8. Juvinal, R. C., (1994), “Fundamentals of Machine Component Design”, John Wiley and Sons, USA
9. Ganeshan, V., (2018), “Internal Combustion Engines”, McGraw Hill
10. Anderson, Curtis Darrel and Anderson,Judy, (2010), “Electric and Hybrid Cars: A History”, 2nd Ed., McFarland
11. Jolhe, D. A., (2015), “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill, New Delhi

Lani Tran, (2024), “Mastering Modern CAD Drawings with SOLIDWORKS 2024: Applying ASME Standards to Engineering Drawings”, SDC Publications

COURSE CODE: BIT25414A0A COURSE NO – FOUNDATION OF COMPUTER PROGRAMMING		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory:03 hrs. /week	**03**	**CIE: 50 Marks** **ESE: 50 Marks**
Prerequisite Courses, if any:Basic Mathematics		
Companion Course, if any: -		
Note: Students have to work on same case study from 1st to 5th unit.		

Course Objectives:

1. To understand the fundamental Concepts of C Programming
2. To acquire knowledge and Compare usage of Operators and Expressions in C Programming
3. To apply Control Flow structures in C Programming for Problem solving
4. To design a solution using Arrays, Character and String Arrays in C programming
5. To design a develop solution for simple computational problems using User Defined Functionsand structures in C Programming

Course Outcomes: On completion of the course, students will be able to -

CO1: Able to solve Computational problems using Structured methodologies and Programming Tools.

CO2: Illustrate the use of algorithm in solving Fundamental Computational Challenges.

CO3: To Apply the concept of Control Flow Structures and user defined data types to solve the particle Problems.

CO4: Identify use of Pointers and user defined function.

CO5: Understand File Handling and Pre-processors.

Course Contents

Unit I : Fundamentals of Programming	**(06-Hrs)**

1. Problem Solving: Skills required for a software engineer: Technical Skills, Problem Solving Skills and Soft Skills. Problem and Types of Problem: Social Problem, Management Problem and Computational Problem. Examples of Computational Problems: Decision Problem, Searching and Sorting Problem, Counting Problem, Optimization Problem.
2. Logic: Importance of Logic in Problem Solving, Positive logic, Negative logic.Problem Solving Tools:Algorithms, Flowcharts.
3. Introduction to computer-based problem solving:Importance of Studying Programming Languages, Impact ofRole of Programming Languages, Programming Environments.Program design and implementation issues, Pseudocodes.

Case Study:	A User Login System (focus on Pseudocode)
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO5, PO6, PO19, PO11, PSO1**

Unit II : Introduction to C Programming	**(09 - Hrs)**

4. **Programming Fundamentals:** Structure of C program, Header files and preprocessor directives. Compiler, Interpreter, Assembler, Loader, Linker. Coding Standards. Writing and executing the first C program. Syntax and logical Errors, Object and executable code.
5. **Tokens in C:** Identifiers, Keywords (Variable declaration, initialization and manipulation of data.), Constants, Strings, Operators, special symbols.
6. **Data Types**: Definition of Primitives and Non-Primitives using ADT
7. **Operators and expressions:** Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Conditional Operators (Ternary Operator), Assignment Operator, Special operators (Comma, dot, arrow, sizeof, asterisk, addressofoperators) Operator precedence and associativity, Expression formation and evaluation. Type Casting.

Case Study:	Banking System(focus on datatypes and operators)
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO5, PO9, PO11, PSO1**

Unit III : Control Structures& User defined data Types	**(09 - Hrs)**

1. Decision-making control Statements-Simple if statement, If-else statements, Nested if-else statements, else-if ladder
2. **Conditional statements:** switch Statements, goto statements, break, continue Statements
3. **Loop control statements in C:** While Loop, Do-while Loop, For Loop
4. **Arrays:** Introduction to arrays, Declaration and initialization of Array, One-dimensional and multi-dimensional arrays, Array manipulation (sorting, searching)
5. **Strings:** Introduction to strings in C, String handling functions
6. **Structures:** Defining and using structures, Arrays of structures, Unions and their uses, Enumerated types

Case Study 1: **Case Study 2:**	Online Exam System (focus on all Control statements) Students enrollment System(Focus on Arrays and Structures)
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO5, PO6, PO9, PO11, PSO1**

Unit IV : Pointer and Functions	**(09 - Hrs)**

1. Introduction to pointers, Declaration, Pointer arithmetic, Pointers and arrays, Pointers to functions, Use of pointers for passing variables, Dynamic allocation-malloc(), calloc(), realloc(), free() and its application; Garbage
2. **Functions in C:** Definition and declaration of functions, Function prototypes, passing arguments (by value, by reference), Scope and lifetime of variables, Function types – Built-in and User-defined functions, Recursive functions

Case Study:	Dynamic Memory Management in a Library System(Adding ,delete and update of books)
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO5, PO9, PO11, PSO1**

Unit V : File Handling and Pre-processors in C	**(07 - Hrs)**

File Handling, Pre-processors, Macros, Conditional CompilationPreprocessor Directives and Macros. Using macros for code optimization, Error Handling and Debugging Techniques, Implementing error handling strategies

Case Study:	Students marks sheet generation
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO4, PO5, PO6, PO9, PO11, PSO1**

Learning Resources

Text Books:

1. R. G. Dromey,"How to solve it by Computer", Pearson Education, ISBN 0-13-433995-9.
2. Kernighan, Brian W., and Ritchie, Dennis M. The C Programming Language. 2nd ed., Prentice Hall, 1988, ISBN 0-13-110362-8.
3. McConnell, Steve. Code Complete. 2nd ed., Microsoft Press, 2004, ISBN 978-0735619678.
4. Scott, Michael L. Programming Language Pragmatics. 4th ed., Morgan Kaufmann, 2015, ISBN 978-0123745149

Reference Books:

1. Maureen Sprankle, "Problem Solving and Programming Concepts", Pearson Education, ISBN-978-81-317-0711-1
2. "Programming and Problem-Solving Using C", International Software Research and Development (ISRD Group), Lucknow, TMcGraw-Hill Publishing, ISBN 13: 978-0-07-066760-0
3. Balguruswamy, E.," Programming in ANSI C", 7th ed., Tata McGraw-Hill, 2011, ISBN 978-0-07-068233-7
4. Krantz, Stephen G.," Problem Solving Techniques.", Universities Press, 2005, ISBN 978-8173717030.
5. Rajaraman, V.,"Computer Programming in 'C'." 2nd ed., Prentice Hall, 1995, ISBN 978-0130223045.
6. Martin, Robert C.," Clean Code: A Handbook of Agile Software Craftsmanship.", 1st ed., Prentice Hall, 2008, ISBN 978-0132350884.
7. King, K. N.," C Programming: A Modern Approach.", 2nd ed., W. W. Norton & Company, 2008, ISBN 978-0393979503.
8. Harbison, Samuel P. and Steele, Guy L.," C: A Reference Manual." 5th ed., Prentice Hall, 2002, ISBN 978-0134092669.

MOOC / NPTEL Courses/Other Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs53/preview

COURSE CODE: BIT25414A0B FOUNDATION OF COMPUTER PROGRAMMING LABORATORY		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Practical: 02 hrs. / week	**01**	**Term Work: 25 Marks**

Prerequisite Courses, if any:Basic Mathematical concepts.

Companion Course, if any:Nil

Course Objectives:

1. **Understand** and **Apply** Problem-Solving Techniques.
2. **To Implement** Arrays and Strings.
3. **Develop** a Strong Understanding of Functions and Structures.
4. **Enhancing** Knowledge of Searching and Sorting Techniques.
5. **Understand** and **Implement** File Handling in C

Course Outcomes:

On completion of the course, learner will be able to–

CO1. **Use** algorithms on various linear data structure using sequential organization to solve real lifeproblems.
CO2. **Apply** Array and Strings to solve applications.
CO3. **Implement** Functions and Structures to Solve Real-World Problems
CO4. **Analyse** problems to **apply** suitable searching and sorting algorithm to various applications.
CO5. **Ability** to Perform File I/O Operations

Guidelines for Instructor's Manual

The instructor‘s manual is to be developed as a hands-on resource and reference. The instructor’s manual needs to include prologue (about University/program/ institute/ department/foreword/ preface etc.), Course Syllabus, POs, PSOs, Cos, CO-PO-PSO mapping, Assignment mapping with CO, PO and Blooms taxonomy mapping, conduction & Assessment guidelines, topics under consideration concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student’s Lab Journal

The laboratory assignments are to be submitted by student in the form of journal. Journal consists of prologue, Certificate, table of contents, and handwritten write-up of each assignment (Title, Objectives, Problem Statement, Outcomes, software & Hardware requirements, Date of Completion, Assessment grade/marks and assessor's sign, Theory- feature/Concept in brief, algorithm, flowchart, test cases, conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as softcopy.

As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journal may be avoided. Use of DVD/One Drive Directory containing students’ programs maintained by lab subject In charge is highly encouraged. For reference one or two journals may be maintained with program prints at Laboratory.

Guidelines for Lab /TW Assessment

Continuous assessment of laboratory work is done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes, punctuality and neatness.

Guidelines for Laboratory Conduction

The instructor is expected to frame the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. The assignment framing policy need to address the average students and inclusive of an element to attract and promote the intelligent students. The instructor may set multiple sets of assignments and distribute among batches of students. Encourage students for the use coding standards such as appropriate use of Hungarian notation, proper Indentation and comments. Use of open source software is encouraged. Instructor may also assign one real life application in the form of a micro-project. Based on the concepts learned.

List of Laboratory Experiments

Group A: Control Structures (Any three)

Solving assignment no.1 is mandatory

1.	**Assignment (a):Understanding and Implementing Problem-Solving Tools**

	Task: Choose one of the following problems and solve it using both an algorithm and a flowchart: 1. **Problem 1:** Write an algorithm to find the maximum number in a list of integers. Represent the algorithm then create a flowchart for it. 2. **Problem 2:** Write an algorithm to check whether a number is prime or not, then draw a flowchart to illustrate the solution. **Assignment (b): Pseudocode and Program Design** **Task:** Write pseudocode for the following problems: 1. **Problem 1:** Find the factorial of a number. 2. **Problem 2:** Determine whether a number is even or odd.
2.	Writer C program for printing following patterns: * ***** * * ** **** *** *** *** *** ***** ***** **** ** ******* *** ***** * ********* * Right-Angled Triangle; Inverted Right-Angled Triangle; Pyramid; Diamond Write a menu driven C program for a) Calculate the sum of all numbers from 1 to n that are divisible by 4. b) Calculate the sum of all prime numbers from 1 to n c) Find out if the number is a Pythagoras triplet.Ex.: $a^2 + b^2 = c^2$.
3.	Write C program to accept an object mass in kilograms and velocity in meters per second and display its Momentum. Momentum is calculated as e=mc2 where m is the mass of the object and c is its velocity.
4.	Write a C program to accept the length of 3 sides of triangles and to test & print the type of triangle as equilateral, isosceles or right angled or none
5.	Write a C program to accept cost price & sales price of an item & calculate the profit percentage or loss percentage. Formulas to find profit or loss: Profit=selling price-cost price Loss = cost price-selling price Formulas to find profit or loss percent: Profit%= (profit/cost price) x 100 Loss% = (loss/cost price) x 100
Group B: Array & String (Any two)	
1.	Write menu driven C program for Array input from user & do the following: a) Find Max and Min element b) Find Frequency of given element in array c) Find Average of elements in array d) Find Mean of the array.
2	In FEComputer Engineering class, group A student's play cricket, group Bstudents play badminton and group C students play football. Write a C program to compute following: - a) List of students who play both cricket and badminton b) List of students who play either cricket or badminton but not both c) Number of students who play neither cricket nor badminton d) d) Number of students who play cricket and football but not badminton.
3.	Write a C program to compute following operations on String: a) To display word with the longest length b) To determines the frequency of occurrence of particular character in the string c) To check whether given string is palindrome or not d) To display index of first appearance of the substring e) e) To count the occurrences of each word in a given string
4.	Write a C program that store 12 city names in a single dimensional array. Writefunction to display only those city names that begin with a consonant &endswith a vowel. For Example: Pune
Group C: Functions & Structure (Any two)	
1.	Write C program to demonstrate the Parameter-Passing Methods to Function
2.	Write a C program to store marks scored in subject "Problem Solving Techniques" by N students in the class. Write functions to compute following:

	a) The average score of class b) Highest score and lowest score of class c) Count of students who were absent for the test d) Display mark with highest frequency
3.	Create Structure EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary), and store the data and update the data in structure.
4.	Write a program in C to define a structure for Customer bank account that holds Information like Account Number, Name of account holder, balance, Internet banking facility availed (Yes or No), Pin code (422001 to 422013), Account type (saving, recurring, deposit) a) Read account details for n customers b) Identify the golden, silver and general customers. c) Display the list of customers availing the Internet banking facility d) Display the customers belonging to a particular geographical location depending on postal code e) Display the customer list as per their account type Use Functions for above cases.
5.	Write a program in C using structure for maintaining extra-curricular activities of students (roll, name, year, activity name, and prize). The prize can be either cash prize or memento but not both. Cash prize is to be recorded as integer and memento is to be recorded as character string. Use union within structure for prize. Read extra-curricular activity record for n students and Display extra-curricular activities.
Group D: Searching & Sorting (Any three)	
1	Write a Menu-Driven C Program for Student Attendance. Program store roll numbers of student in array who attended training program in random order. Write functions for Various Search Techniques (Sequential, Binary) for whether particular student attended training program or not.
2	Write a C program to store first year percentage of students in array. Writefunction for sorting array of floating-point numbers in ascending order using Selection Sort, Bubble sort and display top five scores.
3	Write a Menu-Driven C program to compute following computation on matrix: a) Addition of two matrices b) Subtraction of two matrices c) Multiplication of two matrices d) Transpose of a matrix e) Determine location of saddle point
4	Write a Menu-Driven C program to compute or display matrix operations: a) Printing diagonal element b) Printing Upper triangle&lower triangle c) sum of all even numbers from matrix
5	Write a C program to store 12th class percentage of students in array. Writefunction for sorting array of floating-point numbers in ascending order using Radix sort and display top five scores.
Useful Links/Resources: **a)** https://ps-iiith.vlabs.ac.in/ **b)** https://nptel.ac.in/courses/106105171	

COURSE CODE:BCC25415A0X
COURSE NAME – DESIGN THINKING & IDEATION

Teaching Scheme:	Credit	Examination Scheme:
Theory: 01 Hrs. / week	01	CIE: 50 Marks
Practical: 02 Hrs./ Week	01	Term Work : 25 Marks

Prerequisite Courses, if any: NIL

Companion Course, if any:NIL

Course Objectives:

1. **Understand** the core principles of design thinking and its role in engineering.
2. **Apply** knowledge of design thinking to analyze and solve complex problems.
3. **Develop** creative and user-centered solutions to real-world challenges.
4. **Demonstrat**e effective communication and collaboration in multidisciplinary teams.
5. **Evaluate** and analyze design concepts and prototypes.
6. **Develop** a mindset for continuous innovation and improvement

Course Outcomes:

On completion of the course, learner will be able to –

CO1: Apply empathy and observation to gain insights into user needs and behaviors.
CO2: Generate innovative ideas and solutions through brainstorming and ideation.
CO3: Carry out primary and secondary research for better insights.
CO4: Present and communicate design ideas effectively.
CO5: Collaborate with peers and industry professionals to address real-world design challenges.

Course Contents

Unit I: Introduction to Design Thinking (CO1&CO2)	**(02 Hrs)**
Introduction to Design Thinking, understanding what is design, who is a design thinker, What is a design thinking process. Brain Storming, Decide the topic for Brain-Storming, generate keywords or ideas.17 UN Sustainable Development Goals.	
Mapping of Course Outcomes with POs & PSOs	**PO: 03, 06 PSO1**
Unit II: Case Studies (CO1)	**(03 Hrs)**
Case studies to understand the design thinking process and field visit to validate: Refer Annexure I and II	
Mapping of Course Outcomes with POs & PSOs	**PO: 02, 03, 06, 07, 09, 10, PSO:1,2**
Unit III: Idea Generation (CO1&CO4)	**(03 Hrs)**
Techniques for idea generation and brainstorming, key words, sorting, linkages. Mind mapping. Introduction to primary and secondary research methods.	
Mapping of Course Outcomes with POs & PSOs	**PO: 01 to 09, 11, PSO: 1,2**
Unit IV: Research Methodology (CO3&CO5)	**(03 Hrs)**
Sources of secondary research – 5W/1H tool, Publications, Events: Conference Papers, Workshops, Symposiums, Information gathered from the Internet, Web resources: Websites, Blogs, Web Magazines, Web Journals, etc., Data Sets, Survey Results, Census Data, Records and Standards. **Sources of primary research- t**alking to experts, questionnaires, Cue-cards, surveys, visits, interviews, focus group discussions etc. Application of primary and secondary research methodology.	
Mapping of Course Outcomes with POs & PSOs	**PO: 02, 03, 04, 07, 08, 09, 11, PSO:1,2**
Unit V: Ideation (CO2&CO4)	**(03 Hrs)**
Brain storming for ideation, divergent thinking, SCAMPER, lateral thinking, idea sketching.	
Mapping of Course Outcomes with POs & PSOs	**PO: 02, 03, 04, 05, 06, 10 PSO: 1,2,3,**

Group Structure:

1. Working in faculty monitored groups. The students plan, manage and complete a task / project / activity which addresses the stated problem.
2. There should be a of team / group of 3 – 4 students.

Learning Resources

Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross.
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown.

3. Design Thinking for Visual Communication" by RanjanNayar and JaidipSubedi
4. The Design of Everyday Things" by Don Norman• "Design Thinking: Creativity and Innovation" by S. Balaram
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp
6. Creative Confidence: Unleashing the Creative Potential Within Us All" by Tom Kelley and David Kelley (with a foreword by Ratan Tata)

MOOC / NPTEL Courses/Other Resources:
1. https://swayam-plus.swayam2.ac.in/courses
2. https://swayam.gov.in/explorer
3. https://nptel.ac.in/courses

List of Laboratory Experiments

Course Outcomes: On completion of the course, the learner will be able to -
CO1: Think out of box with the solid foundation of Design thinking and ideation.
CO2: Present Solutions to problems

Guidelines for Student's Lab Journal

1. Draw the diagram on blank pages. You can use colored pencils/sketch pens etc to make your work clear and presentable.
2. The content will be written on one side ruled pages.
The pictures can be pasted on the blank side.

Guidelines for TW Assessment (25)

1. 15 marks for the lab / journal work, which includes 5 marks for timely submission / task completion, 05 interests shown in the classroom and laboratory and 05 marks for file writing.
2. 05 marks is for theory attendance.
3. 05 marks class presentations.

Guidelines for CIE (50)

1. First evaluation based on presentation to be conducted around midterm for 10 marks.
2. Second presentation to be conducted at the time of submission for 10 marks.
3. The evaluation of the submitted report for 10 marks.
4. The final hard prototype will be evaluated for 20 marks.
[Creativity and originality (05), Clarity and completeness (05), Justification of prototype features (05), Quality (05)]

Guidelines for Laboratory Conduction

1. Come with a completed file.
2. Ensure the file is checked regularly.
3. Participate in class/lab activities.
4. Complete your tasks on time.

List of Assignments and Submission

1.	Explain design thinking process in 200 words
2.	Draw a flow chart of the steps involved in brainstorming and generation of key words to select your project of design thinking. Submit a list of brainstormed ideas along with justification for the selected one.
3.	Explain the topic selected for the project in 300 words, with the relevant diagrams/flow charts/pictures if any
4.	Write a report of 200 words on any one of the case studies discussed with the relevant diagrams/flow charts/pictures if any
5.	Write a 300 words report on the site visit with the relevant diagrams/flow charts/pictures if any
6.	Create a mind map of your idea. It should have at least 3 branches. Colour code it for ease of understanding.
7.	Write a 500 words report on Primary research with conclusions, acknowledgements and references.
8.	Write a 300 words report on Secondary research with conclusions drawn, along with the relevant diagrams / flow charts / pictures
9.	Use Scamper to fine tune the selected idea and redefine the problem statement with the help of meaningful actionable statements for creative idea solving.
10.	Make rough sketches of the idea and explain them in 200 words.

Annexure I:

1. Nike: Renowned as a prominent influencer in the shoe design industry, Nike has maintained its status as a favorite among athletes for nearly five decades.

2. Airbnb: Known as the pioneer of the experience economy, Airbnb today stands as a $75.4B company still dictating the fundamentals of user-friendly design. However, behind Airbnb's massive success lies its approach to human-centric design.
3. Netflix: Credited for bringing in the phenomenon of 'binge-watching', Netflix has been known for keeping up with the changing market and producing customer-friendly solutions.
4. GE Healthcare: Founded in 1994, GE Healthcare is headquartered in Chicago, Illinois, and operates in more than 100 countries. It was through design thinking that the brand revamped the typically scary experience that children face when undergoing a scan.
5. UberEats: UberEats stands out among other delivery services as one of the fastest-growing platforms. Unlike a retrospective approach, which focuses on refining existing models, UberEats opted for a forward-thinking strategy, emphasizing the importance of creativity and user-centric design from the outset.
6. Oral B: Oral-B, a renowned brand in oral hygiene products, has consistently leveraged design thinking principles across its product development and innovation endeavours.
7. Project Bloks: Project Bloks was an experimental research project initiated by Google's Creative Lab in collaboration with IDEO to explore tangible programming for kids.
8. Tata Nano: The People's Car: Explore how Tata Motors aimed to revolutionize the automobile industry by creating an affordable and compact car for the masses, known as the Tata Nano.
9. Aravind Eye Care System: Investigate how Aravind Eye Care System in India used innovative design thinking to provide high-quality, affordable eye care services to a large population, often in remote areas.
10. Aadhaar: India's Unique Identification Program: Explore how the Aadhaar program used biometric data and design thinking to provide millions of Indians with a unique identification system, enhancing access to government services and benefits.
11. Ola Cabs: Transforming Transportation in India: Learn how Ola, an Indian ride-sharing platform, disrupted the traditional taxi industry by applying innovative design thinking to its services and business model.
12. Swiggy: Redefining Food Delivery: Investigate how Swiggy, an Indian food delivery platform, leveraged design thinking to enhance the food delivery experience for customers and partner restaurants
13. Lifebuoy: Promoting Hygiene in Rural India: Explore how Lifebuoy, a brand under Unilever, used design thinking to develop innovative marketing campaigns and products to promote hand washing and hygiene in rural India.
14. Amul: The White Revolution in India: Analyze how the Amul cooperative transformed the dairy industry in India through a unique business model, design thinking, and innovative marketing strategies
15. Flipkart: E-commerce Success Story: Study how Flipkart, one of India's leading ecommerce platforms, employed design thinking to grow its business and offer a wide range of products and services.
16. Designing Google's Self-Driving Car: Explore how Google used design thinking to develop autonomous vehicles that redefine transportation.
17. Dyson: Revolutionizing Vacuum Cleaners and Hand Dryers: Investigate how Dyson's innovative design thinking has transformed household appliances.
18. SpaceX: Advancing Space Exploration Through Design Thinking: Analyze SpaceX's approach to space technology and how it has disrupted the aerospace industry.
19. Red Bull: Creating an Energy Drink Empire: Learn how Red Bull's unique design thinking approach contributed to the success of their energy drink and brand.
20. McDonald's: Evolution of Fast Food Service: Study the design thinking principles applied by McDonald's to enhance their customer experience and streamline operations.
21. Nest: Reinventing Thermostats and Home Automation: Examine how Nest Labs, a subsidiary of Google, reimagined home automation with their smart thermostats and other products.
22. LEGO: Building a Design-Centric Toy Empire: Investigate how LEGO has used design thinking to create a global brand that fosters creativity and learning through play.
23. Starbucks: Brewing Design Innovation in the Coffee Industry: Analyze how Starbucks incorporates design thinking into its store layouts, product offerings, and customer experiences.
24. Amazon: Customer-Centric Design in E-commerce: Discover how Amazon's design thinking philosophy has played a pivotal role in its e-commerce dominance

Annexure II:

- Accops
- Vir Bike
- Udchalo
- Copper Cloud
- Vigyan Ashram
- Bhau Innovation Centre
- SPPU Innovation Centre
- NCL Innovation Centre

COURSE CODE:BCC25416A0X
COURSE NAME:INDIAN KNOWLEDGE SYSTEM

Teaching Scheme:	Credit	Examination Scheme:
Theory: 02 Hrs./ Week	02	CIE: 50 Marks

Prerequisite Courses, if any: NA

Companion Course, if any: NA

Course Objectives:

1. To understand the nature of knowledge.
2. To understand the evolution of the scientific approach in the Indian subcontinent.
3. To study contributions made by different people to the various branches of knowledge before modernity evolved in India.

Course Outcomes: On completion of the course, learner will be able to -

CO1: The concept of the ancient intellectual knowledge tradition will be understood.
CO 2: Developments in science from ancient times will be introduced.
CO 3: Developments in humanities from ancient times will be understood.

Program Outcomes: On completion of the program , learner will be able to –

PO1 : Develops research and presentation skills while enhancing knowledge of Indian scientific achievements
PO2: Enhances research and experimentation skills while deepening understanding of materials science
PO3: Develops critical analysis skills and an understanding of sustainable engineering practices.

Course Contents

Unit I: Introduction to Indian Knowledge System	**(06 Hrs.)**

1. Definition, Scope and importance of knowledge
2. Nature of Indian Knowledge System
3. Evolution of scientific approach

Mapping of Course Outcomes with POs & PSOs	**CO1: Understand the significance and historical context of Indian knowledge systems -P08,11-PSO1, PO3**

Unit II: Development of Sciences	**(12Hrs)**

a. Astronomy- Aryabhatta, Varahamihira, SawaiJaisingh
b. Medicine- Ayurveda and Yunani
c. Metallurgy- Copper, Iron, Bronze & alloys

Mapping of Course Outcomes with POs & PSOs	**CO2: Recognize the role of engineering in ancient India and its impact on architecture and materials.PO2**

Unit III: Role of Ancient Indian Engineering principles in modern practices	**(12 Hrs)**

1. Language-Prakrit,Sanskrit,Farsee
2. Philosophy-Vedic,Lokayat,Buddhist,Jaina
3. EducationsysteminancientIndia–Takshashila,Nalanda,ValabhiUniversity
4. Architecture

Mapping of Course Outcomes with POs & PSOs	**CO3: Apply ancient Indian engineering principles in modern practices while considering cultural and environmental aspects. PO3**

Learning Resources

1. AbdurRahman, Science and Technology in Medieval India: A Bibliography of Source Materials in Sanskrit, Arabic, and Persian, Indian National Science Academy, New Delhi, 1982.
2. Bag A. K. (ed), History of Technology in India(Vol I)(From Antiquity to C. 1200 A.D.), Indian National Science Academy, Delhi, 1997.
3. AbdurRahman, Science and Technology in Medieval India: A Bibliography of Source Materials in Sanskrit, Arabic, and Persian, Indian National Science Academy, New Delhi, 1982.
4. Chattopadhyaya, Debiprasad, History of science and technology in ancient India: the beginnings, Firma KLM Pvt. Ltd. 1986

5. DasguptaSurendranath,AHistoryofIndianPhilosophy,CambridgeUniversity press, 1922.GopalL. and V. C. Shrivastava, History of Agriculture in India (Upto 1200A.D.), Concept Publishing, New Delhi, 2008.
6. IrfanHabib(ed.),People'sHistoryofIndia–Vol20:TechnologyinMedieval India, c. 650–1750, Aligarh Historians Society and Tulika Books, 2016.
7. JanGonda,AHistoryofIndianLiterature,OttoHarrassowitz,Wiesbaden,1975.
8. PadmanabhaThanu(ed.),AstronomyinIndia:AHistoricalPerspective,Indian National Science Academy, Springer, New Delhi. 2014.
9. SohoniPushkar, Introduction to the History of Architecture in India, IISER, Pune,2020.
10. TripathiRadhavallabh, Vāda in theory and practice : studies in debates, dialogues and discussions in Indian intellectual discourses, IIAS, Shimla, 2016.

COURSE CODE:BCC25417A0X COURSE NAME :COMMUNICATION SKILLS & HUMAN VALUES		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory: 01 Hrs. / Week **Tutorial : 01 Hrs. / Week**	**01** **01**	**CIE: 50 Marks** **Term Work: 25 Marks**

Prerequisite Courses, if any:

Companion Course, if any:

Course Outcomes:

On completion of the course, learner will be able to–

CO1: To make the engineering students understand, analyze and interpret the essentiality of grammar, vocabulary and phonetics and their proper usage facilitated by professors and a Language Laboratory.

CO2: To encourage self-awareness by exploring beliefs, values, strengths, weaknesses, and aspirations to facilitate students to construct a career development plan (roadmap) that outlines the skills required for the type of job, recognizing individual skill strengths and gaps, and identify activities that can be used to acquire the skills associated with the gaps.

CO3: To teach professional skills like communication skills, presentation skills, technical writing skills, paper reading, networking skills through instruction, knowledge acquisition, and demonstration.

CO4: To train future engineers to prepare for interviews and adapt to a diverse socio-economic arena while functioning effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, interpersonal relationships, conflict management and leadership quality.

CO5: To understand the significance of universal human values in promoting harmony, compassion, and mutual respect in society and to cultivate mindfulness practices for personal well-being and societal harmony.

Guidelines for Student's Lab Journal

The student must prepare a file that will include all the assignments performed in the class. Continuous assessment of laboratory work is to be done based on overall performance and laboratory assignment's performance of student. Each Laboratory assignment assessment will be assigned grade/marks based on parameters with appropriate weightage.

Guidelines for Lab /TW Assessment

Each laboratory assignment assessment includes timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities. Attendance of the student will also be considered while granting term work.

Guidelines for Laboratory Conduction

The instructor may frame assignments to enhance skills supporting career aspects. Multiple set of activity based assignments can be prepared and distributed among batches. Every student must be given opportunity to participate actively in each activity. The assignments must aim to enhance language skills, communications skills, personal skills, professional skills and human values.

COURSE CONTENT

Unit 1:Language Skills (CO1, CO3)	**(3 Hrs.)**
Articles, Tenses, Prepositions, Adverbs, Adjectives, Pronunciation Guide, and Exposure to technical terms related to the field of technology and phrases, idioms, proverbs, significant abbreviations, formal (business) vocabulary.	
Mapping of Course Outcomes with POs & PSOs	**PO9, PO7, PO8, PO11, PSO3**
Unit 2:Personal Skills (CO2)	**(3 Hrs.)**
Introduction to Soft-Skills, Self-Awareness, Stress Management, Taking Criticism, Self Confidence, Adaptability, Assertiveness, Self-Assessment, Motivational Skills, Organization, Planning	
Mapping of Course Outcomes with POs & PSOs	**PSOs: PO7, PO8, PO11**
Unit 3:Communication Skills (CO1, CO3)	**(3 Hrs.)**
Concept, Methods and Models of Communication, Verbal Communication, Body Language, Listening Barriers, Listening Ethics, Creative Writing, Storytelling, Visual Communication, Listening Skills, Reading Skills, Public Speaking.	
Mapping of Course Outcomes with POs & PSOs	**PO7, PO8, PO9, PO11**
Unit 4:Professional Skills (CO3, CO4)	**(3 Hrs.)**

Interview Skills, Email Writing, Note Writing, Summarization, CV Writing, Cover-Letter, Minute Writing, Report Writing, Writing effective Proposals, Meeting Management, Entrepreneurial Thinking, Decision Making, Problem Solving, Crisis Management, Negotiation Skills, Team Building Strategies,	
Mapping of Course Outcomes with POs & PSOs	**PO7, PO8, PO09, PO 11, PSO3**
Unit 5:Human Values (CO 5)	**(3 Hrs.)**
Work Ethics, Universal Human Values, Time Management, Goal Setting, Value based action plan, Community Service, Ethics in Innovation, How to avoid Plagiarism	
Mapping of Course Outcomes with POs & PSOs	**PO7, PO8, PO11**
List of Laboratory Experiments	
Group A- Language Skills	
1.	Grammar Test
2.	Vocabulary Test
3.	Comprehension
Group B- Personal Skills	
1.	Flag
2.	SWOC
3.	Self-Awareness Questionnaire
4.	Johari Window
5.	Time Management Activity
Group C- Communication Skills	
1.	Extempore
2.	Inner Monologue
3.	Role Play
4.	GD
5.	Creative Writing
6.	Article Reading
Group D- Professional Skills	
1.	Mock Interview
2.	CV
3.	Cover Letter
4.	Report Writing
5.	Paper Summarising
6.	Problem Solving
Group E- Human Values	
1.	Time Management
2.	Presentation
3.	GD
4.	Personal & Career Goal setting – Short term & Long term
5.	Paper Writing

Reference Books:

1. Dale Carnegie, “How to Win Friends and Influence People, 50th Anniversary Ed.”,Pocket Books (New York, NY)
2. Stephen R. Covey, “The 7 Habits of Highly Effective People, 30th Anniversary Ed.”, Free Press (New York, NY)
3. Monica Seeley, “How to Get Ahead in Interviews, 1st Ed.”,Kogan Page (London, UK)
4. P. C. Sahasrabuddhe, “Effective Communication Skills, 1st Ed.”,Jaico Publishing House, (Mumbai, India)
5. S. K. Chakraborty, “The Art of Public Speaking, 1st Ed.”,Sterling Publishers, (New Delhi, India)
6. Wren and Martin, “High School English Grammar and Composition, 14th Ed.”,S. Chand Publishing, (New Delhi, India)
7. John Seely, “The Oxford Guide to Writing and Speaking, 1st Ed.”Oxford University Press, (Oxford, UK)
8. Beryl Bainbridge, “Speaking and Writing English Well, 1st Ed.”,Collins, (London, UK)

MOOC/NPTEL COURSES:

1. **English for Career Development** by **Dr. Robert J. Allison** (University of Pennsylvania) Link: English for

Career Development - Coursera

2. **English Grammar and Style** by **Dr. Lesley J. Ward** (University of Queensland)
   Link: English Grammar and Style - Coursera
3. **Technical Communication for Engineers by Prof. Arun K. Saraf:**
   https://onlinecourses.nptel.ac.in/noc24_ge37/preview
4. **Enhancing Soft Skills and Personality by Prof. T. Ravichandran:**
   https://onlinecourses.nptel.ac.in/noc25_hs87/preview
5. **Soft Skill Development by Prof. Priyadarshi Patnaik, Prof. V.N. Giri, Prof. D. Suar**
   https://onlinecourses.nptel.ac.in/noc25_hs72/preview
6. **Employment Communication A Lab based course by Prof. Seema Singh**
   https://onlinecourses.nptel.ac.in/noc25_hs17/preview

COURSE CODE: BCC25418A0X COURSE NAME – ENVIRONMENTAL SCIENCE		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Online Learning, Presentations, MOOC courses, Guest lectures, Hands-on Assignments, Team Activities etc	**(Mandatory Non-Credit Course)**	**Audit Course**

Prerequisite Courses, if any: Environmental Science basic knowledge learnt till 12th Standard.

Companion Course, if any: NIL

Audit course for Environmental Science is mandatory but non-credit course. Assessment has to be conducted at the end of Semester for award of grade at college level. Grade awarded for audit course shall not be calculated for grade point & CGPA.

Course Objectives:

- To explain the concepts related to sustainable development and various components of environment.
- To provide a comprehensive overview of environmental pollution and the science and technology associated with the monitoring and control.
- To gain an understanding of the value of biodiversity and current efforts to conserve biodiversity at national and local level.
- To examine a range of environmental issues in the field, and relate these to scientific theory and find their solutions using technology.

Course Outcomes: On completion of the course, learner will be able to -

CO1: Demonstrate an integrative approach to environmental issues with a focus on sustainability.

CO2: To provide a comprehensive overview of environmental pollution and the science and technology associated with the monitoring and control.

CO3: Identify key threats to biodiversity and develop technological options for conserving biodiversity in different settings

CO4: Learn skills required to research and analyze environmental issues scientifically and these skills in applied situations such as careers that may involve environmental issues.

Course Contents

Unit I:Introduction to Environmental Science	**(02 Hrs)**
Multidisciplinary nature of subject environmental science; study of natural systems and the application of technology to protect and improve the environment. Scope and importance; Concept of sustainability and sustainable development and ethical environmental practices. UN sustainable development goals.	
Mapping of Course Outcomes with POs & PSOs	**PO 1, PO 4, PO 6, PO 11**

Unit II: Environmental Pollution and Control	**(04 Hrs)**
Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution, nuclear hazards and human health risks, solid waste management. Control measures for urban and industrial waste, technology in controlling pollution.	
Mapping of Course Outcomes with POs & PSOs	**PO 1, PO 4, PO 6, PO 11**

Unit III: Biodiversity and Conservation	**(04Hrs)**
Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; emerging solutions for conservation of biodiversity; In-situ and Ex-situ conservation of biodiversity.	
Mapping of Course Outcomes with POs & PSOs	**PO 1, PO 4, PO 6, PO 11**

Unit IV: Field Work **(06Hrs)**

- Visit to an area to document environmental assets; river / forest / flora / fauna, etc.
- Visit to a local polluted site – urban / rural / industrial /agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Site visit for emerging solution for environmental issues.

Mapping of Course Outcomes with POs & PSOs	PO 1, PO 4, PO 6, PO 11

Learning Resources

Text Books:

1. Air Pollution: H. V. N. Rao and M. N. Rao, TMH Publications
2. Environmental Engineering: Peavy and Rowe, McGraw Hill Publications
3. Biodiversity Conservation: Present Scenario and Future Prospects, Dr. Amar Nath Singh and Dr. Awadh Kishore Roy, Walnut publication.
4. Environment Pollution Control and Environmental Engg. C. S. Rao, Tata McGraw Hill, New Delhi.

Reference Books:

1. Principals of Conservation Biology, Groom, Martha J. Gary K. Meffe, and Carl Ronald carroll.. Sunderland: Sinauer Associates.
2. 1999. Global Ethics and Environment, Gleeson,B. and Low, N. (eds.) London, Routledge.
3. Something New Under the Sun: An Environmental History of the Twentieth Century,McNeil, John R.
4. Environmental Science; S. C. Santra; New Central Book Agency (P) Ltd.; 2nd Edtn.

MOOC / NPTEL Courses/Other Resources:

1. https://swayam-plus.swayam2.ac.in/courses
2. https://swayam.gov.in/explorer
3. https://nptel.ac.in/courses

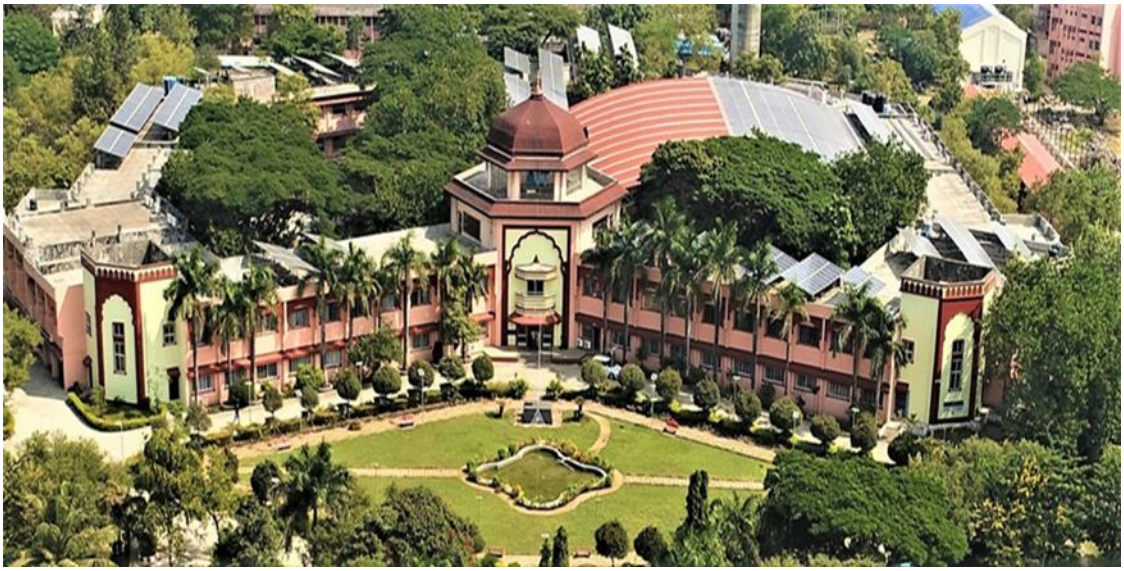
ARMY INSTITUTE OF TECHNOLOGY, PUNE

AUTONOMOUS INSTITUTE

AFFILIATED TO SAVITRIBAIPHULE PUNE UNIVERSITY,MAHARASHTRA, INDIA

National Education Policy (NEP) Compliant Curriculum

Semester - II



First Year Engineering (2025 Pattern)

www.aitpune.com

COURSE CODE: BIT25421A0A
COURSE NO – ENGINEERING MATHEMATICS II

Teaching Scheme:	Credit	Examination Scheme:
Theory: 03 hrs. / week	03	CIE (Theory): 50 Marks ESE (Theory): 50 Marks

Prerequisite Courses, if any:Mathematics of XI and XII standards

Companion Course, if any: NA

Course Objectives:

1. To gain sound knowledge to formulate and solve problems with sets and propositions.
2. To understand basics of probability, distributions and their applications.
3. To make the students familiarize with concepts and techniques of statistics.
4. To understand concepts of Graphs and their applications.
5. To understand basics of number theory and its applications

Course Outcomes: On completion of the course, learner will be able to -

CO1: **Formulate and apply** formal proof techniques and solve the problems with logical reasoning.
CO2: **Apply** the concept of Probability theory and various discrete distributions.
CO3: **Apply** the Statistical inference and Descriptive Statistics.
CO4: **Apply** the concepts of Graph theory to devise mathematical models.
CO5: **Identify** techniques of Number theory and Algebraic structures.

Course Contents

Unit I : Logic and Propositions	**(8Hrs)**

Propositions: Propositions, Logical Connectives, Conditional and Bi-conditional Propositions, Logical Equivalence, Validity of Arguments by using Truth Tables, Predicates and Quantifiers, Normal forms.
Applications of Propositions.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**

Unit II : Probability	**(8Hrs)**

Random Variables and Probability Distribution Functions,Binomial Distribution, Poisson Distribution, Normal Distribution,Expectation and Variance,Central Limit Theorem, Calculation of Expectation, Variance, Skewness and Kurtosis of above distribution and their importance. Random sampling, Sample mean, Sample variance, Weak law of large numbers and Central limit theorems.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**

Unit III : Statistics	**(8 Hrs)**

Statistical Inference,Descriptive Statistics, Mean, Median, Mode,Range, Variance, Mean Deviation, Standard Deviation, Coefficient of Variation, Inferential Statistics and Hypothesis Testing,Chi-Square Test,t-Test,Correlation Analysis, Practical Applications and Case Studies.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**

Unit IV : Graph Theory	**(8 Hrs)**

Basic Terminologies,WeightedGraphs,Isomorphic Graphs, Types of Graphs,Operations on Graphs,Hamiltonian and Eulerian Graphs,Planar Graphs, Graph Coloring,Trees, Rooted Trees,Path Length in Trees,SpanningTrees,Max Flow – Min Cut Theorem,Graph-based Modeling, Traveling salesman problem.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**

Unit V : Introduction To Number Theory & Algebraic Structures	**(8 Hrs)**

Properties of Divisibility,DivisionAlgorithm,Greatest Common Divisor (GCD) and its properties,EuclideanAlgorithm,Prime Factorization Theorem,CongruenceRelation,ModularArithmetic,Euler Phi Function,Euler'sTheorem,Fermat's Little Theorem,Chinese Remainder Theorem,Semigroup, Monoid, Group, Abelian Group,Normal Subgroup Ring, Integral Domain, Field.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3**

Learning Resources

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, McGraw-Hill.

Reference Books:

1. BernardKolman,RobertC.Busby,SharonCutlerRoss,"Discretemathematicalstructures",6th edition,PrenticeHallofIndia.
2. EdgarG.Goodaire,MichaelM.Parmenter,"DiscreteMathematicswithGraphTheory",3rdEdition,PearsonEducation.
3. TremblayJ.S.,"Discretemathematicalstructureswithapplication",3rdEdition,TataMcGrawHill.
4. LipschutzSeymour,"Discretemathematics",4thEdition,TataMcGraw-Hill.
5. JohnsonbaughRichard,"DiscreteMathematics",7thedition,Pearson.
6. BiggsNormanL,"Discretemathematics",6thedition,Oxford.
7. DavidM.Burton,"ElementaryNumberTheory",and 7thEdition,McGraw-Hill.

MOOC / NPTEL Courses/Other Resources:

1. **https://onlinecourses.nptel.ac.in/noc21_ma74/preview**
2. **https://onlinecourses.nptel.ac.in/noc22_ma10/preview**
3. **https://youtu.be/cxHQHobGq8g?si=ogDG6qAidUqBa3Zd**
4. **https://onlinecourses.nptel.ac.in/noc24_ma26/preview**

COURSE CODE: BIT25421A0C COURSE NAME : TUTORIALS ON ENGINEERING MATHEMATICS-II		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Tutorial: 01 Hrs. / Week	**01**	**Term Work: 25 Marks**

Prerequisite Courses, if any: Mathematics of XI and XII standards

Companion Course, if any:Engineering Mathematics-II

Course Outcomes: On completion of the course, learner will be able to -

CO1: **Formulate and apply** formal proof techniques and solve the problems with logical reasoning.
CO2: **Apply** the concept of Probability theory and various discrete distributions.
CO3: **Apply** the Statistical inference and Descriptive Statistics.
CO4: **Apply** the concepts of Graph theory to devise mathematical models.
CO5: **Identify** techniques of Number theory and Algebraic structures.

Guidelines for Student's Tutorials

- Will be given centrally

Guidelines for Lab /TW Assessment

For TW assessment - weightage given to

- Attendance
- Completion of Assignments(at least one assignment per unit)
- In time Submission

Guidelines for Conduction

- Will be given centrally

List of Assignments

	Unit I -Logic and Propositions
1.	Study of Fundamentals of Logic and Propositional Reasoning: Concepts, Applications, and Analysis with Suitable Examples
	Unit II -Probability
2.	Study of various probability distributions with the help of Microsoft Excel/ Suitable software tools.
	Unit III-Statistics
3	Study of descriptive and inferential statistics with the help of Microsoft Excel/Suitable software tools.
	Unit IV-Graph Theory
4	To study of various concepts of Graph theory with the help of suitable real life problems like salesman traveling problem .
	Unit V- Introduction To Number Theory & Algebraic Structures
5	To study of various concepts of Number theory and algorithms

Learning Resources

Text Books:

1. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill.
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, McGraw-Hill.

Reference Books:

1. BernardKolman,RobertC.Busby,SharonCutlerRoss,"Discretemathematicalstructures",6th edition,PrenticeHallofIndia.
2. EdgarG.Goodaire,MichaelM.Parmenter,"DiscreteMathematicswithGraphTheory",3rdEdition,PearsonEducation.
3. TremblayJ.S.,"Discretemathematicalstructureswithapplication",3rdEdition,TataMcGrawHill.
4. LipschutzSeymour,"Discretemathematics",4thEdition,TataMcGraw-Hill.
5. JohnsonbaughRichard,"DiscreteMathematics",7thedition,Pearson.
6. BiggsNormanL,"Discretemathematics",6thedition,Oxford.
7. DavidM.Burton,"ElementaryNumberTheory",and 7thEdition,McGraw-Hill

MOOC / NPTEL Courses/Other Resources:

1. **https://onlinecourses.nptel.ac.in/noc21_ma74/preview**
2. **https://onlinecourses.nptel.ac.in/noc22_ma10/preview**
3. **https://youtu.be/cxHQHobGq8g?si=ogDG6qAidUqBa3Zd**

4. https://onlinecourses.nptel.ac.in/noc24_ma26/preview

COURSE CODE: BIT25422A0A COURSE NO – APPLIED SCIENCES FOR IT-II		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory: 03 hrs. / week	**03** **01**	**CIE (Theory): 50 Marks** **ESE (Theory): 50 Marks**

Prerequisite Courses, if any: NA

Companion Course, if any: NA

Course Objectives: To impart the knowledge of fundamentals of physics through hands-on experiments and extend it to relevant engineering applications.

1. Gain an in-depth understanding of the fundamental principles of lasers and explore their applications in fibre optic communication systems.
2. Develop a comprehensive understanding of the electrical properties of semiconductors, with an emphasis on the Fermi level, and explore the fundamentals of superconductivity and its real-world applications.
3. Understand and apply the basic principles of Quantum mechanics, wave functions, and equations to solve problems related to electronic devices and materials.
4. Explore the core concepts of quantum computing, including quantum bits (qubits) and their potential applications in solving complex computational problems.
5. Understand the basics of nanotechnology, focusing on nanoparticles and their engineering applications in fields like electronics, medicine, and material science.

Course Outcomes: On completion of the course, the learner will be able to -

CO1: Analyze the working principle of lasers and evaluate their application in fibre optic communication.
CO2: Explain the electrical properties and functioning of semiconducting devices based on the Fermi level, and illustrate the fundamentals of superconductivity and its applications.
CO3: Apply the basic concepts of Quantum mechanics and solve problems using wave equations in relation to electronic devices.
CO4: Define the basics of quantum computing and assess its potential applications in real-world problems.
CO5: Describe the fundamentals of nanoparticles and analyze their engineering applications.

Course Contents

Unit I : Lasers and Fiber Optics	**(8 Hrs)**

1. **Lasers:** Basics of laser and its mechanism, characteristics of the laser, Semiconductor laser, CO_2 laser, Applications of lasers: Holography, IT, industrial, medical.
2. **Fibre Optics:** Introduction, Acceptance Angle, Acceptance Cone, Numerical Aperture, Types of optical fibres-step index and graded index, Attenuation and reasons for losses in optic fibres (qualitative), Communication system: Block diagram, Advantages of optical fibre communication over conventional methods.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO11,PSO1**

Unit II : Electrical Properties of Materials	**(8 Hrs)**

Hall effect and its applications, Fermi level and Fermi energy for metal and semiconductors, FD distribution function, the position of Fermi level in intrinsic semiconductors (derivation); Fermi level for extrinsic semiconductors (qualitative) and its dependence on temperature and doping, working of PN junction diode based on Fermi energy; Solar cell: principle, working, IV-characteristics, efficiency and fill factor, measures to improve efficiency of solar cell, advantages and applications in environmental sustainability.

Superconductivity: Introduction to superconductivity; Properties of superconductors (zero electrical resistance, critical magnetic field, persistent current, Meissner effect), numerical problems, Type I and Type II superconductors, Low and high-temperature superconductors, AC/DC Josephson effect; SQUID, Applications of superconductors.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO7, PO11,PSO1**

Unit III : Quantum Mechanics	**(8 Hrs)**

de Broglie hypothesis of matter waves, Heisenberg's Uncertainty Principle and its application, properties of matter waves; Wave function and probability density, mathematical conditions for wave function, Schrödinger's time-independent and time-dependent equations; Significance of Schrödinger's equations, Wave function and Energy of a particle enclosed in a rigid box; Quantum mechanical tunneling, tunnel diode, principle and applications of Scanning tunnelling microscope.

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO11,PSO2**

Unit IV : Quantum Computing	(8 Hrs)
Moore's law and its end, Key Principles of quantum computing, Quantum Superposition, Quantum Entanglement, Quantum Interference, Quantum Computer Hardware, concept of qubit and its properties, comparison of classical and quantum computing, Quantum Computing Advantages and limitations, potential applications of quantum computing, Quantum Computing in India.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO11,PSO2**
Unit V : Modular Physics	**(8 Hrs)**
Nanotechnology: Quantum confinement, Properties of nanoparticles (optical, electrical, mechanical, and magnetic), the effect of Quantum confinement on properties of nanoparticles, synthesis methods - colloidal and Physical Vapor Deposition, Types of nanomaterials: Metal nanoparticles eg. Au, Ag, Cu, Pt and their application as FETs. Metal oxide nanoparticles TiO_2, ZnO, SnO_2 and their application in solar cells, Carbon-based nanomaterials and their applications in FETs, MOSFETs, sensors and actuators, Applications of nanotechnology: Electronics (GMR effect and its application in read-write head of HDD), environmental & energy.	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO11,PSO3**

Learning Resources

Text Books:

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

Reference Books:

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

e-Books:

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

MOOC / NPTEL Courses/Other Resources:

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

COURSE CODE: BIT25422A0B COURSE NAME :APPLIED SCIENCES FOR IT-II LAB		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Practical: 02 hrs. / week	**01**	**Term Work:25 Marks**
Prerequisite Courses, if any:		
Companion Course, if any:		

Course Outcomes:
On completion of the course, learner will be able to–
CO1: correlate principles of Physics to everyday and complex engineering problems.
CO2: think out of box with the solid foundation of physics to solve engineering problems.

Guidelines for Student's Lab Journal

1. Draw the diagram on the left side of the first page, in front of aim in pencil, on a blank page.
2. The observations will be written on blank age with a pencil, followed by the calculations on the same page.
3. The graph will face the observation table. Show the slope and any related calculations on the graph, in pencil.
4. Write the precautions.
5. The page on which the readings are taken in the laboratory will be signed by the teacher and attached to the file as rough readings.

Guidelines for Lab /TW Assessment

1. 15 marks for the lab/journal work, which includes 05 marks for timely submission/practical completion, 05 interest shown while performing the practical and 05 marks for file writing, calculations etc.
2. 05 marks for theory attendance.
3. 05 marks for class seminars/viva.

Guidelines for Laboratory Conduction

1. Come with a completed file in the laboratory.
2. Ensure the file is checked regularly.
3. Get the circuit verified before switching on the apparatus/circuit.
4. Do not enter the lab/work in the lab without an instructor.

List of Laboratory Experiments

Group A (Any two)	
1.	An experiment on Laser (determining the wavelength of laser or number of lines on a grating)
2.	To plot I-V characteristics and determine fill factor and efficiency of a given solar cell.
3.	Synthesis of nanoparticles
4.	An experiment on properties of nano particles
Group B (Any two)	
1.	To determine the divergence of a laser beam.
2.	An experiment on Superconductor
3.	To determine the diameter of a thin wire using a laser or to perform beam profile analysis of a laser beam.
Group C (Any three)	
1	To determine the numerical aperture or attenuation coefficient or any experiment to calculate parameters of optical fiber.
2	Tunnel diode characteristics
3	Diode characteristics
Group D (Any three)	
1	To determine the band gap energy of a semiconductor sample
2	Determination of Planck's constant
3	Compare characteristics of different types of solar cells
4	To determine Hall coefficient and charge carrier density of a given semiconductor sample
5.	Virtual experiment on quantum computing (?)

Useful Links/Resources:
1.https://vlab.amrita.edu/?sub=1&brch=282&sim=1512&cnt=1

2.https://virtuallabs.merlot.org/vl_physics.html
3.https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html

COURSE CODE: BIT25423A0A COURSE NAME – OBJECT ORIENTED PROGRAMMING		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory:03 hrs. /week	**03**	**CIE (Theory): 50 Marks** **ESE (Theory): 50 Marks**

Pre-Requisite: Basic Knowledge of programming c

Companion Course, if any:Introduction to C++ Lab

Course Objectives:

1. Understand the capability of a class to rely upon another class and functions.
2. Apply constructors which are special type of functions
3. Demonstrate the OOPs features Encapsulation, Inheritance, Polymorphism
4. Create and process data in files using file I/O functions
5. Analyze the generic programming features of C++ including Exception handling
6. Analyze and implement algorithms efficiently using STL to solve complex real-world problems.

Course Outcomes: On completion of the course, learner will be able to -

CO1: Able to understand and design the solution to a problem using object-oriented programming concepts

CO2: Achieve code reusability and extensibility by means of Inheritance and Polymorphism

CO3: Able to reuse the code with extensible Class types, User-defined operators and function Overloading, and exceptions for providing programmed solutions to complex problems.

CO4: Identify and handle file access errors, exceptions, and unexpected input/output conditions

CO5: Analyze different data structures provided by STL.

Course Contents

Unit I : Principles of Objective Oriented Programming	**(7Hrs)**
Basic concepts of OOP, Benefits of OOP, Basic structure of an object-oriented program, Definition of classes and objects, Class declaration, creating objects, and the role of constructors, Attributes and methods, Access specifies: Public, Private, Protected, Examples of class creation and object instantiation, Definition and concept of abstraction, Abstract classes and methods, Interfaces (in languages like Java or C#),Real-life examples and practical applications of abstraction	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5,PO8, PO9,PO11,PSO1, PSO2, PSO3**

Unit II : Constructors & Destructors &Exception Handling	**(7 Hrs)**
Constructors, Parameterized Constructors, Copy Constructors, DynamicConstructors, Destructors, Defining Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions, Errors and exceptions, Exception handling using try, catch, throw (in C++, Java, etc.), Importance of exception handling in writing robust programs, Creating custom exceptions	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO11, PSO1, PSO2, PSO3**

Unit III : Building Blocks of Encapsulation	**(8 Hrs)**
Encapsulation -Introduction to encapsulation, Concept of data hiding and restricting direct access to data members, Getters and Setters (Accessory and Mutator methods), Importance of encapsulation in object-oriented design., **Inheritance-**Concept of inheritance, Types of inheritance: Single, Multiple, Multilevel, Hierarchical, and Hybrid, Role of super and base keywords in accessing parent class properties, Method overriding and reusability of code, Use of inheritance in real-world problems. **Polymorphism-**Concept of polymorphism: Compile-time (Method overloading) and Runtime (Method overriding), Operator overloading (in languages like C++), Dynamic binding, static binding, Practical applications of polymorphism	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO11, PSO1, PSO2, PSO3.**

Unit IV : File Handling	**(8 Hrs)**
File Handling-Introduction to file input/output, File streams: if stream, of stream, fstream in C++ or equivalent in other languages, reading from and writing to files, Binary and text file handling	
Case Study: Automating Customer Data Processes through File Handling: Insights from XYZ Corp"	
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO5, PO11, PSO1, PSO2, PSO3.**

Unit V : Standard Template Library (STL)	(8 Hrs)
Introduction to STL in C++, Containers, Iterators, Algorithms, and Functions, Vectors, Lists, Stacks, Queues, Maps, Introduction to function and class templates, Generic programming concept, Creating and using function templates, Creating and using class templates	
Case Study	Simplifying Complex Problems with the Standard Template Library.
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3,PO4,PO7,PO10,PO11,PSO1,PSO2,PSO3.**

Learning Resources

Text Books:

1. E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition.
2. "The C++ Programming Language" by BjarneStroustrup

Reference Books:

1. The C++ Standard Library a Tutorial and Reference Second Edition Nicolai M. Josuttis.
2. Ashok N Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education 2003.
3. Maria Litvin& Gray Litvin, “C++ for you”, Vikas publication 2002.
4. Object Oriented Design by Rumbaugh (Pearson publication)
5. Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication
6. The Complete Reference C++" by Herbert Schildt

MOOC / NPTEL Courses/Other Resources:

NPTEL & MOOC courses titled Object oriented programming concepts using C++.

1. https://onlinecourses.nptel.ac.in/noc25_cs34/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs34/preview
3. https://www.mooc-list.com/tags/object-oriented-programming
4. https://www.udemy.com/course/object-oriented-programming-oop-in-c20/?srsltid=AfmBOoqkJj2U-pntq2MXLSF2GZv1yY2L94nRWgVSdWYkjtX7BPcUBHF4&utm_source=chatgpt.com&couponCode=LEARNNOWPLANS

COURSE CODE :BIT25423A0B
COURSE NAME – OBJECT ORIENTED PROGRAMMING LAB

Teaching Scheme:	Credit	Examination Scheme:
Practical: 02 hrs. /week	01	Term Work: 50 Marks

Prerequisite Courses, if any:Programming Knowledge in C.

Companion Course, if any:

Course Objectives:

1. Create and manipulate classes and objects to represent real-world entities and their behaviors.
2. Practice the creation and destruction of objects using constructors and destructors (where applicable) and Use method overriding and method overloading to implement polymorphism.
3. Handle runtime errors effectively using exception handling mechanisms in OOP languages.
4. Solve real-world problems by designing, coding, and testing object-oriented programs.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Practically apply key OOP concepts such as classes, objects, inheritance, and polymorphism.

CO2:Effectively use Exception Handling and Constructor Destructor to design extensible and reusable code.

CO3: Implement file handling and data storage in an object-oriented way.

CO4: Design and implement simple real-world applications using object-oriented principles

Guidelines for Student's Lab Journal

Encourage students to keep their lab journals organized and regularly updated. The journal should serve not only as a record of their work but also as a tool for enhancing their understanding and skills in C++. Regular review of the journal can also aid in exam preparation and reinforce learning.

Guidelines for Lab /TW Assessment

Adhering to these guidelines can greatly enhance the quality of your lab or term work in C++. They promote thorough understanding, good coding practices, and a systematic approach to problem-solving. Focus on not just completing the project, but also on understanding the underlying concepts and improving your programming skills.

Guidelines for Laboratory Conduction

By following these guidelines, laboratory sessions in C++ can become more engaging and effective, leading to a deeper understanding of programming concepts and practical skills. Fostering a supportive and collaborative environment will help students build confidence and proficiency in their coding abilities.

List of Laboratory Experiments

Group A Class and Object	
1.	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square having the same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.
2.	Suppose we have three classes Vehicle, Four Wheeler, and Car. The class Vehicle is the base class, the class four Wheeler is derived from it and the class Car is derived from the class method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods. So, if we invoke the methods in this order, car (), four-wheelers (), and vehicle (), then the output will be I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.
Group B (Any three)Inheritance & Polymorphism	
1	Write a program to show Constructor and Destructor in a class
2	Write a program to show the concept of Single inheritance in classes
3	Write a function which throws a division by zero exception and catch it in catch block. Write a C++ program to demonstrate usage of try, catch and throw to handle exception
4	Write a C++ program function which handles array of bounds exception using C++.

Group C (Any three) File Handling & STL	
1	Write a C++ program to create a text file, check file created or not, if created it will write some text into the file and then read the text from the file.
2	Write aC++ program to write and read time in/from binary file using fstream
3	Designing a Generic Container with C++ Standard Templates
4	C++ Standard Library Algorithms: Implementing a Sorting Utility
5	Library Management System Design and implement a Library Management System (LMS) using C++ Standard Template Library (STL) components. The system should manage a collection of books and allow users to perform various operations such as adding, searching, and removing books.

Useful Links/Resources:

1. **https://www.w3schools.com/cpp/cpp_oop.asp?utm_source**
2. https://codewithmosh.com/p/ultimate-c-plus-plus-series?utm_sourceTutorials Point – C++ Programming.
3. **https://www.codecademy.com/learn/learn-c-plus-plus?utm_source**
4. **https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/?ref=asr1**

COURSE CODE: BEC25424A0A COURSE NAME – : BASIC ELECTRICAL &ELECTRONICS ENGINEERING		
Teaching Scheme:	**Credit**	**Evaluation Scheme:**
Theory:03 hrs. /week	**03**	**CIE : 50 Marks** **ESE: 50 Marks**

Pre-Requisite: Electron theory,Ohms law ,Magnetism ,Number system ,Semiconductor theory

Companion Course, if any: Science Subjects

Course Objectives:

1.. To provide working knowledge for the analysis of basic DC circuits.
2. To build strong conceptual understanding of single phase and polyphase AC circuits with phase or diagram representation.
3. To impart basic knowledge for conceptual understanding of DC and AC machines.
4. To understand the construction and applications of diode and BJT
5. To understand basics of combinational logic, Boolean algebra and flip -flops.

Course Outcomes: On completion of the course, learner will be able to -

CO1: Apply the knowledge of DC circuits to solve the complex networks and to define the various terms related to magnetic circuits.
CO2: Apply the knowledge of single phase and three phase circuits to determine unknown electrical quantities.
CO3: Demonstrate the constructional features and operational details of DC and AC machines.
CO4: Design simple analog circuits using these devices
CO5: Build simple combinational and sequential logic circuits.

Course Contents

Unit I:Electric and Magnetic Circuit	**(08 Hrs.)**

Electric Circuits: Classification of electrical networks, Source transformation, Simplification of networks using series and parallel combinations, Star delta transformation, Kirchhoff‟s laws (loop Current analysis).
Magnetic Circuit: Flux, flux density, reluctance, MMF, permeability and field strength, their units and relationships; comparison of electric and magnetic circuit.
Electromagnetism: Faradays law of electromagnetic induction, statically and dynamically induced EMF

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO5, PSO1, PSO2**
Unit II :Single and three phase AC circuits	**(08 Hrs.)**

Single phase AC Circuits: AC Quantities, Single phase ac circuit analysis (R, L, C, R-L-C series) on the basis of impedance, admittance, concept of active, reactive, apparent power and power factor etc.
Three phase AC Circuits: Introduction to 3 phase supply and its necessity, balance three phase system, relation between line and phase quantities (with phasor diagram), power in three phase circuits for star and Delta connection.

Mapping of Course Outcomes with POs & PSOs	**PO1,PO2,PO3,PO6, PSO1,PSO2**
Unit III: DC and AC machines	**(08 Hrs.)**

DC Machines: Construction, working principle of D.C. Motor, types of D.C. motor (series and shunt),emf equation of D. C. generator (numerical), concept of back emfin DC motor (Numerical), Industrial applications.
Transformer: Single phase transformer: Construction, operating principle, emf equation, voltage and current ratios. Losses, efficiency and regulation, Auto-transformer, Sensors used for protection of machines.
Sensors for Electric Motors

Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO4, PO6, PSO1, PSO2**
Unit IV:Analog electronics	**(08 Hrs.)**

Diode: Ordinary Diode: Construction, symbol, working, characteristics. Application of diode: Half wave, full wave and bridge rectifiers.
Transistor: Construction, types, operation; transistor configuration (CE, CB and CC): characteristics, relationship between α and β, load line for a transistor, application of transistor as a switch and amplifier.
Operational Amplifier: Functional block diagram of operational amplifier, Ideal & practical values of performance parameters, Op-amp applications: Inverting, Non-inverting amplifier.

Mapping of Course Outcomes with POs & PSOs	**PO1,PO2,PO3, PSO1,PSO2**
Unit V:Digital electronics	**(07 Hrs.)**

Logic Gates: Fundamental, derived and exclusive logic gates: symbol, operation, truth table, concept of universal gates.
Combinational Logic Circuit: Reduction of digital expressions by Boolean algebra,standard representation of logic functions (SOP and POS forms), and De Morgan's Theorem, half and full adder.
Sequential Logic Circuit: Flip – Flop (SR, JK & T): construction, working, truth table; types of Triggering.

Mapping of Course Outcomes with POs & PSOs	**PO1,PO2,PO3,PSO1,PSO2**

Learning Resources

Text Books:

1. I. J. Nagrath and Kothari, "Theory and problems of Basic Electrical Engineering", PHI learning Pvt. Ltd.
2. V. N. Mittal and Arvind Mittal, "Basic Electrical Engineering", 2nd Edition. Tata McGrawHill
3. R.P. Jain, "Modern Digital Electronics", 4th Edition, Tata McGrawHill.
4. John G. Proakis, "Digital Communications", Tata McGraw Hill Publications.

Reference Books:

1. B. L. Theraja and A. K. Theraja,"A textbook of Electrical Technology Vol I", 1st Edition, S. Chand & Co. Pvt. Ltd. New Delhi.
2. Floyd, Electronic Devices and Circuits", 7th edition, Pearson education.
3. AP Malvino& Donald Leach, "Digital Principles and Applications", 6 th edition, McGraw Hill Education.
4. Edward Hughes, "Electrical Technology", 10th Edition, Pearson.
5. Thomas L Floyd,"Digital Fundamentals" 10th Edition, Pearson.
6. M. Morris Mano,"Digital design", 3rd Edition, Pearson
7. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson.
8. Sanjay Sharma, "Digital communication", Katson Books.

MOOC / NPTEL Courses/Other Resources:

1. Fundamentals of Electrical Engineering
   https://nptel.ac.in/courses/108105112
2. Electrical Machine
   https://nptel.ac.in/courses/108105155
3. Digital Circuits
   https://nptel.ac.in/courses/117103064
4. Basic Electronics
   https://nptel.ac.in/courses/117103063

COURSE CODE: BEC25424A0B COURSE NAME – : BASIC ELECTRICAL &ELECTRONICS ENGINEERING LAB		
Teaching Scheme:	**Credit**	**Evaluation Scheme:**
Practical : 02 hrs/week	**01**	**Term Work: 25 Marks**

Prerequisite Courses, if any: 12th standard Physics

Companion Course, if any: Science subjects of First year Engineering

Course Objectives:

1. To impart Comprehensive understanding of the fundamentals of electrical and electronic circuits.
2. To provide working knowledge for the analysis of basic DC and AC circuits.
3. To provide hands on experience for conceptual understanding of DC machines, AC machines & measuring instruments.
4. To provide knowledge of Building, Testing and analyzing concepts of basic analog circuits.
5. To provide knowledge of Building, Testing and analyzing concepts of basic digital circuits

Course Outcomes:

On completion of this course student will be able to --

CO1: Perform basic domestic wiring.
CO2: Demonstrate AC and DC circuits by performing different experiments.
CO3: Demonstrate AC and DC machines by performing different experiments.
CO4: Demonstrate diode and transistor circuits.
CO5: Build basic digital circuits.

Guidelines for Student's Lab Journal

The students Lab Journal should contain following related to every experiment –

1. Title of the experiment
2. Objective
3. Apparatus with their detailed specifications
4. Brief theory related to the experiment
5. Connection diagram /circuit diagram
6. Observation table
7. Sample calculations for one/two reading
8. Result table
9. Graph and Conclusions

Guidelines for Lab /TW Assessment

1. Continuous assessment of laboratory work is to be done based on overall performance and Laboratory performance of student.
2. Each Laboratory assignment assessment should assign grade/marks based on parameters with appropriate weightage.
3. Suggested parameters for overall assessment as well as each Laboratory assignment include- timely completion, performance, efficiency, punctuality, and neatness.

Guidelines for Laboratory Conduction

1. All the experiments (Any Eight) mentioned in the syllabus are compulsory.
2. Use of open source software and recent version is too beencourage.
3. Ensure the file is checked regularly.

List of Laboratory Experiments

1. Introduction of different electrical and electronics components and instruments.
2. To perform electrical wiring to control lamps using one way and two-way switches.
3. To measure steady state response of series RL and RC circuits on AC supply and observations of voltage and current waveforms.
4. To derive resonance frequency and analyze resonance in series RLC circuit.
5. To perform load test on single phase transformer to determine voltage regulation and efficiency.
6. Speed control of DC motor.
7. Speed control of DC motor.
8. To determine output voltage and ripple voltage of half wave, full wave rectifier with center tap transformer and bridge rectifier with and without filter.
9. To Plot input and output characteristics of CE Transistor configuration.
10. Verify truth table of SR, JK & T flip flops.
11. Implementation of Half Adder & Full Adder using Logic Gate IC's.
12. Introduction of different electrical and electronics components and instruments.

Useful Links/Resources:

1. https://asnm-iitkgp.vlabs.ac.in/
2. https://em-coep.vlabs.ac.in/
3. https://be-iitkgp.vlabs.ac.in/
4. https://de-iitr.vlabs.ac.in/

COURSE CODE:BCC25425A0X COURSE NAME: DESIGN THINKING, INNOVATION AND PROTOTYPING		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory: 01 Hrs. / Week **Practical: 02 Hrs./ Week**	**01** **01**	**CIE: 50 Marks** **Term Work : 25 Marks**

Prerequisite Courses, if any: Nil

Companion Course, if any: Nil

Course Objectives:

1. **Understand** the core principles of design thinking and its role in engineering.
2. **Apply** knowledge of design thinking to analyze and solve complex problems.
3. **Develop** creative and user-centered solutions to real-world challenges.
4. **Demonstrat**e effective communication and collaboration in multidisciplinary teams.
5. **Evaluate** and analyse design concepts and prototypes.
6. **Develop** a mindset for continuous innovation and improvement.

Course Outcomes:

On completion of the course, the learner will be able to –

CO1: Generate innovative ideas and solutions through brainstorming and ideation.
CO2: Conceptualize a product based on design requirements and evaluate prototypes to validate design specifications.
CO3: Prototype and test design solutions to refine and improve them.
CO4: Present and communicate design ideas effectively
CO5: Collaborate with peers and industry professionals to address real-world design challenges.

Course Contents

Unit I: Redefining Problem CO1	**(03 Hrs)**
OIOR tool, redefining problem statement, Storyboarding, visual representation of how the prototype will function in real world scenarios, user journey/interaction with product, Persona creation	
Mapping of Course Outcomes with POs & PSOs	**PO3,PO5, PO6, PSO : 1**
Unit II: Concept Evaluation (CO2&CO3)	**(03 Hrs)**
Ideation: Synectics, Analogical thinking, Metaphors, Inspiration from nature, Concept evaluation, Concept maps. Introduction to Process of Prototyping, rough sketches, wireframes, draft layouts, paper prototypes, Mockups with clay, paper, wood, etc.	
Mapping of Course Outcomes with POs & PSOs	**PO4, PO8, PO10, PSO : 1**
Unit III: Prototyping (CO2&CO3)	**(03 Hrs)**
Minimum Viable Product, Proof of Concepts (PoC) (to demonstrate the feasibility of the core Concept in order to get feedback from its users), medium prototyping. Process of final prototyping: Human Factors / Ergonomics, Systems Mapping, Hi-fidelity prototyping, Hard prototyping.	
Mapping of Course Outcomes with POs & PSOs	**PO3, PO4, PO5 PSO:1,2**
Unit IV: User Feedback (CO3, CO4 &CO5)	**(02 Hrs)**
Usability Studies and User Feedback: User feedback on product before, during and after usage, Observation of product usage in Natural settings and Observation in Laboratory/Workshop settings, User feedback evaluation.	
Mapping of Course Outcomes with POs & PSOs	**PO8, PO9, PSO 1,2**
Unit V: Business Model (CO3,CO4 &CO5)	**(03 Hrs)**
Innovative Business Model (Key resources, Revenue streams, Cost structure, Customer segment, Channels to reach customer future plan), SWOT & SWOR Analysis, Pitch presentation	
Mapping of Course Outcomes with POs & PSOs	**PO1 to PO 11, PSO1,2,3**

Group Structure:

1. Working in faculty monitored groups. The students plan, manage and complete a task / project / activity which address the stated problem. 2. There should be a of team / group of 3 – 4 students

Learning Resources

Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown
3. Design Thinking for Visual Communication" by RanjanNayar and JaidipSubedi
4. The Design of Everyday Things" by Don Norman• "Design Thinking: Creativity and Innovation" by S. Balaram
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp
6. Creative Confidence: Unleashing the Creative Potential Within Us All" by Tom Kelley and David Kelley (with a foreword by Ratan Tata)

MOOC / NPTEL Courses/Other Resources:

1. https://swayam-plus.swayam2.ac.in/courses
2. https://swayam.gov.in/explorer
3. https://nptel.ac.in/courses

Design Thinking, Innovation and Prototyping Practical

Course Outcomes:On completion of the course, the learner will be able to–

CO1: Work in team to think out of box with the solid foundation of Design thinking and ideation concepts.

CO2: Create Prototype of Problem present and document the same.

Guidelines for Student's Lab Journal

1. Draw the diagram on blank pages. You can use colored pencils/sketch pens etc to make your work clear and presentable
2. The content will be written on one side ruled pages.
3. The pictures can be pasted on the blank side.

Guidelines for TW Assessment (25)

1. 15 marks for the lab / journal work, which includes 5 marks for timely submission/task completion, 05 interest shown in the classroom and laboratory and 05 marks for file writing.
2. 05 marks is for theory attendance.
3. 05 marks class presentations.

Guidelines for CIE(50)

1. First evaluation based on presentation to be conducted around midterm for 10 marks.
2. Second presentation to be conducted at the time of submission for 10 marks.
3. The evaluation of the submitted report for 10 marks.
4. The final hard prototype will be evaluated for 20 marks.

[Creativity and originality (05), Clarity and completeness (05), Justification of prototype features (05), Quality (05)]

Guidelines for Laboratory Conduction

1. Come with a completed file.2. Ensure the file is checked regularly.3. Participate in class/lab activities.
4. Complete your tasks on time.

List of Assignments and Submission

1.	Using OIOR or some other appropriate tool redefine the problem statement
2.	Submit a completed storyboard outlining the user experience with your prototype. (both in graphical form and in text of 200 words) Use the relevant diagrams/flow charts/pictures.
3.	Design a function map for the persona using your product. Use the relevant diagrams/flow charts/pictures.
4.	Draw a concept Evaluation map along with a text of 200 words describing it.
5.	Write a 200 words report on the soft prototype created with the relevant diagrams/flow charts/pictures, with a list of features to be included in the prototype.
6.	Create a mind map for proof of concept of your idea. Explain it in 200 words.
7.	Write a detailed report of 300 words on the hard prototype created, along with the relevant diagrams/flow charts/pictures.
8.	Discuss user feedback on your prototype in 300 words along with the relevant diagrams/flow charts/pictures.
9.	Draw an evaluation matrix and a map of user feedback and the actions taken in 200 words.
10.	Make a Business model of your idea, giving it a title, mission etc along with its SWOT and SWOR analysis and the pitch.

COURSE CODE:BCC25426A0X COURSE NAME: ENTREPRENEURSHIP SKILLS AND PROFESSIONAL ETHICS		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Theory: 02 hrs. / week **Tutorial: 01hr /week**	**02** **01**	**CIE: 50 Marks** **TermWork : 25 Marks**

Prerequisite Courses, if any:

Companion Course, if any:

Course Objectives:

Primary objective of the course is to give students a basic understanding and awareness about "Entrepreneurship", its significance and skills required to pursue the same. The course also gives an overview of process of building a startup.

1. To introduce fundamental concepts of entrepreneurship
2. To develop basic entrepreneurial skills
3. To foster financial and marketing literacy for startups
4. To understand of professional and ethical responsibility
5. To acquaint with leadership and teamwork skills

Course Outcomes: On completion of the course, learner will be able to -

CO1: Identify various types of entrepreneurship, discuss its economic impact, and outline the entrepreneurial mindset and characteristics of successful entrepreneurs

CO2: Perform basic ideation, identify viable opportunities, and create a simple business plan, including understanding key elements of a business model

CO3: Apply basic budgeting, funding options, and marketing strategies relevant to new businesses and identify ways to reach and satisfy customers.

CO4: Understand and apply ethical principles, resolve ethical dilemmas responsibly, and recognize the role of corporate social responsibility in modern business.

CO5: Exhibit essential leadership qualities, work effectively in teams, manage conflicts, and make sound, ethical decisions in diverse professional settings.

Course Contents

Unit I: Introduction to Entrepreneurship and the Entrepreneurial Mindset.	**(8 Hrs)**

To provide students with foundational knowledge of entrepreneurship, covering its role in economic development, types of entrepreneurship, and the entrepreneurial mindset.

1. Basics of Entrepreneurship: Definition, characteristics, and types of entrepreneurship.
2. Role in Economy and Society: How entrepreneurship drives innovation and growth. Different models – Micro, Small, and Medium Enterprises
3. Developing an Entrepreneurial Mindset: Characteristics, and skills like risk-taking, creativity, and resilience.
4. Understanding Different Domains Entrepreneurship – Techno, Social, Women, Healthcare, Education, Manufacturing, Entrepreneurship etc.

Activities:

1. Quiz on definitions and types of entrepreneurship.
2. Role-play scenarios focusing on decision-making and risk-taking.
3. Panel discussion or guest lecture on diverse entrepreneurial domains.

Case study - Women entrepreneurs' success story / A Successful MSME.

Mapping of Course Outcomes with POs & PSOs	**PO6, PO7, PO8**

Unit II: The Entrepreneurial Process and Business Models	**(7 Hrs)**

To enable students to identify business opportunities, understand the entrepreneurial process, and create simple business models.

1. Ideation and Opportunity Recognition: Generating and evaluating business ideas.
2. Feasibility and Business Planning: Basics of market research and planning.
3. Business Models: Overview of various models (B2B, B2C, subscription, etc.).
4. Components of a Business Plan: Key elements of a simple business plan.

Activities:

1. Group ideation exercise to generate start-up ideas.
2. Workshop on creating a simple business plan.
3. Role-play exercise to explain different business models to a layperson.
4. Interactive session on key business plan components.

Mapping of Course Outcomes with POs & PSOs	**PO6 – PO11,PSO1**

Unit IV: Professional Ethics and Corporate Social Responsibility (CSR)	**7 (Hrs)**

To help students recognize the importance of ethics in engineering and business, promoting integrity, accountability, and social responsibility in their professional behavior.

1. Introduction to Ethics: Importance and principles of ethics in personal and professional life.
2. Professional and Engineering Ethics: - Ethics in management, organizational Ethics, Ethical aspects of Marketing, Intellectual property and Ethics
3. Corporate Social Responsibility (CSR): Basics and examples.
4. Common Ethical Dilemmas in Engineering and Business: Case Studies

Activities/ Tutorial

1. Group activity to identify unethical practices in real-world case studies.
2. Case study analysis on ethical issues in engineering and management.
3. Workshop on integrating CSR into business strategies.
4. Role-play scenarios depicting ethical dilemmas.

Mapping of Course Outcomes with POs & PSOs	**PO6 – PO11,PSO1**

Unit V: Leadership and Team Work	**7 (Hrs)**

1. Leadership and Team Skills: Effective communication, teamwork, and conflict resolution.
2. Compliance and Social Responsibility: Environmental and societal obligations.
3. Human Resource Management, Customer Care
4. • Trends and Future Opportunities in Entrepreneurship: Emerging fields like green tech and digital transformation

Activities/ Tutorial

1. Conduct a role-play simulating leadership challenges.2. Case study - Environmental compliance in businesses.
3. Guest lecture / Workshop on effective customer service techniques.4. Role-play customer service scenarios

Course Name : Entrepreneurship Skills and professional Ethics Tutorial

Course Outcomes: On completion of the course, -

CO1: Student will have awareness about each component of business.

CO2: Student will be able to define a minimum viable product for an innovative idea

Guidelines for Student's Lab Journal

- Every Experiment is to be written and completed using given template by faculty.

Guidelines for Lab /TW Assessment

For TW assessment - weightage given to

- Attendance, Participation in each activity, Completion of Assignment, In time Submission

Guidelines for Conduction

- Minimum 10 assignments to be completed

List of Assignments

UNIT I	
1.	Create a comparative chart / info graphic poster highlighting key features of each domain (e.g., social vs. tech entrepreneurship).
2.	Case study : Successful Women Entrepreneur / Social Entrepreneur / Any other
UNIT II	
1.	Conduct a group ideation exercise to generate start-up ideas. Create a mind map connecting various business opportunities in a given sector.
2.	Conduct Market research for the initiated idea and analyse the same.
UNIT III	
1	Develop a mini business plan or a business model canvas for a new idea.
2	Create a simple marketing strategy or pitch deck for a business idea.

UNIT IV	
1	Enlist various funding resources for a startup and create a comparative chart of advantages and disadvantages of funding sources.
2	Study of different types of companies with significance of each. Register your hypothetical company for any suitable type. Complete hypothetically the registration process.
3	Study and Analyse different categories of IPR relevant to your business.
UNIT V	
1	Analyze a case study on an ethical dilemma in engineering or business. And create a visual representation (poster/video) of ethical principles.
2	Write a report on best HR practices in startups.

Learning Resources

Text Books:

1. "Entrepreneurship Development and Management" by S. S. Khanka - Publisher: S. Chand Publishing This book provides a comprehensive introduction to entrepreneurship, focusing on Indian entrepreneurial scenarios. It includes topics on startup strategies, government initiatives, and managerial skills.
2. "Fundamentals of Entrepreneurship" by H. Nandan - Publisher: PHI Learning. This book explains entrepreneurship concepts with a focus on small and medium enterprises (SMEs) in India. It provides insights into entrepreneurial competencies, business planning, and government support systems.
3. "Engineering Ethics" by Charles B. Fleddermann- Publisher: Pearson Education. This book focuses on engineering ethics, covering case studies, ethical theories, and professional responsibilities. It's particularly suitable for students looking to understand ethical considerations in engineering practices

Reference Books:

1. "Innovation and Entrepreneurship" by Peter F. Drucker- Publisher: Harper Business. Drucker's classic text explores how innovation drives entrepreneurship. It's ideal for understanding the role of creativity and innovation in the entrepreneurial process.
2. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses"** by Eric Ries- Publisher: Penguin Random House.This book introduces the lean startup methodology, focusing on rapid prototyping, validated learning, and customer feedback. It's helpful for understanding modern approaches to building startups.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger- Publisher: McGraw-Hill Education. This book provides a thorough overview of ethical responsibilities for engineers, covering case studies and moral dilemmas in engineering.
4. "Entrepreneurship" by Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd - Publisher: McGraw-Hill Education. This is an advanced textbook on entrepreneurship, covering opportunity identification, venture capital, and managing growth. It provides an international perspective with case studies and examples.
5. "Corporate Social Responsibility in India" by Sanjay K. Agarwal- Publisher: SAGE Publications. This book covers CSR from an Indian perspective, discussing relevant policies, case studies, and CSR strategies. It's useful for understanding the ethical and social responsibilities of businesses in India.

MOOC / NPTEL Courses/Other Resources:

1. Entrepreneurship Development Course- "Wharton Entrepreneurship Specialization" by the University of Pennsylvania on Coursera: This course covers the full entrepreneurial journey, from idea generation to business growth. It's a comprehensive series that addresses opportunity identification, market analysis, and securing financing, ideal for beginners and early-stage entrepreneurs
2. Professional Ethics Course - "Global Impact: Business Ethics" by the University of Illinois on Coursera: This course introduces foundational business ethics and its application in global contexts, covering issues like corporate responsibility and ethical decision-making in various industries.
3. Entrepreneurship Development Program (EDP), by Thought Power

https://www.youtube.com/watch?v=pseWtIpC5ko&t=3s

COURSE CODE:BCC25427A0X COURSE NAME - LIFE SKILLS & LIBERAL LEARNING		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Practical: 02 Hrs. / Week	**01**	**Term Work: 25 Marks**

Prerequisite Courses, if any: NIL

Companion Course, if any: NIL

Course Objectives: Students are required to go through the list of following Co-Curricular Courses and select any one of their interests. They will be allocated one course from the list. Experts from respective course will conduct classes on campus / online through activities, discussions, presentations, and lecture methods.
Students are required to submit hard copy of a report on the activities performed related to topics of opted Co-Curricular Course. If student is doing course online on Swayam, NPTEL platform, submission of completion / grade certificate is mandatory. Evaluation will be done based on the report of activities submitted by student. Faculty members will be allotted for mentoring the activities related to Co-Curricular Courses. They will frame the activities list to be performed by students with the help of experts in respective course. Continuous evaluation will be done for term work marks.

Course Outcomes: On completion of the course, learner will be able to –
CO1: Understand basic concept of the selected course.
CO2: Learn co-curricular course that aligns his / her interest.
CO3: Enrich educational experience.
CO4: Explore strengths and talents outside of academics

Basket of Co-Curricular Course:

1. Yoga and Meditation
2. Dancing
3. Singing
4. Basics of Music Composition
5. Painting
6. Photography
7. Short Film making / Cinematography
8. Green Initiatives
9. Applied Arts
10. Applied Writing Skills

Here are some tips and ideas to help you choose the right courses

1. Consider Your Interests and Hobbies. Think about what you enjoy doing in your free time or what activities you have always wanted to try. Co-curricular courses can be a great opportunity to pursue passions outside your major.
2. Explore Different Fields. Choosing courses from different areas can provide a well-rounded experience.
3. Balance Your Schedule Ensure that the co-curricular courses fit well with your academic schedule and personal commitments. Avoid overloading yourself, as these courses should enhance your experience, not add undue stress.
4. Look at Course Benefits Some co-curricular courses offer skills that can be beneficial in your future career or personal development.
5. Consult with Advisors or Seniors Talking to academic advisors, professors, or senior students can give you insights into which courses are popular, have good instructors, or offer valuable experience

MOOC / NPTEL Courses/Other Resources:

1. https://swayam-plus.swayam2.ac.in/courses
2. https://swayam.gov.in/explorer
3. https://nptel.ac.in/courses

COURSE CODE: BCC25428A0X COURSE NAME - SUBJECT: THE CONSTITUTION OF INDIA		
Teaching Scheme:	**Credit**	**Examination Scheme:**
Online Learning, Presentations, MOOC courses, Guest lectures, Hands-on Assignments, Team Activities etc	**(Mandatory Non-Credit Course)**	**Audit Course**

Prerequisite Courses, if any: NIL

Companion Course, if any: NIL

Course Objectives:

1. To learn and understand the democracy and its advantages.
2. To learn and understand parliamentary system and its working
3. To learn and understand provisions made in Constitution of India.
4. To learn and understand constitutions of other Countries and global perspective.

Course Outcomes: On completion of the course, learner will be able to -

CO1: **Explain** various aspects of democracy and parliamentary system
CO2: **Understand** and **explain** various aspects of constitution of India
CO3: **Apply** the concepts of Sustainable Development Goals in his life and work.

Course Contents		
Unit I	**Democracy**	**(2 Hrs)**
Society, Nation and its constitution, Various Definitions of democracy, Definition of Democracy in Indian context, Dimensions of Democracy- Social, Economic, and Political Necessary conditions for successful working of democracy		
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO6, PO7, PO9,PSO1**	
Unit II	**Parliamentary System**	**(3 Hrs)**
Parliamentary system of democracy, Pillars of Indian democracy, Separation of power, Elections: Political party-Registration, Rules for Recognition, Delimitation Commission: Constitutional Provisions		
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO6, PO7, PO8, PO9, PO11,PSO1**	
Unit III	**The Constitution of India**	**(3 Hrs)**
Preamble, Overview of The Constitution of India (COI), Definition of State, Fundamental rights, Fundamental duties, Directive Principles of state policies, Themes for understanding our Constitution, Constitutional morality		
Mapping of Course Outcomes with POs & PSOs	**PO1, PO2, PO3, PO6, PO7, PO8, PO9, PO11,PSO2**	
Unit IV	**Amendment of The Constitution**	**(2 Hrs)**
Basic structure doctrine, Power of Parliament to amend the Constitution and procedure therefor, Procedure for Amendment of The Constitution before and after 42nd Amendment Case studies: Self case study of 24th and 42nd Amendment.		
Mapping of Course Outcomes with POs & PSOs	**PO2, PO3, PO6, PO7, PO10,PSO2**	
Unit V	**Comparative Studies**	**(2 Hrs)**
Comparison of COI and Constitution of Presidential system (e.g. USA), Constituent Assembly of India and Constituent assembly of Pakistan, COI and Constitution and situations in neighboring countries like Pakistan, Bangladesh, Nepal etc.		
Mapping of Course Outcomes with POs & PSOs	**PO2, PO3, PO6, PO7, PO8, PO10, PO11,PSO2**	
Unit VI	**Global perspective**	**(3 Hrs)**
Human and Sustainable Development, Global goals for Sustainable development and The Constitution of India, Challenges for India and its solutions within constitutional framework. COI & PESTLE analysis		
Mapping of Course Outcomes with POs & PSOs	**PO2, PO5, PO6, PO7, PO8 PO10, PO11,PSO2**	
Hands-on Assignments		
Group-A Assignments		
1.	Translate the Preamble of The Constitution of India in any Indian language.	

2.	Visit: https://secure.mygov.in/read-the-preamble-india Read the Preamble of The Constitution of India Get the online GOI Certificate Inform, Motivate, help your friends and relatives for getting certificate Email copy of certificate to: HOD and Faculty in-charge
3.	Download the copy of The Constitution of India from Union Govt. web site. https://legislative.gov.in/constitution-of-india Read titles of articles, Prepare Hand-written or Softcopy of only titles of all articles and Schedules. Find which article is repeated in which parts of our Constitution. Read and translate this article in any Indian language
Group B Assignments (Any one)	
1.	Prepare Street play script and perform Street play for enlightenment on the subjects related to The Constitution of India (Minimum. 5 Min., Max. 15 Min.) [Team work]
2.	Making movie for enlightenment on the subjects related to The Constitution of India (Minimum. 5 Min., Max. 15 Min.) [Team work]
3.	Prepare and deliver written speech on The Constitution of India (Minimum. 5 Min., Max. 15 Min.)
Group C Assignments (Optional Extra Co-curricular)	
Create/Join AIT_FE Constitution Club2025 WhatsApp group of your class Create/Join AIT_FE Constitution Club2025 Facebook/twitter/social media group/page of your class Regularly read/write posts about COI	
Learning Resources	
Reference/Text Books/ Web References: 1. The Constitution of India Gov. of India 2. Basu, D. D. "Introduction to the Constitution of India" Prentice Hall of India. 3. Debate and discussion in Constituent assembly, Different volumes (GOI) 4. SudhirKrishnaswamy "Democracy and Constitutionalism in India" Oxford University Press 5. Fali S. Nariman "You Must Know Your Constitution" 6. Sustainable development goals UNO 7. www.constitutionofindia.net 8. MOOC courses available on the subject, recommended by Board of studies.	