AC –

Item No. –

As Per NEP 2020

Anjuman-I-Islam's
Kalsekar Technical Campus
School of Engineering & Technology
(An Autonomous Institute Affiliated to University of Mumbai)

Syllabus for Major Vertical – 1, 4 & 6		
Name of the Programme – B.Tech. (Computer Science & Engineering (Artificial Intelligence & Machine Learning))		
Faulty of Engineering		
Board of Studies in Computer Science & Engineering (Artificial Intelligence & Machine Learning)		
U.G. First Year Programme	Exit Degree	One Year U.G. Certificate in Computer Science & Engineering (Artificial Intelligence & Machine Learning).
Semester		I & II
From the Academic Year		2025-26

AIKTC – School of Engineering & Technology **University of Mumbai**

(As per NEP 2020)

Sr. No.	Heading	Particulars
1	Title of program O: _____	B.Tech. (Computer Science & Engineering (Artificial Intelligence & Machine Learning))
2	Exit Degree	One Year U.G. Certificate in Computer Science & Engineering (Artificial Intelligence & Machine Learning).
3	Scheme of Examination R: _____	NEP 40% Internal 60% External, Semester End Examination Individual Passing in Internal and External Examination
4	Standards of Passing R: _____	40%
5	Credit Structure R: _____	Attached herewith
6	Semesters	Sem. I & II
7	Program Academic Level	5.00
8	Pattern	Semester
9	Status	New
10	To be implemented from Academic Year	2025-26

Dr. Salim Shaikh **BoS-Chairman – CSE(AIML)** **SoET-AIKTC**	**Dr. Rajendra Magar** **Principal, SoET-AIKTC**	**Dr. Ramjan Khatik** **Director, AIKTC**

Preamble

In alignment with the **National Education Policy (NEP) 2020**, the Department of Computer Science & Engineering (Artificial Intelligence & Machine Learning) is committed to ensuring academic excellence through a structured and outcome-based approach to teaching and learning. Accreditation remains the key mechanism for assuring quality in higher education, with a primary focus on evaluating program outcomes. Reflecting this philosophy, the **Faculty of Science and Technology, University of Mumbai**, has pioneered the integration of NEP 2020 principles into curriculum design and implementation.

The **Second-Year Engineering Program** serves as a foundation for developing scientific reasoning, analytical thinking, and problem-solving skills among learners. Students are offered a flexible choice of subjects from **Program Core Courses, Multidisciplinary Minors, and Vocational Skill-Enhanced Courses**, ensuring holistic development. In line with NEP 2020, the curriculum emphasizes the essential knowledge and skills required in modern engineering, while also providing exposure to emerging technologies and industry practices.

To support a **stress-free and learner-centric pedagogy**, a **choice-based subject pool** has been introduced for the 3rd and 4th semesters. These include **Core Courses, Open Electives, and Multidisciplinary Minors**, designed to nurture creativity and align with current industry trends. Vocational and skill-enhancement modules further provide hands-on experience in contemporary industrial practices, ensuring learners acquire both academic knowledge and practical expertise.

The program structure ensures learners have the **freedom to pursue courses of their interest**, enabling a personalized and interdisciplinary learning experience. Alongside core engineering courses, emphasis is placed on **Design Thinking** introduced in the First Semester to encourage innovation and transition learners from rote learning to becoming creative professionals. Additionally, the NEP 2020 framework provides for **multiple exit options** with Certificates and Diplomas, supported by vocational skill pools aligned with industry demands.

The faculty has resolved that **clear Course Objectives and Course Outcomes** be defined for every subject to ensure consistency and depth across affiliated institutes. The **NEP 2020 grading system** brings a paradigm shift from teacher-centric to learner-centric education, focusing on time invested in learning rather than teaching. It emphasizes **continuous internal assessment**, integrating revision sessions, tutorials, guest lectures, and advanced content delivery within the 15-week teaching framework (12–13 weeks for teaching and 2–3 weeks for reinforcement).

Importantly, the second-year syllabus is designed to be **balanced and stress-free**, ensuring that learners can smoothly transition into college life and build strong bonds with faculty mentors. The revised curriculum will be implemented for the **First Year and Second Year of Engineering from the academic year 2025–26**, followed by Third Year in 2026–27 and Final Year in 2027–28.

Dr. Salim Shaikh **BoS-Chairman – CSE(AIML)** **SoET-AIKTC**	**Dr. Rajendra Magar** **Principal, SoET-AIKTC**	**Dr. Ramjan Khatik** **Director, AIKTC**

One Year Under Graduate Certificate in Engineering- Computer Science & Engineering (Artificial Intelligence & Machine Learning).

Credit Structure (Sem. I & II)

		R: _____C									
Level	**Semester**	**Major**		**Minor**	**OE**	**BSEC**	**VSC, SEC (VSEC)**	**AEC, VEC, IKS**	**OJT, FP, CEP, CC,RP**	**Cum. Cr. / Sem.**	**Degree/ Cum. Cr.**
		Mandatory	**Electives**								
5.0	I	PCC101:2 PCL101:2	--	--	--	BSEC101:3 BSEC102:3 BSEC103:2 BSECL:1	VSC101:2 VSC102:1	AEC: 2	CC101:2	20	**One Year UG Certificate 42**
		R: _____D									
	II	PCC201:3	--	--	--	BSEC201:3 BSEC202:3 BSEC203:3 BSECL:1	VSC201:2 VSC202:1	IKS:2 VEC:2	CC201:2	22	
	Cum Cr.	7	--	--	--	19	6	**6**	4	42	

Exit option: Award of One Year UG Certificate in Major with 42 credits and additional 8 credits, out of which 4 credits in work based vocational courses or internship/apprenticeship during summer vacation and 4 credits from skill based courses to be earned during first and/or second semester.

[Abbreviation - OE – Open Electives, VSC – Vocation Skill Course, BSEC- Basic Science & Engineering Course, SEC – Skill Enhancement Course, (VSEC), AEC – Ability Enhancement Course, VEC – Value Education Course, IKS – Indian Knowledge System, OJT – on Job Training, FP – Field Project, CEP – Continuing Education Program, CC – Co-Curricular, RP – Research Project]

Letter Grades and Grade Points:

U.G and P.G Program				
Sr. No.	**Letter Grade**	**Percentage of Marks**	**Grade Points**	**Performance**
1	0	80 and above	10	Outstanding
2	A	75:00 – 79.99	9	Excellent
3	B	70:00 – 74.99	8	Very Good
4	C	60:00 – 69.99	7	Good
5	D	50:00 – 59.99	6	Fair
6	E	45:00 – 45.99	5	Average
7	P	40:00 – 44.99	4	Pass
8	F	< 40.00	0	Fail

Semester -I

Semester - I									
Course Code	Course Name	Course Abbr	Teaching Contact Hours			Credits			
			Theory	Tutorial	Practical	Theory	Tutorial	Practical	Total
25CAIPCC101	Structured Programming Language	SPL	2	-	-	2	-	-	2
25CAISEC101	Engineering Maths I	EM-I	3	-	-	3	-		3
25CAISEC102	Engineering Chemistry	EC	3	-	-	3	-	-	3
25AE101	Communication Skills (English)	CS	2	-	-	2	-	-	2
25CAISEC103	Engineering Mechanics	EM	2	-	-	2	-	-	2
25CAIPCL101	Structured Programming Language Lab	SPL-L	-	-	4	-	-	2	2
25CAISEL101	Engineering Chemistry Lab	EC-L	-	-	2	-	-	1	1
25CAIVSL101	Web Development Lab	WD-L	-	-	4	-	-	2	2
25CAIVSL102	Techshop Lab	TS-L	-	-	2	-	-	1	1
25CC101	Liberal Learning I (UHV)	LL-I	-	2	-	-	2	-	2
TOTAL			**26 hrs**			**20 Credits**			

Semester - I							
Course Code	Course Name	Course Abbr	Internal Assessment		External Assessment		TOTAL
			CIA	MSE	ESE	Prac / Pres / Oral	
25CAIPCC101	Structured Programming Language	SPL	20	20	40	-	80
25CAISEC101	Engineering Maths I	EM-I	20	30	50	-	100
25CAISEC102	Engineering Chemistry	EC	20	30	50	-	100
25AE101	Communication Skills (English)	CS	20	20	40	-	80
25CAISEC103	Engineering Mechanics	EM	20	20	40	-	80
25CAIPCL101	Structured Programming Language Lab	SPL-L	50	-	-	25	75
25CAISEL101	Engineering Chemistry Lab	EC-L	25	-	-	25	50
25CAIVSL101	Web Development Lab	WD-L	50	-	-	25	75
25CAIVSL102	Techshop Lab	TS-L	25	-	-	-	25
25CC101	Liberal Learning I (UHV)	LL-I	50	-	-	-	50
TOTAL			**420 (59%)**		**295 (41%)**		**715**

Structured Programming Language

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIPCC101	Structured Programming Language	2	-	-	2	-	-	2

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	20	40

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite : Problem Solving using Imperative Programming	
Course Objectives : To learn problem solving using C	
Course Outcomes (COs) : At the End of the course students will be able to	
CO1	Understand the basics of Programming, structure of C programs and apply input/output functions, data types, and operators to solve simple problems.

CO2	Develop decision-making and looping logic using conditional and iterative constructs for implementing problem-solving strategies and Implement user-defined functions and recursion to modularize code
CO3	Manipulate arrays, strings, and pointers to handle structured data and memory management.
CO4	Design and use structures and file handling techniques to develop data-centric applications for real-world scenarios.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	**Programming : The First Step**				
	1.1	**What is Programming?** Definition, Role of Programmers,Real life applications of Programming, Understand Basic Structure of a program	**CO1**	**BL3**	**7**
	1.2	**How Computers Understand Instructions -** Internal mechanisms of Code Compilation and Execution, Compiled vs Interpreted languages			
	1.3	**C Programming Basic** History of C, Features, Applications that can be developed using C, Structure of a C Program, Data Types and Variables, Operators and Expressions, I.O Operations, Constants and Literals, Type Conversion and Casting, In-built Libraries			
	1.4	**Good Programming Practices** Version Control, Writing Algorithms, Code Documentation			
2	**Working with Control Structures and Functions**				
	2.1	**Conditional Statements -** if, else, nested if, switch-case, **Loops -** for, while, do-while break, continue.	**CO2**	**BL3**	**7**
	2.2	**Working with Patterns-** Nested loops, various pattern printing			
	2.3	**Functions -**Declaration, Definition, Calling, Function Arguments (Call by Value, Call by Address), Recursion			
	2.4	**Storage Classes** (auto, static, extern, register)			
3	3.1	**Arrays, Strings, and Pointers**			

		One-dimensional & Two-dimensional Arrays, Array operations (searching, reversing)	**CO3**	**BL3**	**7**
	3.2	**String Handling :** Declaring strings, gets, puts, strlen, strcpy, strcmp, etc.			
	3.3	**Introduction to Pointers :** Pointer Arithmetic, Pointers with Functions, Pointer to pointer, array of pointers			
	3.4	**Dynamic Memory Allocation** (malloc, calloc, free)			
4	**Structures, File Handling and Preprocessors**				
	4.1	Structures and Unions : Defining structures, nested structures, Array of structures,	**CO4**	**BL3**	**7**
	4.2	File Handling : File operations: fopen, fclose, fscanf, fprintf, fread, fwrite			
	4.3	Command Line Arguments, Preprocessor Directives : #define, #include, #ifdef			
				Total	**28**

Text Books :	
1	Programming in C, Stephen G. Kochan, Pearson Education
2	Head First C, David Griffiths and Dawn Griffiths, O'Reilly Media
3	C Programming: A Modern Approach, K. N. King, W. W. Norton & Company
Reference Books :	
1	The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall
2	Expert C Programming: Deep C Secrets, Peter van der Linden, Pearson Education
3	21st Century C, Ben Klemens, O'Reilly Media

Engineering Mathematics-I

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEC101	Engineering Mathematics-I	3	-	-	3	-	-	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Basics of Mathematics upto Senior secondary level

Course Objectives: To build a strong maths foundation to support advanced engineering studies

Course Outcomes (COs): At the end of the course, students will be able to

CO1	Apply the concept of complex number to solve engineering problems
CO2	Apply partial differentiation techniques to obtain the extremum of the given function.
CO3	Apply basic knowledge of analytic functions to solve engineering problems.
CO4	Apply numerical methods to solve algebraic and transcendental equations

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	Complex Numbers Expansion of $\sin n\theta$, $con\ n\theta$ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ	CO1	BL 3	**08**
	1.2	Powers and Roots of a complex number			
	1.3	Hyperbolic Functions **Self-learning topic: Basics of Complex Numbers**			
2	2.1	Partial Differentiation: Function of several variables, Partial Derivatives of first and higher order. Differentiation of composite functions.	CO2	BL3	**08**
	2.2	Euler's Theorem on Homogeneous functions with two independent variables (with proof). Deductions from Euler's Theorem (without proof)			
	2.3	Maxima and Minima of a function of two independent variables **Self-learning topics: Euler's Theorem on Homogeneous functions with three independent variables.**			
3	3.1	Successive differentiation Introduction to successive differentiation	CO3	BL3	**07**
	3.2	n^{th} derivative of standard functions			
	3.3	Leibnitz's theorem(without proof) and problems			
4	4.1	**Analytic Functions** Function *f(z)*of a complex variable. Necessary and sufficient conditions for *f(z)*to be analytic (without proof}	CO4	BL3	**10**

	4.2	Cauchy-Riemann equations in Cartesian coordinates (without proof).			
	4.3	Milne-Thomson method: Determine analytic function *f(z)*when real part(u),imaginary part (v) is given			
	4.4	Harmonic functions, Harmonic conjugates, Orthogonal trajectories			
	4.5	Analytic function *f(z)*when is given **Self-learning topics: Applications of analytic functions**			
5	5.1	**Numerical methods** Solution of algebraic and transcendental equations - Regula-Falsi and Newton-Raphson methods (only formulae). Problems	CO4	BL3	**09**
	5.2	Solution of a system of linear algebraic equations, by (1) Gauss Jacobi Iteration Method, (2) Gauss Seidel Iteration Method			
	5.3	Expansion of functions using Taylor's series Series expansion of Standard function using Maclaurin's series **Self-learning topics:Gauss Elimination Method, Gauss Jordan Method.**			
					42

Text Book :	
1	Dr B.S. Grewal, "*Higher Engineering Mathematics*", Khanna Publications, 4nd Edition
Reference Books :	
1	H. K. Das, "*Advanced Engineering Mathematics*", S. Chand, 28th Edition
2	Erwin Kreysizg, "*Advanced Engineering Mathematics*", John Wiley & Sons, 10th Edition.
3	Jain and Iyengar, "*Advanced Engineering Mathematics*", Narosa Publications, 4th Edition.

Engineering Chemistry

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEC102	Engineering Chemistry	3	-	-	3	-	-	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Calculation of molecular weight of compounds, balancing chemical equations, types of polymerisation.

Course Objectives:

1	To study the important types, synthesis and uses of plastics & elastomers and nanomaterials for specific engineering applications.

2	To study the effect of corrosion by different mechanisms on metals and methods of corrosion control.
3	To study different water treatment and water management techniques that contribute to health, environmental sustainability, and economic development.
4	To study coal as a conventional source of energy and quantify the oxygen required for combustion of given fuels.
5	To apply the principles of green chemistry and study environmental impact for sustainable development.
Course Outcomes (COs): At the End of the course students will be able to	
CO1	Apply the knowledge of polymers and nanomaterials for specific engineering applications on the basis of properties.
CO2	Apply different control methods to minimize corrosion in industries.
CO3	Determine the quality of coal and quantify the oxygen for the given fuels by combustion reaction mechanism.
CO4	Apply the wastewater treatment techniques for sustainable management of water resources.
CO5	Apply the principles of Green chemistry and study environmental impact for sustainable development.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1	1.1	**Polymers** Introduction: Definition- Polymer and polymerisation, Classification- Thermoplastics & Thermosetting plastics.	**CO1**	BL1, BL2, BL3	**08**
	1.2	Properties of polymers- i) Molecular weight (Number average, Weight average and Polydispersity index). Numerical problems on Molecular weight polymers.			
	1.3	ii) Crystallinity: Crystalline and Amorphous polymers - Glass Transition Temperature, Viscoelasticity.			
	1.4	Plastics: Compounding of plastics; Fabrication of plastic by Compression, Injection, Transfer and Extrusion moulding. Preparation, Properties and applications of commercial			

		plastics- PMMA and Kevlar.			
	1.5	Elastomers: Manufacturing process of natural rubber, Drawbacks of natural rubber, vulcanisation of rubber.			
	1.6	Preparation, Properties and applications of commercial elastomers- Silicone rubber and Polyurethane rubber.			
	1.7	Advanced Polymers: Conducting polymers, Intelligent(smart) polymers.			
		Self Learning Topic: Addition and Condensation polymerisation, Plastic recycling processes and environmental impact. Use of plastics in 3D printing.			
2	2.1	**Corrosion** **Introduction:** Definition, Types of Corrosion – i) Dry or Atmospheric Corrosion, ii) Wet or Electrochemical corrosion (In Acidic medium, In Neutral medium).	**CO2**	BL1, BL2, BL3	**08**
	2.2	**Factors affecting rate of corrosion:** i) Position of metal in galvanic series, ii) Purity of Metal, iii) Nature of Corrosion product, iv) Temperature.			
	2.3	v) pH of medium, vi) Concentration of medium, vii) Moisture, viii) Relative Areas of Anode and Cathode, ix) Overvoltage.			
	2.4	Methods to control corrosion: i) Selection of material ii) Proper Designing, iii) Cathodic protection,			
	2.5	iv) Use of Corrosion Inhibitors, v) Metallic Coating- Galvanising and Tinning.			
		Self Learning Topic: Electrochemical and galvanic series. Pitting corrosion, Stress corrosion cracking. Intergranular and crevice corrosion. Effect of environmental pollution on corrosion. Corrosion monitoring techniques.			

3	3.1	**Fuels & Combustion** Introduction: Definition, classification, characteristics of a good fuel.	**CO3**	BL1, BL2, BL3	**08**
	3.2	Calorific value: Definition, Units, Gross or Higher calorific value & Net or lower calorific value.			
	3.3	Dulong's formula & numerical for calculations of Gross and Net calorific values.			
	3.4	Analysis of coal: Proximate and Ultimate Analysis (theory and numericals).			
	3.5	Combustion: Calculations for requirement of oxygen and air (by weight and by volume) for given fuels.			
	3.6	Green Fuel: Power alcohol; Biodiesel (Synthesis and advantages).			
		Self Learning Topic: Emissions from fuel combustion. Grades of Indian coal. Jatropha as a biodiesel source. Algae-based biofuels. Comparison of Biodiesel vs. Petroleum diesel.			
4	4.1	**Water Technology** **Introduction:** Definition of Hard water and Soft water , Hardness, types of hardness (Temporary hardness, Permanent hardness).Unit of hardness (ppm).	**CO4**	BL1, BL2, BL3	**08**
	4.2	Numericals on types of hardness. Estimation of hardness (EDTA titration method).			
	4.3	**Softening Methods:** Ion Exchange method (Priniciple, Process, Numericals), Reverse Osmosis, Electrodialysis.			
	4.4	**Wastewater Treatment Technologies:** Types of wastewater (domestic, industrial), Primary, Secondary, and Tertiary treatments, Activated Sludge Process, Definition , determination, significance.			
	4.5	Numericals of COD and BOD.			

		Self Learning Topic: Compare ion exchange vs. RO in terms of cost and efficiency. Membrane fouling in RO systems. Real-world applications: STPs and ETPs.			
5	5.1	**Composite Materials** Introduction: Definition, Characteristics of composites.	**CO1**	BL1, BL2 BL3	**04**
	5.2	Constituents of composites: Matrix Phase & Dispersed Phase. Classification of composites			
		Self Learning Topic: Types of composites with applications in various fields.			
6	6.1	**Green Chemistry** Introduction: Definition, 12 Principles of Green Chemistry, Numericals on Atom Economy.	**CO5**	BL1, BL2, BL3	**06**
	6.2	**Synthesis:** Comparative study of synthesis of following industrially important molecules by conventional and green route: - i) Indigo dye, ii) Adipic acid, iii) Carbaryl.			
	6.3	**C) Green Solvents:** Characteristics and applications of Supercritical solvents and ionic liquids.			
		Self Learning Topic: Comparison of green solvents with traditional solvents. Industrial applications and case studies using green solvents. Role of biotechnology in green synthesis.			
				Total	**42**

Text Books :	
1	A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai).
2	A Text Book of Green Chemistry – V.K. Ahluwalia (Springer)
Reference Books :	
1	Engineering Chemistry - Jain & Jain (Dhanpat Rai)
2	Engineering Chemistry – Dara &Dara (S Chand)
3	Engineering Chemistry - Wiley India (ISBN – 9788126519880)
4	Materials Science and Engineering: An Introduction, William D. Callister Jr. and David G. Rethwisch, Wiley.
5	Polymer Science: Vasant Gowarikar, Wiley Estern Ltd New Delhi.
Online References:	
Sr.No	**Website Name**
1	https://www.researchgate.net/
2	https://www.sciencedirect.com/topics/engineering/polymer-material
3	https://www.sciencedirect.com/topics/chemistry/nanomaterial

Communication Skills (English)- CS

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25AE101	Communication Skills (English) CS	2	-	-	2	-	-	2

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	20	40

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Basic English language fluency

Course Objectives:

1	Develop proficiency in English by engaging with literary texts and language theory.
2	Enhance their comprehension, vocabulary, and interpretive skills through drama, poetry, prose, and fiction.
3	Understand and apply foundational linguistic concepts such as syntax, semantics, and pragmatics.

4	Cultivate an appreciation for literature as a means of language development and cultural insight.
Course Outcomes (COs): At the End of the course, students will be able to	
CO1	Read and interpret selected literary texts (drama, poetry, novel, prose) with improved understanding of tone, theme, and structure.
CO2	Identify and use syntactic structures effectively in writing and speaking.
CO3	Analyze the meaning and use of language in context (semantics and pragmatics).
CO4	Express ideas clearly and coherently in both oral and written English using improved vocabulary and grammar.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	**Reading Literature –** 'The Future of Mankind' by Bertrand Russell	CO1	BL1, BL2 & BL3	09
	1.2	'The Ideas That Have Helped Mankind' by Bertrand Russell			
	1.3	'What We Must Learn from the West' by Narayan Murty			
	1.4	Language Skills: Reading aloud, summarizing scenes, vocabulary from context, and sentence construction.			
2	2.1	**Speaking / Describing** Introducing self / other persons	CO2	BL1, BL2 & BL3	05
	2.2	Making Requests, Inviting, Suggesting, Accepting and Refusing			
	2.3	Talking about past events (Celebrations / Festivals and Holidays)			
	2.4	The people in my life (Memories)			
	2.5	After Graduation			
3	3.1	**Introduction to Grammar** Identifying Common Errors (Subject-verb agreement, Articles. Prepositions, Misplaced modifiers and Punctuations)	CO3	BL1, BL2 & BL3	08

	3.2	Redundancies, Idioms, Cliches at a similar difficulty level of entrance tests like CAT / GRE / GMAT & Proficiency Tests like TOEFL / IELTS			
	3.3	Language Skills: Grammar drills, sentence analysis, usage exercises.			
4	4.1	**Reading and Writing** Passage for Comprehension	**CO4**	BL1, BL2 & BL3	**06**
	4.2	Content Creation for Social Media and e-Commerce Platforms • Blogs • Poetry • Keynote speeches • Podcast titles • Landing pages • Social media posts • YouTube video description • Screenwriting/Script Writing (Minimum 3 categories to be covered in the form of competitions)			
	4.3	Self-Learning Activity: Vocabulary & Grammar Building Website: https://learnenglish.britishcouncil.org			
	4.4	**Self-Learning Activity:** Vocabulary & Grammar Building **Website**: https://learnenglish.britishcouncil.org			
				Total	**28**

Text Books:	
1	Enhancing Ability: Disposition and Temperament - I (Macmillan Education) Edited by Kapil Singhel, Renuka Roy, Leena Phate
2	Enhancing Ability: Disposition and Temperament-II (Macmillan Education) Edited by Manjushree Sardeshpande
Reference Books:	
1	"Literature and Language" – University Prescribed Anthology (adapted texts)
2	English for Students of Science – R.P. Bhatnagar & R. T. Bell

3	An Introduction to Language and Linguistics – Ralph Fasold & Jeff Connor-Linton (selected chapters)
4	Teacher-prepared notes and simplified literary texts
5	Unpopular Essays by Bertrand Russell

Engineering Mechanics

Course Code	Course Name	Teaching Scheme (Hrs/week)			Cedits Assigned			
		L	T	P	L	T	P	Total
25CAISEC103	Engineering Mechanics	2	-	-	2	-	-	2

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	20	40

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Resolution of a force. Use of trigonometry functions. Parallelogram law of forces. Law of triangle. Polygon law of forces, Lami's theorem. Uniformly accelerated motion along a straight line, motion under gravity, projectile motion, Time of flight, Horizontal range, Maximum height of a projectile.

Course Objectives: The course will enable students:

1	To familiarize with the concepts of force, moment, Resultant and Equilibrium of the system of co planar force.

2	To acquaint them with the basic concept of friction and its application in real-life problems.
3	To introduce the parameters required to quantify the Kinematics of Particle.
4	To acquaint with basic principles of centroid and its application
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	Apply the concepts of force systems, resultants, and static equilibrium (with and without friction) to solve problems involving support reactions and system stability.
CO2	Analyse and solve motion problems of a particle using kinematic principles such as motion curves and projectile motion
CO3	Determine the centroid of composite plane figures using the first moment of area and assess its relevance to structural behaviour.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
		Course Introduction The Engineering Mechanics Course marks the transition from physics to engineering applications. This course develops the ability to apply and analyze, which are paramount in the engineering profession.	--	--	1
1		**Co planar force System: System of Co planar Forces**			
	1.1	Classification of force systems (Concurrent, Parallel and General Force systems). Principle of Transmissibility, Composition and Resolution of Forces.	CO1	BL3	7
	1.2	Resultant of Coplanar Force Systems: Resultant of coplanar force system (Concurrent, Parallel and non-concurrent non-parallel force systems).			

	1.3	Moment of force about a point, Couples, Varignon's Theorem and its significance. Force couple system			
	1.4	**Self Learning :** Numerical on Parallelogram law of forces			
2		**Equilibrium of Co planar Force System & Friction**	CO1	BL3	8
	2.1	Equilibrium: Conditions of equilibrium for concurrent forces, parallel forces and general forces, Couples. Equilibrium of rigid bodies, free body diagrams.			
	2.2	Equilibrium of Beams: Types of beams, simple and compound beams, type of supports and reaction: Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)			
	2.3	Friction: Laws of friction. Cone of friction. angle of repose, angle of friction, equilibrium of bodies on a horizontal and inclined plane.			
	2.4	**Self Learning :** Concept of trusses			
3		**Kinematics of Particle**	CO2	BL3	6
	3.1	Motion of particles with Variable Acceleration. Motion Curves (a-t, v- t, s-t curves). Projectile Motion: Trajectory Equation of Projectile. Application of the concepts of Projectile Motion in real life and related numerical.			
	3.2	**Self Learning :** Concepts of linear Acceleration			
4		**Centroid**	CO3	BL3	6

	4.1	Centroid of Composite Plane Lamina. Plane lamina consisting of primitive geometrical shapes.			
	4.2	**Self Learning :** Moment of Inertia			
				Total	**28***

*Total Hrs 28 excluding self learning session

Textbooks:	
1	Engineering Mechanics by A K Tayal, Fourteenth Edition, 2011 Umesh Publication.
2	Engineering Mechanics by Kumar, Fourth Edition, 2017 Tata McGraw Hill
3	Engineering Mechanics by F. L. Singer, Third Edition, 1975, Harper & Raw
4	Engineering Mechanics by R. C. Hibbeler, Fourth Edition, 2017, Pearson Education
Reference Books:	
1	Engineering Mechanics by Beer &Johnston, Fourth Edition, 1987, Tata McGraw-Hill
2	Engineering Mechanics (Statics) by Meriam and Kraige, Fourth Edition, 1999 Wiley Books
3	Engineering Mechanics by Timoshenko’s Fifth Edition,2015, generic

Structured Programming Language Lab

Course (Category) Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIPCL101	Structured Programming Language Lab	-	-	4	-	-	2	2

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
30	10	05	05	50	25

IPE: Internal Practical Evaluation (30)

Three (03) internal practical exams of 30 marks each as per below syllabus. 15 marks for Program execution, 05 marks for Program documentation and 10 marks for viva. The average of 03 exams marks would be considered as IPE.

Exp: Experiments (10)
Program(s) Execution & Problem(s) Solving: 06; On Time: 02; Viva: 02

Activity: [Assignment/Model/Mini Project] (05)
Minimum Two (02) of the above assessment tools each of 05 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Problem Solving using Imperative Programming

Course Objectives: To learn problem solving using C

Course Outcomes (COs): At the End of the course students will be able to

CO1	Apply fundamental programming constructs such as loops, conditionals, and functions to

	solve basic computational problems in C.
CO2	Develop C programs using arrays and strings for problem-solving in real-world contexts.
CO3	Apply concepts of pointers and memory management to implement dynamic data structures in C.
CO4	Construct modular programs using functions, structures, and file handling for specific application problems.

Week No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1	1.1	**Demonstrate Input/Output Functions and Operators in C** **The program should:** a) Read a character from the user using **getchar()** and display it using **putchar().** b) Read two integers using **scanf()** and display their sum, difference, product, and quotient using arithmetic operators and **printf()**. c) Read a string (full name) using **gets()** and display it using **puts()**.	CO1	BL3	4
	1.2	**Demonstrate Relational, Logical, and Bitwise Operators in C** Write a C program to demonstrate the use of relational, logical, and bitwise operators. **The program should:** a) Read two integer values from the user. b) Demonstrate relational operators (==, !=, <, >, <=, >=) by comparing the two values. c) Use logical operators (&&, ||, !) to evaluate conditions on the values. d) Apply bitwise operators (&, |, ^, ~, <<, >>) on the input values and display the results.			
2	2.1	**Program to demonstrate Control Statements (Conditional) & Looping:** a) If and its Variants, Switch	CO1	BL3	4

		(Break) b) while, do-while, for			
3	3.1	**Program to demonstrate Nested control structure**- Switch statement, Continue statement, Break statement, Goto statement	CO1	BL3	4
4	**Internal Assessment -1(IA-I)**				
5	4.1	Programming with Arrays Write a C program to perform various operations on an array of integers entered by the user. Requirements: 1. Accept the size of the array from the user (maximum size: 100). 2. Accept the elements of the array from the user. 3. Perform the following operations using menu-driven logic: ● Display all elements of the array. ● Find the maximum and minimum element in the array. ● Calculate the sum and average of the array elements. ● Search for a given element in the array (linear search). ● Reverse the array. ● Sort the array in ascending order (using bubble sort or selection sort).	CO2	BL3	4
	4.2	You are given an array A of size N and an element X. Your task is to find whether the array A contains the element X or not. (https://www.codechef.com/practice/course/arrays/ARRAYS/problems/SEARCHINARR)			

6	5.1	**Program to demonstrate String** Write a C program to perform the following tasks using strings: ● Read two strings from the user. ● Display the entered strings. ● Use predefined functions from the **string.h** library to: ● Find and display the length of each string. Compare the two strings and display whether they are equal or not equal. ● Concatenate the second string to the first and display the result. ● Copy the second string into a third string and display it.	**CO2**	BL3	4
7	6.1	**Program to demonstrate Pointers and Functions** a) Use of Functions in the previous programs b) Use of pointers and function in array and string processing c) Passing Arguments to a Function (call by value and call by reference).	**CO3**	BL3	4
8	**Internal Assessment -II(IA-II)**				
9	7.1	**Program to demonstrate Structure** Write a C program to store and display information of an **employee** using **structures**. Program should include the following: a) **Define a structure** named Employee with the following fields: Employee ID (integer), Name (string), Department (string), Salary (float) b) **Read and store details** of a single employee from the user. c) **Display** the stored employee information in a well-formatted manner.	**CO4**	BL3	4
10	8.1	**Program to demonstrate files** Write a program to maintain a simple employee database using file handling. 1)Open a file to store employee records 2)Add new employee 3)Update existing employee (by employee ID) 4)Display all employee records 5)Ensures data persistence using file operations	**CO4**	BL3	4
11	9.1	**Program to demonstrate recursion**	**CO3**	BL3	4

		factorial, GCD, Fibonacci, Power, Tower of Hanoi etc using recursion..			
12	10.1	Implement a Simple Employee Management System in C to add, display, and search employee records using functions, file handling, structures, and pointers. **Functions** – To add, display, and search employee records. **Files** – To store and retrieve employee data permanently. **Structures** – To define an employee. **Pointers** – To manage employee data dynamically.	**CO4**	BL3	4
13		**Internal Assessment -III (IA-III)**			
14		**Some Advance topics for Self study**			
		Implementation of Bubble sort			
		Implementation of Merge Sort			
		Implementation of quick sort			
Assignment 1		There are N items in a shop and the price of the i-th item is Ai. Chef wants to buy all the N items. There is also a discount coupon that costs X rupees and reduces the cost of every item by Y rupees. If the price of an item was initially ≤Y, it becomes free, i.e, costs 0. Determine whether the Chef should buy the discount coupon or not. Chef will buy the discount coupon if and only if the total price he pays after buying the discount coupon is strictly less than the price he pays without buying the discount coupon. **(https://www.codechef.com/practice/course/arrays/ARRAYS/problems/DISCOUNTT)**			
Assignment 2		**Student Grades Analyzer** write a program in C that uses functions and pointers to process a list of student grades. The program should: ● Dynamically read the number of students (n). ● Accept n grades (as float values) from the user and store them in a dynamically allocated array using pointers. Use functions to: ● Calculate the average grade. ● Find the highest and lowest grade.			

	• Sort the grades in ascending order using pointer manipulation. You must: • Use pointer arithmetic (not array indexing) to access and modify elements in the array. • Pass the pointer to the grades array into functions.			

Text Books :	
1	“Let Us C”, by Yashwant Kanetkar, BPB Publication.
2	“Programming in ANSI C”, by E. Balaguruswamy, Tata McGraw-Hill Education.
Reference Books :	
1	"The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie, Publisher: Prentice Hall Publication Date: February 22, 1988 ,ISBN-13: 978-0131103627 ,
Online Resources:	
1	**Codecademy -** Codecademy provides a comprehensive, interactive course for learning C, complete with real-world projects and skill paths.
2	**Coursera -** Coursera, in collaboration with Duke University, offers a specialization in C programming, including hands-on projects and a certificate upon completion.
3	**LeetCode-** LeetCode is an online platform for coding interview preparation. The platform provides coding and algorithmic problems intended for users to practice coding.
4	**CodeChef -** Learn and Practice Coding with Problems

Engineering Chemistry Lab

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEL101	Engineering Chemistry Lab	-	-	2	-	-	1	1
Examination Scheme								
Continuous Internal Assessment (CIA)							External	
IPE	Exp	Activity		Att	Total		Prac & Oral	
15	05	03		02	25		25	

IPE: Internal Practical Evaluation (15)

Two (02) internal practical/ oral exams of 15 marks each as per below syllabus. The average of 02 exam marks would be considered as IPE.

Exp: Experiments (05)
Performance: 03; On Time: 01; Viva: 01

Activity: [Assignment/Model/Mini Project] (03)
Minimum Two (02) of the above assessment tools each of 03 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (02)
As per the rubric provided by the Attendance committee.

Prerequisite: Familiarity with laboratory equipment and understanding of lab safety protocols.

Course Objectives: The course will enable students to:

1	To reinforce theoretical chemical concepts through practical experimentation.
2	To analyse experimental results and write laboratory reports.
3	To work effectively both independently and as part of a team.
4	To ensure proper handling and usage of laboratory equipment and chemicals.

5	To develop proficiency in standard laboratory procedures such as titration and synthesis.
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	Synthesize a polymer and calculate the atom economy of a drug based on the principle of green chemistry.
CO2	Determine the hardness, COD of water sample and pH of the given solutions.
CO3	Determine the Saponification value, Acid Value of oil sample to understand the quality of lubricating oil and the quality of coal sample to understand the significance of proximate analysis of coal.
CO4	Compare the rate of corrosion of various metals in acidic medium and determine % composition of constituent elements in metallic alloys.
CO5	Demonstrate the understanding of material properties and their real-world applications.

Module No.	Module Name & Content	CO	BL
1	Synthesis of Phenol formaldehyde resin.	CO1	BL1, BL2 & BL3
2	Synthesis of Aspirin from salicylic acid and calculate its atom economy.		
3	Synthesis of Urea formaldehyde resin		
4	Synthesis of Biodiesel from vegetable oil		
5	Synthesis of biodegradable plastics.		
6	To determine total, temporary, and permanent hardness of water sample by EDTA method.	CO2	
7	To determine chemical oxygen demand in effluent sample.		
8	To determine the pH of different solutions using pH meter.		
9	To determine Chloride content of water by Mohr‘s Method.		
10	To determine % Moisture content of coal sample.	CO3	
11	To compare rate of corrosion of various metals in acidic medium		
12	Determination of viscosity average molecular weight of polymer.	CO4	
13	To determine glass transition temperature of an amorphous polymer.		
14	Report Writing/ Case Study on Composite materials.	CO5	

Books Recommended:

Textbooks:	
1	A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai).
2	A Text Book of Green Chemistry – V.K. Ahluwalia (Springer)
Reference Books:	
1	Engineering Chemistry - Jain & Jain (Dhanpat Rai)
2	Engineering Chemistry – Dara &Dara (S Chand)
3	Engineering Chemistry - Wiley India (ISBN – 9788126519880)
4	Materials Science and Engineering: An Introduction, William D. Callister Jr. and David G. Rethwisch, Wiley.
5	Polymer Science: Vasant Gowarikar, Wiley Estern Ltd New Delhi.

Web Development Lab

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIVSL101	Web Development Lab	0	0	4	0	0	2	2

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
30	10	05	05	50	25

IPE: Internal Practical Evaluation (30)

Three (03) internal practical exams of 30 marks each as per below syllabus. 15 marks for Program execution, 05 marks for Program documentation and 10 marks for viva. The average of 03 exams marks would be considered as IPE.

Exp: Experiments (10)
Program(s) Execution & Problem(s) Solving: 06; On Time: 02; Viva: 02

Activity: [Assignment/Model/Mini Project] (05)
Minimum Two (02) of the above assessment tools each of 05 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite:

Course Objectives: The course will enable students to:

1	Gain knowledge of HTML elements, document structure, forms, multimedia, and semantic tags to create well-organized and accessible web pages.
2	Understand and apply CSS styling techniques, including layout models, typography, animations, and responsive design using modern CSS frameworks.
3	Understand the core concepts of JavaScript, including variables, control structures, functions, and DOM manipulation to create interactive web pages.

4	Develop proficiency in advanced JavaScript concepts, including modern ES6+ features, asynchronous programming, web storage, and modular development.
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	Apply HTML concepts to design structured and accessible web pages, incorporating text formatting, navigation, multimedia, and forms.
CO2	Design visually appealing and responsive web pages using CSS techniques, including Flexbox, Grid, typography, animations, and preprocessors.
CO3	Apply JavaScript concepts to create dynamic and interactive web pages using functions, event handling, and DOM manipulation techniques.
CO4	Implement advanced JavaScript concepts to enhance web applications using ES6+ features, asynchronous programming, error handling, and modular coding practices.

Week No.	Detailed Contents		CO Mapped	BL	Hrs
1	**1. HTML Page Structure & Semantic Elements**		**CO1**	BL3	4
	1.1	Design a personal portfolio webpage with semantic HTML elements like <header>, <section>, <article>, <footer>, and navigation links.			
2	**2. Responsive Web Design with CSS**		**CO2**	BL3	4
	2.1	Develop a responsive multi-column blog page using CSS Grid and Flexbox with media queries for different screen sizes.			
3	**3. Interactive Navigation Menu with CSS & JavaScript**		**CO2**	BL3	4
	3.1	Design a navbar using CSS and add JavaScript to highlight active links and implement a dropdown menu.			
4		**Assessment 1 (10 marks)** **Submission of Assignment 1: Complete any 5 HTML problems from the HackerRank website**			4
5	**4. Form Validation with JavaScript**		CO3	BL3	4

	4.1	Create a user registration form with validation for required fields, email format, password strength, and matching passwords.			
6	**5. Image Gallery with JavaScript Events**		CO3	BL3	4
	5.1	Create a gallery where clicking on a thumbnail displays a larger version using JavaScript event listeners.			
7	**6. Handling Local Storage**		CO3	BL3	4
	6.1	Implement a JavaScript-based to-do list with features to add, remove, and mark tasks as complete, using local storage.			
8		**Assessment 2 (10 marks), Submission of Assignment 2: Complete any 5 CSS problems from the HackerRank website**			4
9	**7. Temperature Converter using JavaScript**		CO3	BL3	4
	7.1	Build an interactive converter that updates the result dynamically as the user enters a value.			
10	**8. Fetch API & JSON Data Display**		CO4	BL3	4
	8.1	Fetch data using an API (e.g., jsonplaceholder) and display it dynamically on a webpage.			
11	**9. JavaScript Animations with CSS Transitions**		CO2	BL3	4
	9.1	Create a button that changes color and size smoothly on hover and click using CSS animations and JavaScript event handling.			
12	**10. User Authentication Simulation with JavaScript**		CO4	BL3	4
	10.1	Create a login form that checks username and password validity and displays a personalized greeting upon successful login.			
13		**Assessment 3 (20 marks), Submission of Assignment 3: Complete JavaScript (Basic) Certification from the HackerRank website**			4
14		**Assignment & TW Submission**			4

Textbooks:	
1	"Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and Ajax, Black Book", Kogent Learning Solutions Inc., Dreamtech Press
2	"Internet & World Wide Web: How to Program", Paul Deitel, Harvey Deitel, Pearson Education
3	"HTML5 and CSS3: Complete", Denise M. Woods, Cengage Learning
4	"Beginning Web Programming with HTML, XHTML, and CSS", Jon Duckett, Wiley
Reference Books:	
1	"Learning PHP, MySQL & JavaScript"Robin Nixon, O'Reilly
2	"Web Development with Node and Express", Ethan Brown, O'Reilly
3	"Eloquent JavaScript" *(3rd Edition),* Marijn Haverbeke, No Starch Press
4	"HTML and CSS: Design and Build Websites", Jon Duckett, Wiley
Online Resources & Tools:	
1	MDN Web Docs (by Mozilla) – https://developer.mozilla.org
2	W3Schools Tutorials – https://www.w3schools.com
3	FreeCodeCamp Labs & Projects – https://www.freecodecamp.org

Techshop Lab (Logic and System Lab)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIVSL102	Techshop Lab (Logic and System Lab)	0	0	2	0	0	1	1

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
15	05	03	02	25	-

IPE: Internal Practical Evaluation (15)

Two (02) internal practical/ oral exams of 15 marks each as per below syllabus. The average of 02 exam marks would be considered as IPE.

Exp: Experiments (05)
Performance: 03; On Time: 01; Viva: 01

Activity: [Assignment/Model/Mini Project] (03)
Minimum Two (02) of the above assessment tools each of 03 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (02)
As per the rubric provided by the Attendance committee.

Prerequisite: NIL

Course Objectives: The course will enable students to:

1	Introduce foundational concepts of digital electronics.
2	Develop circuit design and analysis skills using simulation tools
3	Enhance problem-solving using Boolean algebra and K-Map.

4	Relate digital logic to real-world applications in AI and ML.
Course Outcomes (COs): At the End of the course students will be able to	
CO1	Understand logic gates and digital building blocks
CO2	Design and simulate combinational and sequential circuits
CO3	Apply Boolean algebra and K-Map for circuit simplification
CO4	Analyze timing diagrams and sequential logic behaviour
CO5	Design and implement sequential circuits like flip-flops, counters, and registers
CO6	Use simulation platforms like Circuit Verse and IIT Virtual Labs effectively

Week No.	Detailed Contents		CO Mapped	BL	Hrs
1	**Tutorial:Introduction to Digital Electronics**		CO1	BL1	2
		1.1 What is digital electronics? 1.2 Number systems: binary, decimal, hexadecimal. 1.3 Logic levels: 0 and 1, Basic logic families (TTL, CMOS).			
2	**Experiment: Logic Gates using Circuit Verse**		CO1	BL1	2
		2.1 Implementation and verification of AND, OR, NOT gates. 2.2 Truth tables, gate symbols, simulation output.			
3	**Experiment:Universal Gates as Building Blocks**		CO2	BL2	2
		3.1 NAND and NOR implementation. 3.2 Proof of universality, simulation and verification.			
4	**Tutorial:Boolean Algebra and K-Map Simplification**		CO3	BL3	2
		4.1 Boolean laws and rules. 4.2 Simplifying logic expressions. 4.3 Karnaugh Map (2- or 3-variable).			
5	**Experiment:Half Adder and Full Adder Circuits**		CO2	BL2	2
		5.1 Logic expressions for sum and carry			

		5.2 Truth tables, design, and simulation			
6	**Assessment 1 (20 marks)** **Submission of Tutorial 1**				2
7	**Experiment:** Multiplexer and Demultiplexer		**CO2**	BL2	2
		4×1 MUX and 1×4 DEMUX: Concepts, implementation, and simulation			
8	**Experiment:** Encoder and Decoder Circuits		**CO2**	BL2	2
		8×3 Encoder and 3×8 Decoder: Truth tables, implementation using logic gates, simulation of encoder and decoder circuits			
9	**Experiment:**Flip-Flops Simulation		**CO4**	BL4	2
		SR, JK, D flip-flops, Simulate and see output change with clock			
10	**Experiment :Synchronous and Asynchronous Counters**		**CO4**	BL4	2
		Design using flip-flops, 3-bit counters, timing difference			
11	**Tutorial: Digital Logic in AI Accelerators**		**CO4**	BL2	2
		TPUs and GPUs: Architecture overview and digital logic role			
12	**Tutorial: Binary Arithmetic in ML,Neural Networks and Logic Circuits**		**CO2**	BL3	2
		1 Adders, multipliers in ML applications 2. Binary data processing examples 3.Perceptron using logic gates 4. Logic-based decision making in AI			
13	**Assessment Ii (20 marks)** **Submission of Tutorial 2**				2
14		**Assignment & TW Submission**			2
				Total	**28**

Text Books :	
1	R.P. Jain – Modern Digital Electronics
2	M. Morris Mano – Digital Logic and Computer Design
3	Thomas L. Floyd – Digital Fundamentals
4	Charles H. Roth – Fundamentals of Logic Design
Online Resource :	
1	CircuitVerse.org – Online Digital Logic Simulator
2	IIT Virtual Labs – Digital Electronics Labs
3	NPTEL Course on Digital Circuits
4	Tinkercad Circuits (Optional for extra practice)

Liberal Learning I (UHV)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CC101	Liberal Learning I (UHV)	-	2	-	-	2	-	2

Examination Scheme				
Continuous Internal Assessment (CIA)				External
Activity	Test	Att	Total	Prac & Oral
30	10	10	50	-

Activity: [Assignment/Model/Mini Project/Mind Map or Infographic/Peer Presentation/Role Play / Skit/ Storytelling or Short Film/ UHV Debate] (30)

Minimum Two (02) of the above assessment tools each of 30 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Test [Presentation / Open Book Test/Class Test/Multiple Choice Questions] (10)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (10)

As per the rubric provided by the Attendance committee.

Prerequisite: No prior knowledge required; only an open and receptive mindset is expected.

Course Objectives:

1	Foster a holistic understanding through self-exploration, enabling learners to deeply reflect on their identity as human beings and their interconnectedness with family, society, and nature/existence.
2	Develop clarity and insight into the harmony that exists within and among the human being, family, society, and the natural world, promoting balanced and meaningful relationships.
3	Enhance the capacity for self-reflection, nurturing critical thinking, self-awareness, and continuous personal growth.

4	Empower learners to realize their full human potential, equipping them to contribute actively to building a just and equitable society and to play a meaningful role in national development
Course Outcomes (COs): At the End of the course students will be able to	
CO1	Critically evaluate the role of value-based education alongside skill development, and cultivate a broader, more integrated understanding of life and the purpose of education.
CO2	Identify and articulate their aspirations and concerns across various dimensions of life, and explore sustainable approaches to fulfill them meaningfully.
CO3	Assess their current lifestyle and mindset, and design a model for a balanced and healthy way of living rooted in self-awareness.
CO4	Reflect on personal and social challenges, such as homesickness, peer dynamics, and interactions within the campus environment, while developing a deeper sense of gratitude toward parents, teachers, and others.
CO5	Build confidence and a stronger commitment to value-based living, fostering responsible participation in family, society, and in harmony with nature.

Module No.	Detailed Contents	CO Mapped	BL	Hrs
1	**Self-Exploration** **1.1** Purpose and motivation for the course, getting to know each other. **Self-Learning Topics:** Reading of a short article: *"The Power of Self-Awareness in Success".* The Importance of Knowing Yourself" (motivational video). Write a short personal introduction focusing on strengths, interests, and expectations from the course	CO1	BL3	04
2	**Basic Human Aspiration** **2.1** Understanding personal, academic, and career dimensions. **2.2** Examining expectations from family, peers, society, and the nation. **2.3** Setting meaningful personal goals. **Self-Learning Topics:** Create a personal goal sheet with short-term and long-term goals. Reading: "How to Align Personal and Career Goals"	CO2	BL3, BL4	06

3	**Understanding Harmony in the Human being** 3.1 Developing self-confidence. 3.2 Managing peer pressure, time, anger, and stress. 3.3 Focusing on personality development and continuous self-improvement. **Self-Learning Topics:** "Overcoming Peer Pressure" (TED-Ed video). Time management worksheet (simple daily planner) Reflection Question: What are my time-wasters? How can I improve my confidence?	CO3	BL3, BL4	06
4	**Understanding Harmony of the self and body** 4.1 Fostering mental and physical health by recognizing common health concerns and adopting nutritious dietary habits and a holistic lifestyle." **Self-Learning Topics:** Short reading: *"Developing a Positive Personality"* Activity: List 3 areas for self-improvement and plan action steps. Video suggestion: *"The Habit of Self-Discipline"*	CO4	BL3, BL6	06
5	**Harmony in relationship** Cultivating gratitude towards parents, teachers, and others; understanding healthy peer interactions, including issues like ragging, competition, and cooperation; and nurturing feelings of trust, respect, gratitude, dignity, and love. **Self-Learning Topics:** Reading Article: *"How Diet and Exercise Impact Mental Health".* Food journal template to track eating habits for 3 days. Video: *"The Importance of Sleep for Well-being"*	CO5	BL2, BL3,	06
			Total	**28**

Text Books:	
1	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3rd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2	The Teacher's Manual Teachers‟ Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

3	A Foundation Course in Holistic Human Health – Its Philosophy and Practice, Sharmila Asthana, Akhilesh Shukla, T Sundara Raj Perumall, 1st Edition, October 2023, Published by UHV Publications, , Kanpur, UP.7
Reference Books:	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya
2	The Story of Stuff (Book).
3	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
Assignments:	
1	Prepare a short write-up (200-250 words) on *"What motivates me to pursue higher education?"*
2	Introduce yourself highlighting your strengths, areas for improvement, and personal interests
3	Reflect in 150-200 words on how your family, peers, and society influence your decision-making process.
4	Write a short reflection (100-150 words) on how you manage stress and what improvements you can make.
5	Conduct a self-assessment of your personality (mention at least 3 strengths and 3 areas for improvement).
6	Write a brief reflection (150 words) on how mental and physical health are interconnected.
7	List 3 ways you can build trust and positive relationships in your personal or academic life.
Assessment:	
1.	This is an **audit course.**
2.	Lectures focus on interactive discussions, encouraging students to reflect, explore, and critically engage with the topics.
3.	The mentor facilitates self-observation, self-reflection, and self-exploration
4.	One or two periods per module may be allocated for tutorials.
5.	Based on the topic, worksheets, assignments, or activities may be included. Tutorials support students in aligning actions with their values, fostering commitment to basic human values.

Semester-II

Semester - II									
Course Code	Course Name	Course Abbr	Teaching Contact Hours			Credits			
			Theory	Tutorial	Practical	Theory	Tutorial	Practical	Total
25CAIPCC201	Discrete Structure & Graph Theory	DSGT	3	-	-	3	-	-	3
25CAISEC201	Engineering Maths II	EM-II	3	-	-	3	-	-	3
25CAISEC202	Engineering Physics	EP	3	-	-	3	-	-	3
25CAISEC203	Communication & PD	CPD	2	1	-	2	1	-	3
25IK201	Indian Knowledge System	IKS	1	1	-	1	1	-	2
25VE201	Value Education Course (Prompt Engineering)	VEC	1	1	-	1	1	-	2
25CAISEL201	Engineering Physics Lab	EP-L	-	-	2	-	-	1	1
25CAIVSL201	Object-Oriented Programming Lab	OOP-L	-	-	4	-	-	2	2
25CAIVSL202	Hardware & Networking Lab	HN-L	-	-	2	-	-	1	1
25CC201	Liberal Learning II (Social Sciences & Community Services)	LL-II	-	2	-	-	2	-	2
TOTAL			**26 hrs**			**22 Credits**			

Semester - II							
Course Code	Course Name	Course Abbr	Internal Assessment		External Assessment		TOTAL
			CIA	MSE	ESE	Prac / Pres / Oral	
25CAIPCC201	Discrete Structure & Graph Theory	DSGT	20	30	50	-	100
25CAISEC201	Engineering Maths II	EM-II	20	30	50	-	100
25CAISEC202	Engineering Physics	EP	20	30	50	-	100
25CAISEC203	Communication & PD	CPD	20	30	50	-	100
25IK201	Indian Knowledge System	IKS	50	-	-	25	75
25VE201	Value Education Course (Prompt Engineering)	VEC	50	-	-	25	75
25CAISEL201	Engineering Physics Lab	EP-L	25	-	-	25	50
25CAIVSL201	Object-Oriented Programming Lab	OOP-L	50	-	-	25	75
25CAIVSL202	Hardware & Networking Lab	HN-L	25	-	-	25	50
25CC201	Liberal Learning II (Social Sciences & Community Services)	LL-II	50	-	-	-	50
TOTAL			**450 (58%)**		**325 (42%)**		**775**

Discrete Structures and Graph Theory

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIPCC201	Discrete Structures and Graph Theory	3	0	0	3	0	0	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Basics of Mathematics

Course Objectives: The course will enable students to: (1) Understand foundational mathematical concepts used in computer science.(2) Encourage clear thinking and creative problem solving.(3) Apply logic, set theory and graph theory in computing.(4) Analyze algorithms and data structures using discrete mathematical techniques.

Course Outcomes (COs): At the End of the course students will be able to

CO1	Classify logical reasoning, mathematical thinking and proofs in problem solving.
CO2	Apply relations and functions in solving practical problems.
CO3	Analyze posets and lattices in solving practical problems.
CO4	Demonstrate counting principles and solve recurrence relation problems
CO5	Classify groups and codes in encoding-decoding
CO6	Apply concepts of graph theory in solving real world problems.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1	**Logic and Proof Techniques**		**CO1**	**BL2**	**6**
	1.1	Propositional logic: Syntax, semantics, truth tables			
	1.2	Logical equivalence and implication			
	1.3	Predicate logic, quantifiers			
	1.4	Methods of proof: Direct, contradiction, contrapositive, and mathematical induction.			
2	**Sets, Relations, and Functions**		**CO2**	**BL2**	**8**
	2.1	Set theory: Operations, Venn diagrams, power set, Cartesian product			
	2.2	Relations: Properties (reflexive, symmetric, transitive), equivalence relations, Equivalence Classes			
	2.3	Closures properties of Relations, Warshall's algorithm			
	2.4	Functions: Injective, surjective, bijective, inverse functions, composition			
	SELF PRACTICE	**IDENTIFY DIFFERENT TYPES OF RELATIONS & FUNCTIONS**			

3	**Posets and Lattice Theory**		**CO3**	**BL3**	**6**
	3.1	Partially ordered sets (Posets): Definition, Hasse diagrams, examples			
	3.2	Lattices: Definition, properties, bounded and complemented lattices			
	3.3	Distributive and modular lattices			
	3.4	Applications in data classification and knowledge representation			
	SELF PRACTICE	**DRAW THE HASSE DIAGRAMS FOR D42,D60, D72**			
	Counting Principle and Recurrence Relations		**CO4**	**BL3**	**5**
4	4.1	Basic counting: Rule of sum, Rule of product			
	4.2	Inclusion-exclusion principle			
	4.3	Pigeonhole principle			
	4.4	Recurrence relations: Definition, linear recurrence relations, solving using iteration and characteristic equations			
	SELF PRACTICE	**SOLVE EXAMPLES ON PIGEONHOLE PRINCIPLE**			
5	**Fundamentals of Algebraic Structures**		**CO5**	**BL2**	**10**
	5.1	Introduction to algebraic structures: Semigroups, monoids, groups			
	5.2	Properties and examples			
	5.3	Homomorphisms, subgroups, cyclic groups			
	5.4	Coding Theory - Coding, binary information			
	5.5	Error detection, decoding and error correction			

6	**Principles of Graph Theory and Applications**		**CO6**	**BL2**	**10**
	6.1	Graphs: Terminology, types (simple, multigraph, directed/undirected, weighted/unweighted)			
	6.2	Representations: Adjacency matrix/list			
	6.3	Paths and circuits, connectedness, component			
	6.4	Euler and Hamiltonian paths			
	6.5	Planar Graph and Applications of Graphs in Computer Science.			
	SELF PRACTICE	**PRESENT ANY TWO REAL LIFE EXAMPLES - APPLICATIONS OF GRAPH THEORY**			
				Total	**42***

Total 42* Hrs Excluding Self Learning Session.

Text Books :	
1	Kenneth H. Rosen, *Discrete Mathematics and Its Applications*, McGraw-Hill.
2	Tremblay and Manohar, *Discrete Mathematical Structures with Applications to Computer Science*.
3	B. Kolman, R. Busby, *Discrete Mathematical Structures*
Reference Books :	
1	C.L. Liu, *Elements of Discrete Mathematics*
2	Bondy and Murty, *Graph Theory with Applications*
3	Narsing Deo, "Graph Theory with applications to engineering and computer science", PHI Publications.

Engineering Mathematics-II

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEC201	Engineering Mathematics-II	3	0	0	3	1	0	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Basics of Mathematics up to Senior secondary level

Course Objectives: To build a strong maths foundation to support advanced engineering studies

Course Outcomes (COs): At the end of the course, students will be able to

1	Apply elementary transformation to find rank of given matrices.
2	Apply the concept and Solve first order first degree and higher order linear differential equations.
3	Apply the concepts of Double integral of different coordinate systems to the engineering problems.
4	Apply numerical methods to solve problems of differential equations and integration.

Module No.	Detailed Contents		CO Mapped	BL	Hrs
1	1.1	**Matrices** Introduction: Types of Matrices (symmetric, skew-symmetric, Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices and their properties. (problems on orthogonal and unitary matrices)	**CO1**	**BL3**	**09**
	1.2	The rank of a Matrix using Echelon form, reduction to normal form, and PAQ form (Only 3X3 Matrix).			
	1.3	System of homogeneous and non –non-homogeneous equations, their consistency, and solutions. Self-learning topics: Application of inverse of a matrix to coding theory.			
2	2.1	**Differential Equations of First Order and First Degree and Higher order with constant coefficients.** Exact differential Equations, Equations reducible to exact form by using four rules of integrating factors.	**CO2**	**BL 3**	**09**
	2.2	Linear differential equations Equation reducible to linear form Bernoulli's equation Self-learning topics: Application of differential equations in engineering			

3	3.1	**Higher Order linear differential equations:** Linear Differential Equation with constant coefficient: complementary function,particular integrals of differential equation of the type f(D)y = X, where X is, sin(ax + b) , cos(ax + b), , , where V is a function of x.	**CO2**	**BL 3**	**08**
	3.2	Method of Variation of parameters Self-learning topics: Simple application of differential equations of first order and first degree.			
4	4.1	**Double Integration** Introduction, Evaluation of Double Integrals. (Cartesian & Polar).	**CO3**	**BL3**	**09**
	4.2	Evaluation of double integrals by changing the order of integration			
	4.3	Evaluation of double integrals by changing to polar coordinates Self-learning topics: Application of double integrals to compute area and mass.			
5	5.1	**Numerical solution of ODE of first order and first degree and Numerical Integration.** Numerical solution of ordinary differential equations using (a) Euler's method (b) Modified Euler method, (c) Runge-Kutta method of fourth order.	**CO4**	**BL3**	**07**

	5.2	Numerical integration- by (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule (all without proof)			
			Total	**42**	

Text Book:	
1	Dr B.S. Grewal, "*Higher Engineering Mathematics*", Khanna Publications, 4nd Edition.
Reference Books :	
1	H. K. Das, "*Advanced Engineering Mathematics*", S. Chand, 28th Edition
2 **3**	Erwin Kreysizg, "*Advanced Engineering Mathematics*", John Wiley & Sons, 10th Edition. Elementary Linear Algebra with Application by Howard Anton and Christ Rorres. 6th edition. John Wiley & Sons,INC.
4	Jain and Iyengar, "*Advanced Engineering Mathematics*", Narosa Publications, 4th Edition.

Engineering Physics

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEC202	Engineering Physics	3	0	0	3	0	0	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Principle of superposition of waves, phase difference, path difference, basics of semiconductors, basics of particle motion and equations and basics of electricity and magnetism.

Course Objectives:

1) **Introduce** the fundamental concepts of wave optics, including interference phenomena, and the operational principles of lasers and optical fibres.
2) **Provide** a foundational understanding of quantum mechanics and its role in explaining microscopic physical phenomena.
3) **Familiarise** students with the essential concepts of semiconductor physics, including charge carriers, Fermi levels, Hall effect, and p-n junction-based devices.
4) **Expose** learners to the working principles of common transducers and the classification, properties, and applications of modern engineering materials such as nanomaterials and superconductors.

Course Outcomes (COs): At the End of the course students will be able to

1	**Describe** the fundamental principles of interference, LASER operation, and optical fibre transmission and **calculate** unknown parameters using supported theories.
2	**Discuss** quantum mechanical theory and **calculate** the physical quantities for the moving particles.
3	**Discuss** fermi energy level, Hall effect and junction devices **calculating** related physical quantities using the principles of semiconductor Physics.
4	**Describe** the working principles of various transducers and **classify** modern materials like nanomaterials and superconductors based on their properties and applications.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1	1.1	**Thin Film Interference** Principle of interference in thin films, Constructive and destructive interference conditions in thin parallel film,	1	BL1, BL2, BL3	05
	1.2	Wedge-shaped film (no derivation),			
	1.3	Newton's Rings,			
	1.4	Applications: Anti-reflection & highly reflective coatings, optical filters,			

	1.5	Problems on the applicable topics.			
2	2.1	**LASER & Optical Fibres** **LASER:** Radiation-Matter Interaction: Absorption, spontaneous & stimulated emission,	1	BL1, BL2, BL3	08
	2.2	Population inversion, Optical pumping, Metastable states,			
	2.3	Types of LASERs: Nd:YAG, He-Ne LASER (construction and working), Characteristics of LASER,			
	2.4	Applications of LASER: Material processing, medical, communication			
	2.5	**Optical Fibres:** Structure of optical fibre: Core, cladding,			
	2.6	Types: Step-index and graded-index fibres, Numerical Aperture, Acceptance angle,			
	2.7	Applications: Telecommunication, sensors, endoscopy.			
	2.8	Problems on the applicable topics			
3	3.1	**Quantum Physics** De Broglie hypothesis and properties of matter waves,	2	BL1, BL2, BL3	07
	3.2	Different forms of De Broglie equation, Heisenberg's Uncertainty Principle,			
	3.3	Schrodinger's time-dependent wave equation			
	3.4	Schrodinger's time-independent wave equation			
	3.5	Particle in a 1D box, Quantum tunnelling: Concept and applications,			
	3.6	Problems on the applicable topics			
	3.7	Problems on the applicable topics			
4	4.1	**Semiconductor Physics & Devices**	3	BL1, BL2, BL3	12

		Concepts of electric current, conductivity and mobility, conductivity of Intrinsic and extrinsic semiconductors,			
	4.2	Concept of Fermi level and Fermi Dirac Distribution function in semiconductors,			
	4.3	Law of mass action, charge neutrality condition, intrinsic carrier concentration, electron and hole concentration;			
	4.4	Effect of impurity concentration and temperature on the Fermi Level;			
	4.5	Hall Effect and its applications.			
	4.6	Formation of a P-N junction,			
	4.7	depletion region and barrier potential;			
	4.8	concept of carrier current densities in p-n junction in equilibrium,			
	4.9	Applications of P-N junction devices: LED, Zener diode, photoconductors, solar cells.			
	4.10	Problems on the applicable topics			
5	5.1	**Transducer Technology** Definition and classification of transducers, types of transducers,	4	BL1, BL2	05
	5.2	Ultrasonic transducer: Piezoelectricity and inverse piezoelectricity, applications.			
	5.3	Light sensors: Photodiode & LDR (Principle, working & Applications),			
	5.4	Hall sensor: (Construction &Applications), IR sensor: (Principle, working & applications)			
6	6.1	**Modern Engineering Materials** **Superconductors:** Properties, Meissner effect,	4	BL1, BL2, BL3	05
	6.2	Type-I & Type-II Superconductors, Applications (e.g., MAGLEV, MRI)			

	6.3	**Nanomaterials:** Introduction to nanoscience, size effects, Top-down vs. bottom-up synthesis (overview),			
		Self-Learning: *Diffraction of light:* Theory of Diffraction grating, grating equation, applications of diffraction grating. *Supercapacitors:* Types, properties and applications			4*
			Total (*Not included)		42*

*Total Hours 42 Excluding Self Learning Session

Text Books :	
1	A Text book of Engineering Physics -Dr. M. N. Avadhanulu, Dr. P. G. Kshirsagar, S. Chand, Revised Edition 2014
2	Principles of Electronics- V. K Mehta, Rohit Mehta, S. Chand Publication
3	A Textbook of Nanoscience and Nanotechnology, T. Pradeep Tata McGraw Hill Education Pvt. Ltd., 2012
Reference Books :	
1	Concepts of Modern Physics – Arther Beiser, Shobhit Mahajan, S. Choudhury, McGraw Hill, 7thEdition 2017
2	Fundamentals of optics - Francis A. Jenkins, Harvey E. White, McGraw Hill Publication, India, 4th Edition
3	Semiconductor Physics and Devices – Basic Principles – Donald Neamen – McGraw Hill
4	Materials Science and Engineering: An Introduction, William D. Callister Jr. and David G. Rethwisch, Wiley
5	Smart Materials and Structures- M. V. Gandhi and B. S. Thompson, Chapman & Hall

Communication & Personality Development-I
(CPD-I)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEC203	Communication & Personality Development (CPD-1)	2	1	0	2	1	0	3

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Mid Semester Examination	End Semester Examination
Activity	Test	Att	Total		
10	05	05	20	30	50

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (10)

Minimum Two (02) of the above mentioned activities each of 10 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (05)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: Basic English language fluency.

Course Objectives:
1. To demonstrate the fundamental concepts of interpersonal and professional communication.

2. To encourage active listening with focus on content, purpose, ideas and tone. 3. To facilitate fluent speaking skills in social, academic and professional situations. 4. To train in reading strategies for comprehending academic and business correspondence. 5. To promote effective writing skills in business, technology and academic arenas. 6. To inculcate confident personality traits along with grooming and social etiquettes.

Course Outcomes (COs): At the End of the course, students will be able to	
CO1	Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.
CO2	Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.
CO3	Prepare effectively for speaking at social, academic and business situations.
CO4	Use reading strategies for faster comprehension, summarization and evaluation of texts.
CO5	Adapt effective writing skills for drafting academic, business and technical documents.
CO6	Interact in all kinds of settings, displaying refined grooming and social skills.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1	**1.1**	Fundamentals of Communication Basic Concepts of Communication	**CO1**	**BL1** **BL2** **BL3**	**6**
	1.2	Definition, Objectives, Postulates Process of Communication Stimulus, Sender, Encoding, Message, Medium, Channel, Receiver, Decoding, Feedback			

	1.3	Methods of Communication • Verbal (Written & Spoken). • Non-verbal cues perceived through the five senses (Visual, Auditory, Tactile, Olfactory, Gustatory) • Non-verbal cues transmitted cues through (The body, Voice, Space, Time, Silence)			
	1.4	Barriers to Communication • Mechanical, Physical, Semantic & Linguistic, Psychological, Socio-cultural			
	1.5	Organisational Communication • Formal (Upward, Downward, Horizontal). • Informal (Grapevine)			
2	**2.1**	Developing Basic Listening Skills: Concepts of Active Listening • Listening for Details • Listening for Gist • Listening for Inference (For details please refer to Lab. Syllabus)	**CO2**	**BL1** **BL2** **BL3**	**3**
	2.2	Enhancing Listening Proficiency Using Language Labs or on Open Source Platforms			

3	**3.1**	Developing Basic Speaking Skills: Conversational Activities - Monologues Introducing yourself, Introducing others, One- minute impromptu speeches, Scaffolded story telling	**CO3**	**BL1** **BL2** **BL3**	**3**
	3.2	Conversational Activities – · Dialogues • Role plays on everyday interactions, · Interviews (Find out if...), Information Gap Activities, Picture descriptions and feedback, Situational conversations.			
4	**4.1**	Developing Basic Reading Skills: Verbal Aptitude • Root Words, Meanings, Word Forms, Synonyms, Antonyms, Collocations, Prefixes, Suffixes at a similar difficulty level of entrance tests like CAT/GRE/GMAT & proficiency tests like TOEFL/IELTS	**CO4**	**BL1** **BL2** **BL3**	**4**
	4.2	Techniques to Improve Reading Fluency and Comprehension • Intensive Reading • Extensive Reading • Skimming • Scanning			

		• SQ5R Method (Survey, Question, Reading, Recording, Recall, Review and Revise)			
	4.3	Reading & Summarisation Skills • Summarising text to Graphic Organisers (GO) and visa-versa. Venn diagrams, Radial Diagrams (Mind Maps), Tree Diagrams, Cyclic Diagrams, Flow Charts, Timelines, Matrix (Tables), Pyramids, etc. • Summarising text in point form • Summarising text in one-sentence central idea			
5	**5.1**	Developing Basic Writing Skills: Coherence & Cohesion in Writing • Basic Units of Writing (Words, Sentences, Paragraphs) • Coherence (Structure of written pieces, CSI Order of Organisation) • Cohesive Devices (Referencing, Repetition, Substitution, Ellipsis, Transition Signals). • Structure of a Paragraph (Topic Sentence, Supporting Ideas, Concluding Sentence).	**CO5**	**BL1** **BL2** **BL3**	**8**
	5.2	Seven Cs of Business Writing • Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness.			

	5.3	Format & Types of Formal Letters • Parts of a Formal Letter in Complete Block Style • Request/Permission Letter • Claim and Adjustment Letter • Sales Letter • E-mails			
	5.4	Writing User Instructions • Styles of Instruction Presentation (Impersonal, Indirect, Direct, Imperative) • Describing general function/purpose of object/process, • Drawing labelled diagrams • Describing labelled parts • Writing User Instructions • Writing Special Notices (Note, Caution, Warning, Danger)			
6	**6.1**	PERSONAL DEVELOPMENT AND SOCIAL ETIQUETTES Personality Development ● Formal Dress Code •Showing Empathy and Respect • Learning Accountability and Accepting Criticism	**CO6**	**BL1** **BL2** **BL3**	**4**

		· Social Etiquette • Formal Dining Etiquette • Cubicle Etiquette • Demonstrating Flexibility and Cooperation			
TOTAL HOURS					**28**

List of assignments (minimum 6 is required)

Sr. No.	Topic	CO
1	Communication Barriers + Non-Verbal Communication	CO1
2	1-Listening Record As per the Listening activity in the previous lab, please draft 3 write-ups on 1- Monologue, 2- Dialogue, 3- Listening Workshop	CO2
3	Public Speech and its Transcript	CO3
4	Vocabulary and Grammar (similar in level and format to CAT, GRE, and GMAT verbal sections)	CO4
5	Business Correspondence-Letters + Writing Instructions	CO5
6	Role Play or skit on any topic of the Module 6 and its short report	CO6

Text Books :	
1	Sanjay Kumar & Pushp Lata (2018). Communication Skills with CD. New Delhi: Oxford University Press.
2	Raman, M., & Sharma, S. (2016). Technical Communication: Principles and practice. New Delhi: Oxford University Press.

Reference Books :	
1	Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ: Prentice Hall.
2	English for Students of Science – R.P. Bhatnagar & R. T. Bell
3	Murphy, H. (1999). Effective Business Communication. Place of publication not identified: McGraw-Hill.
4	Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.
5	Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India.

Indian Knowledge System

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25IK201	Indian Knowledge System	1	1	0	1	1	0	2

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Pres/Oral	End Semester Examination
Activity	Test	Att	Total		
30	10	10	50	25	-

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (30)

Minimum Two (02) of the above mentioned activities each of 30 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (10)

Minimum Two (02) of the above mentioned tests each of 10 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (10)
As per the rubric provided by the Attendance committee.

Prerequisite: 1) Basic understanding of Indian culture, history, and language.

2) General awareness of scientific developments in India's past.

Course Objectives:
1) To explore the historical evolution of Indian scientific and philosophical thought.
2) To evaluate the historical and modern educational systems in our country.
3) To analyse sustainable practices in ancient India.
4) To understand the contributions of Indian Scientists and Nobel Laureates.
5) To understand the principles of good governance.

Course Outcomes (COs): At the End of the course, students will be able to	
CO1	Recognize the sources, concepts, and history of the Indian knowledge system and compare the ancient Bharatiya education system with the modern era and the current scenario.
CO2	Analyze traditional Indian practices such as Science, Technology, Astronomy, Mathematics, Life Sciences, Physiology, and Ayurveda, recognizing their impact on modern developments.
CO3	Showcase the multi-dimensional nature of IKS and its importance in modern society.
CO4	Analyze the pioneering work of ancient Indian scholars in various fields.
CO5	Demonstrate sustainable development in various fields like Science, Technology, agriculture, waste management, water conservation, forest conservation, architecture, urban planning, biodiversity preservation, yoga, health care, etc.

Module No.	**Detailed Contents**		**CO Mapped**	**BL**	**Hrs**
1		**Introduction to the Indian Knowledge System (I.K.S.)**	**CO1**	**BL1, BL2**	**6**
	1.1	Basic knowledge and scope of IKS IKS in ancient India and modern India,			
	1.2	Bhartiya education system – from ancient to modern era, Sources of Education, Aim of Education, Curriculum, methods of learning, Educational Institutes, Higher Educational Institutions			
	1.3	Advantages and Disadvantages of the Gurukul System, Distinguish between the Gurukul system and the Modern Education System			
	1.4	**Self Learning Topic:** "Comparative Study of Ancient and Modern Indian Education Systems: Philosophies, Pedagogies, and Institutions"			
2		**Development of Scientific Thoughts in Ancient India**	**CO2**	**BL4**	**5**

	2.1	Development in Science, Technology			
	2.2	Development in Astronomy, Mathematics			
	2.3	Development in Life Sciences – Life Science, Physiology, Ayurveda, etc.			
	2.4	**Self Learning Topic:** Comparative study: Ayurveda vs. Modern Medicine			
3		**Good Governance in Ancient India**	**CO3**	**BL3, BL4**	**5**
	3.1	Introduction to Indian religions			
	3.2	Moral and Ethical Governance			
	3.3	Vishva Kalyan through Vasudhaiva Kutumbkam			
	3.4	**Self Learning Topic:** Role of Religion in Governance			
4		**Contribution of Indian Scientists & Nobel Laureates**	**CO4**	**BL4 BL5**	**6**
	4.1	Baudhayan, Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna, Susruta, Kanada & Charak			
	4.2	Laureates Rabindranath Tagore, C.V. Raman, Har Gobind Khorana, Mother Teresa, Subrahmanyan Chandrasekhar			
	4.3	Amartya Sen, V.S. Naipaul, Venkatraman Ramakrishnan, Kailash Satyarthi, and Abhijit Banerjee			
	4.4	**Self Learning Topic:** Biography of A.P.J. Abdul Kalam			
5		**Sustainable Practices in Ancient India**	**CO5**	**BL3, BL5**	**6**
	5.1	Agriculture, waste management, water conservation, and forest conservation			
	5.2	Architecture, urban planning, biodiversity preservation, etc			
	5.3	Yoga, pranayama, and meditation for health			

		and well-being			
	5.4	**Self Learning Topic:** Explore Eco-Friendly Practices for a Greener Future for wastewater management			

Text Books :	
1	A.K. Bag, History of technology in India (Set 3 vol), Indian National Science Academy, 1997.
2	An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India).
3	Ancient Indian Knowledge: Implications for the Education System, Boski Singh; 2019
Reference Books :	
1	India's Glorious Scientific Tradition by Suresh Soni; 2010 (Ocean Books Pvt. Ltd.)
2	Indian Art: Forms, Concerns, and Development in Historical Perspective (History of Science, Philosophy and Culture in Indian Civilization), General Editor: D.P. Chattopadhyaya, Ed. By. B.N. Goswamy; 1999 Munshiram Manoharlal Publishers Pvt. Ltd.
3	Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd).
🌐 **Online Resources:**	
1	**IKS Portal by AICTE**: https://iksindia.org
2	**SWAYAM Online IKS Course**: https://swayam.gov.in
3	**Bharatiya Vidya Bhavan Digital Library**: http://bhavans.info
4	**IGNCA Digital Repository**: https://ignca.gov.in

Prompt Engineering

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25VE201	Prompt Engineering	1	1	0	1	1	0	2

Evaluation Scheme					
Continuous Internal Assessment (CIA)				Prac & Oral	End Semester Examination
Activity	Test	Att	Total		
30	10	10	50	25	-

Activity: [Presentation/Mindmap/Case Study/Poster/Numerical Assignment/Group Discussion/Field Visit/ GATE Questions] (30)

Minimum Two (02) of the above mentioned activities each of 30 marks have to be conducted. The average marks would be considered.

Test [Open Book Test/Class Test/Multiple Choice Questions] (10)

Minimum Two (02) of the above mentioned tests each of 10 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (10)
As per the rubric provided by the Attendance committee.

Prerequisite:

1. Ability to use a web browser, search online, and operate common software tools.
2. Interest in technology, creativity, and open-mindedness to explore AI tools.

Course Objectives: The course will enable students to:

1	To introduce the principles and strategies of prompt engineering using natural language.

2	To develop students' ability to formulate effective prompts for solving diverse problems using AI tools.
3	To enhance creativity, critical thinking, and communication skills through AI-assisted interactions.
4	To encourage responsible and ethical use of AI platforms in academic and professional settings.
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	Understand the fundamentals of Generative AI and language models.
CO2	Formulate structured and effective prompts for various tasks.
CO3	Apply prompt engineering techniques to solve academic and real-world problems.
CO4	Evaluate and refine AI-generated responses for accuracy and relevance.
CO5	Demonstrate responsible and ethical use of AI tools.

Module	Detailed Contents		CO Mapped	BL	Hrs
01	Foundations of Prompt Engineering		**CO1**	**BL2**	**03**
	1.1	Introduction to Prompt Engineering Role and Importance in AI & NLP			
	1.2	Overview of Large Language Models (LLMs): GPT, Claude, Gemini, etc. Understanding LLM Capabilities and Limitations			

	1.3	Types of Prompting: Zero-shot, One-shot, Few-shot Direct Instructions vs Role-based Prompts Prompt Structuring Best Practices			
02	Prompt Design Techniques and Patterns		**CO2**	**BL2**	**04**
	2.1	Chain-of-Thought (CoT) Prompting Self-consistency and step-by-step reasoning ReAct Prompting (Reasoning + Acting) Instructional and Role-driven Prompting Multimodal Prompting (Text + Image overview) Common Mistakes and How to Refine Prompts Prompt Debugging Techniques			
03	Tools, Platforms, and Applications		**CO3**	**BL3**	**04**
	3.1	Using OpenAI Playground / API Prompt Parameters: Temperature, Max Tokens, Top-p, Stop Sequences			
	3.2	Hands-on with ChatGPT, Claude, Gemini, Copilot Prompt Engineering Tools: PromptLayer, LangChain (Intro only)			

	3.3	Applications in: o Content Creation (summarization, email writing) o Programming Support (code generation, debugging) o Education (quiz generation, concept explanation) o Business (chatbots, support prompts)			
04	Ethics, Case Studies & Project Work		**CO4, CO5**	**BL3**	**03**
	4.1	Ethical Considerations in Prompt Engineering Addressing Bias, Hallucination, and Prompt Injection Privacy and Responsible AI Usage Real-world Case Studies from Various Domains			
	4.2	Mini Project: · Design a Prompt-Based Application or Tool · Presentation & Evaluation of Prompt Design			
			Total	**14**	

Practicals:

Week	Hands-on Activities	COS	BL	Hours
1	Setting up & using ChatGPT or Bing AI	CO1	BL1	1
2	Trying different types of prompts (Q&A, creative writing)	CO1	BL1	1
3	Prompting for studying: Notes, summaries, flashcards	CO2	BL2	1
4	Creating posters, letters, reports using prompts	CO2	BL2	1
5	Prompting for math and science help	CO2	BL2	1
6	Generating fun content (stories, riddles, poems)	CO3	BL2	1
7	Prompting for technical explanations in simple terms	CO3	BL2	1
8	Prompting for resume & email writing	CO3	BL2	1
9	Prompting for career guidance & project ideas	CO4	BL2	1
10	Exploring text-to-image tools (DALL·E, Canva AI)	CO5	BL2	1
11	Prompt evaluation: What worked well and why?	CO5	BL2	1
12	Mini Project: “Prompt Portfolio” for 5 real tasks	ALL	BL2	2
13	Showcase & Feedback	ALL	BL2	1
			Total	14

Engineering Physics Lab

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAISEL201	Engineering Physics Lab	0	0	2	0	0	1	1

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
15	10	03	02	25	25

IPE: Internal Practical Evaluation (15)

Two (02) internal practical/ oral exams of 15 marks each as per below syllabus. The average of 02 exam marks would be considered as IPE.

Exp: Experiments (05)
Performance: 03; On Time: 01; Viva: 01

Activity: [Assignment/Model/Mini Project] (03)
Minimum Two (02) of the above assessment tools each of 03 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (02)
As per the rubric provided by the Attendance committee.

Prerequisite: Basic knowledge of concepts of Physics, graph plotting and mathematical operations.	
Course Objectives: The course will enable students to:	
1	**Demonstrate** fundamental physical concepts through hands-on experiments related to optics, quantum physics, and semiconductors.
2	**Introduce** students to basic experimental techniques, instruments, and data analysis methods.

3	**Develop** skills in accurate measurement, observation, and interpretation of experimental results.
4	**Foster** critical thinking, teamwork, and scientific inquiry through practical problem-solving.
5	**Bridge** the gap between theoretical knowledge and real-world applications in engineering.
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	*Measure and interpret the electrical characteristics of semiconductor devices such as PN junction diodes, Zener diodes, and photodiodes using standard laboratory setups.*
CO2	*Determine key physical constants and parameters such as Planck's constant, carrier concentration, and wavelength using experimental methods.*
CO3	*Demonstrate the principles of optical communication through experiments involving LASERs and optical fibres, including numerical aperture and divergence angle.*
CO4	*Operate and evaluate the functionality of basic sensor systems such as ultrasonic distance meters and temperature sensors (e.g., PT100) in laboratory conditions.*
CO5	*Demonstrate the ability to research, analyze, and write structured reports on selected physics topics.*

List of experiments (Minimum Seven is required)

Module No.	Module Name & Content	CO	BL
1	Study of I-V Characteristics of PN junction diode	CO1	BL3, BL4
2	Study of I-V Characteristics of Zener diode (Reversed Biased)		
3	Study of I-V Characteristics of Photo diode		
4	Determination of Carrier concentration in a semiconductor using Hall Effect setup	CO2	
5	Verification of Planks constant with LED		
6	Determination of wavelength of a monochromatic light by Newton's Rings setup		
7	Determination of the angle of divergence of a LASER	CO3	

8	Study of Optical fibre communication system		
9	Determination of Numerical aperture of optical fibre		
10	Study of Ultrasonic distance meter	CO4	
11	Study of PT100 calibration and use as a thermometer		
12	Assignment on report writing on the topics related theory and lab course	CO5	

Books Recommended:

Textbooks:	
1	Experiments in Engineering Physics-Avadhanulu M.N, Dani A.A, S. Chand
2	Problems in Engineering Physics- Avadhanulu & Kshirsagar, S. Chand
3	A textbook of Engineering Physics, S. O. Pillai, New Age International Publishers.
4	A textbook of Optics - N. Subramanyam and Brijlal, S. Chand
5	Quantum Mechanics: Theory & Applications-Ajoy Ghotak & S. Lokanathan
6	Modern Engineering Physics – Vasudeva, S. Chand.
7	Engineering Physics- Wiley.
8	Optics - Ajay Ghatak, Tata Mc Graw Hill.
9	Electronic Instrumentation –H.S. Kalsi, Tata Mc Graw-Hill Education.
Reference Books:	
1	Fundamentals of optics by Jenkins and White, McGraw Hill.
2	Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill.
3	Introduction to Electrodynamics- D. J. Griffiths, Pearson publication.
4	Instrumentation & Measurement Techniques by Albert D. Helfrick & William D. Cooper (PHI).
5	Handbook of Modern Sensors Physics design and application- Jacob Fraden, Springer, AIP press.

Object-Oriented Programming Lab

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIVSL201	Object Oriented Programming Lab	-	-	2*+2	-	-	2	2

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
30	10	05	05	50	25

***2 hours at class level and 2 hours at batch level per week.**

IPE: Internal Practical Evaluation (30)

Three (02) internal practical exams of 30 marks each as per below syllabus. 15 marks for Program execution, 05 marks for Program documentation and 10 marks for viva. The average of 02 exam marks would be considered as IPE.

Exp: Experiments (10)
Program(s) Execution & Problem(s) Solving: 06; On Time: 02; Viva: 02

Activity: [Assignment/Model/Mini Project] (05)
Minimum Two (02) of the above assessment tools each of 05 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (05)
As per the rubric provided by the Attendance committee.

Prerequisite: C Programming

Course Objectives:

1	To learn core OOP concepts such as classes, objects, inheritance and polymorphism.
2	To develop proficiency in concepts such as multithreading, exception handling, and the use of

	user-defined packages.
3	To familiarize with the fundamental components and structures involved in building Graphical User Interface (GUI) applications.
Course Outcomes (COs): At the End of the course students will be able to	
CO1	To apply fundamental programming constructs. (BL3)
CO2	To illustrate the concept of packages, classes and objects. (BL3)
CO3	To elaborate the concept of strings, arrays to solve problems involving data manipulation. (BL3)
CO4	To implement the concept of inheritance and interfaces. (BL3)
CO5	To implement the concept of exception handling and multithreading. (BL3)
CO6	Design interactive GUI applications. (BL3)

Week No.	Detailed Contents		CO Mapped	BL	Hrs
1	**OOP concepts:** Objects, class, Encapsulation, Abstraction, Inheritance, Polymorphism, message passing, JVM, JDK, JRE **Basic programming constructs:**Input and output functions in Java: scanner class, variables, data types, Operators, I/O,		CO1	BL3	2
	1.1	Write a Java program to input the name, roll number, and CGPA of a student using the Scanner class.			
	1.2	Write a Java program that takes the following details such as Employee ID (String or Integer), Name and Monthly Basic Salary for **employee** and perform the following operations: **Calculate the Annual Basic Salary** (12 * monthly basic). Compute the following based on the monthly basic salary : ● **HRA (House Rent Allowance)** = 20% of basic salary ● **DA (Dearness Allowance)** = 10% of basic salary ● **PF (Provident Fund deduction)** = 12% of basic salary ● **Gross Monthly Salary** = Basic + HRA + DA ● **Net Monthly Salary** = Gross Salary – PF ● **Annual Net Salary** = Net Monthly Salary × 12			

	1.3	**Developing Conversion Utilities**: Develop any converter, such as Rupees to dollars, temperature converter, inch to feet, etc.			
2	**Control Structures, Branching and Loops** if-else, if-else if, switch, loops (for, while and do-while), Branching Statements - Break, Continue, return		CO1	BL3	2
	2.1	Given an integer, , perform the following conditional actions: ● If is odd, print Weird ● If is even and in the inclusive range of to , print Not Weird ● If is even and in the inclusive range of to , print Weird ● If is even and greater than , print Not Weird (https://www.hackerrank.com/challenges/java-if-else/problem)			
	2.2	Write a Java program that accepts the **student's name**, **roll number**, and **marks in five subjects**, each out of 100. The program should **validate** that all entered marks are between 0 and 100. Calculate **total marks** (sum of all subjects), **Average marks and Percentage.** Assign an appropriate **grade** based on the average marks and add a **remark** based on the grade.			
	2.3	**Print number pattern using loops.** Use nested loops to generate a triangle number pattern, applying conditional checks.			
	2.4	**Test your Learning:** **Java Loops:** Read integer N (2–20) and print its first ten multiples. (https://www.hackerrank.com/challenges/java-loops-i/problem)			
3	**Classes & Objects: Class, object, data members, member functions**		CO2	BL3	2
	3.1	Write a Java program to create a Bank Account Simulator with BankAccount class with the attributes: account_number and balance. The program should: Create an object of BankAccount, Set account number and initial balance using setter methods or direct assignment. Accept a series of operations (deposit or withdraw) and apply them and Display the final balance after all operations.			
4	**Constructors– Types of Constructors, Constructor Overloading static members and functions, Method Overloading**				
			CO2	BL3	2

	4.1	Write a Java program that calculates the **area of 2D shapes** and the **volume of 3D shapes** using **method overloading**. The program should **include the 2D Shapes** like Circle, Rectangle, Square, Triangle, **3D Shapes like** Sphere, Cylinder, Cuboid, Cube			
	4.2	Create a Student class to demonstrate **constructor overloading** by allowing the creation of student objects using **different initialization formats**. The program should include **Student Class Fields like** rollNumber, name, department.			
	4.3	Write a program that demonstrates use of Static member and static functions.			
5	**Array, Strings, String Buffer**		CO3	BL3	2
	5.1	Write a program that demonstrates the use of various methods available in String class.			
	5.2	Write a program that demonstrates the use of various methods available in StringBuffer class.			
	5.3	Write a program to find the Maximum Element in an Integer Array			
6	**Internal Assessment -I & Submission**				
7	**Inheritance:Types, Method overriding , super and final keyword**		CO4	BL3	2
	7.1	Create a Java program to demonstrate **inheritance** by designing an Employee superclass and a Manager subclass. The program should include the appropriate methods to demonstrate the inheritance hierarchy.			
	7.2	Write a Java program to create a Vehicle class with a method showSpeed() that displays the default speed of a generic vehicle. Create a Car subclass that **overrides** this method to show specific speed. Then, extend Car with a SportsCar class that further overrides showSpeed() and uses the super keyword to invoke both the Car and Vehicle implementations of showSpeed().			
8	**Abstract Classes & Interfaces– Abstract class and methods and Interfaces**		CO4	BL3	2

	8.1	Write a program that declares an abstract class Shape that implements the Drawable method and also includes a field String color and an abstract method calculateArea(). Implements two subclasses: Circle → stores radius, overrides both methods Rectangle → stores length and breadth, overrides both methods In the main() method: Use polymorphism to refer to Shape references and call overridden methods			
	8.2	Write a Java program that defines a Payment interface with: void processPayment(double amount) ● Implements 'this' interface in two classes: 1. CreditCardPayment with additional fields: cardNumber, cardHolderName, cvv 2. UPIPayment with additional fields: upiId, mobileNumber ● Use validation where necessary (e.g., CVV must be 3 digits, UPI ID must contain '@') ● In main() method: Accept details from user Display confirmation messages			
9	**Packages in java : User defined packages, Access specifiers**		CO2	BL3	2
	9.1	Write a Java program that demonstrates the concept of user-defined packages and the use of all four access specifiers (**private, default, protected, public**) through appropriate class and method structures.			
10	**Exception Handling – Types of Exception, built-in Exceptions, try-catch, custom exception (throw and throws), finally**		CO5	BL3	2
	10.1	Write a Java program to perform the division of two numbers. The program should: ● Use try-catch to handle ArithmeticException (divide by zero) ● Use a try-catch to handle invalid inputs (InputMismatchException) ● Use a finally block to print a message that runs regardless of exception ● Loop until the user provides valid input and a successful division occurs			
	10.2	Write a Java program that: ● Defines a custom checked exception class InvalidAgeException			

		• Throws InvalidAgeException if the age is less than 18 • Catches the exception and displays an appropriate error message • Uses a loop to retry input until valid age is entered • Displays a success message on valid age entry			
11	**Thread lifecycle, thread class methods, creating threads**		CO5	BL3	2
	11.1	Write a Java program to demonstrate the concept of **multithreading** using both approaches: 1. **Extending the Thread class**, 2. **Implementing the Runnable interface**. The program should show how multiple threads can run concurrently and independently, and how to control their execution using thread methods.			
12	**GUI Programming – JavaFX basics, layout managers, Event handling, JDBC connectivity**		CO6	BL3	2
	12.1	**Write a JavaFX program to build a basic calculator GUI that performs simple arithmetic operations:** Addition, Subtraction, Multiplication, and Division. Use ActionListener to detect button clicks and perform calculations. Handle invalid input (e.g., non-numeric entries) using try-catch and display appropriate error messages. For division, include zero-check to avoid divide-by-zero errors			
	12.2	Write a Java program using JavaFX to create a login form with Backend connectivity using JDBC			
13	**Internal Assessment -II & Submission**				
14		**Assignment** **Building a Database-Driven GUI (JavaFX + JDBC)** (https://www.codeproject.com/Articles/1197811/JavaFX-JDBC-Application) Build a complete GUI-based application integrating OOP, file handling, and event handling and database connectivity.	CO6	BL5	2

Text Books :	
1	Herbert Schildt, Java: The Complete Reference, McGraw Hill
2	E. Balagurusamy, Programming with Java, McGraw Hill
3	Cay S. Horstmann, Core Java Volume I – Fundamentals, Pearson
4	Kathy Sierra & Bert Bates, Head First Java, O'Reilly
Reference Books :	
1	Oracle Java Documentation – https://docs.oracle.com/javase/
2	JavaTpoint Java Tutorial – https://www.javatpoint.com/java-tutorial
3	GeeksforGeeks Java Guide – https://www.geeksforgeeks.org/java/
4	W3Schools Java Tutorial – https://www.w3schools.com/java/

Hardware & Networking Lab

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CAIVSL202	Hardware & Networking Lab	0	0	2	0	0	1	1

Examination Scheme					
Continuous Internal Assessment (CIA)					External
IPE	Exp	Activity	Att	Total	Prac & Oral
15	05	03	02	25	25

IPE: Internal Practical Evaluation (15)

Two (02) internal practical exams of 15 marks each as per below syllabus. The average of 02 exam marks would be considered as IPE.

Exp: Experiments (05)
Performance: 03; On Time: 01; Viva: 01

Activity: [Assignment/Model/Mini Project] (03)
Minimum Two (02) of the above assessment tools each of 03 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Att: Attendance (02)
As per the rubric provided by the Attendance committee.

Prerequisite:	
Course Objectives: The course will enable students to:	
1	Understand the components and functioning of computer hardware.
2	Learn the assembly and troubleshooting of computer systems.
3	Gain practical knowledge of basic networking concepts and devices.
4	Configure, maintain, and troubleshoot computer networks.

5	Understand the basics of IP addressing, subnetting, and LAN setup.
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	**Use** and **demonstrate** internal components of a computer system.
CO2	**Apply** skills to assemble a computer system and install operating systems and necessary drivers for functional setup.
CO3	**Analyze** common hardware issues and determine appropriate troubleshooting steps to resolve them effectively.
CO4	**Analyze** the functions of various network components and determine appropriate cable connections to establish an effective network setup.
CO5	**Apply** skills to configure and troubleshoot basic LAN connections and router settings for effective network communication.
CO6	**Apply** virtualization concepts by setting up virtual machine configurations & basic firewall settings.

Week No.	Detailed Contents		CO Mapped	BL	Hrs
1	**1. Demonstration of PC Components and System Reassembly Techniques**		**CO1**	BL3	2
	1.1	Use various PC components such as the motherboard, RAM, HDD, SMPS, and ports, and to demonstrate the proper procedure for dismantling and reassembling a computer system.			
2	**2. Operating System Installation: Windows and Linux via Bootable USB**		**CO2**	BL3	2
	2.1	Perform the installation of Windows and Linux (Ubuntu/CentOS) operating systems by creating a bootable USB, configuring BIOS/UEFI settings, and exploring boot sequence options.			
3	**3. Identification and Diagnosis of Hardware Issues Using System Monitoring Tools**		**CO3**	BL4	2

	3.1	Differentiate hardware issues in RAM, SMPS, and display systems by utilizing diagnostic tools such as CPU-Z, HWMonitor, and CrystalDiskInfo.			
4	**4. Peripheral Device Installation and Configuration: Printers, Scanners, and Ethernet Crimping Techniques**		**CO3**	BL4	2
	4.1	Examine the installation and configuration processes of printers and scanners, and analyze the crimping methods for Ethernet cables (straight-through and cross-over) using RJ-45 connectors.			
5	**5. Networking Device Configuration and IP Address Management**		**CO4**	BL4	2
	5.1	Analyze networking configurations by connecting devices such as hubs, switches, routers, and access points, and examine the assignment of static and dynamic IP addresses with correct subnet masks and gateway settings to ensure effective device communication.			
6	**A1**	**Assignment 1 (10 marks) - Quiz (Hardware based)**			2
7	**6. Peer-to-Peer LAN Configuration and Communication Analysis**		**CO5**	BL4	2
	6.1	Differentiate the components and configuration steps involved in setting up and testing a Peer-to-Peer LAN to understand communication between connected devices.			
8	**7. Network Troubleshooting and File Sharing Using Command-Line Tools and LAN Permissions**		**CO5**	BL3	2
	7.1	Demonstrate the ability to test and troubleshoot network connectivity using commands like ping, ipconfig, tracert, and netstat, and configure file and folder sharing over a LAN with appropriate permissions			
9	**8. Wi-Fi Router Setup and Configuration with Secure Wireless Access Controls**		**CO6**	BL3	2
	8.1	Apply network configuration skills by setting up and configuring Wi-Fi routers, ensuring secure wireless network access through appropriate security settings.			

10	**9. Operating System Installation on Virtual Machines Using VirtualBox/VMware**		**CO6**	BL3	2
	9.1	Execute the installation of an operating system using VirtualBox or VMware to apply the fundamental concepts of virtual machines and virtualization.			
11	**10. Firewall Configuration and Internet Connectivity Troubleshooting for Network Security**		**CO6**	BL3	2
	10.1	Implement basic firewall settings and perform internet troubleshooting to achieve secure and stable network connectivity.			
12	**A2**	**Assignment 2 (10 marks) - Quiz (Networking based)**			**2**
13		**Assignment & TW Submission**			**2**

Textbooks:	
1	"Computer Hardware and Networking", Govindarajalu, Tata McGraw-Hill
2	"Data Communication and Networking", Behrouz A. Forouzan, McGraw-Hill Education
3	"A+ Guide to Hardware: Managing, Maintaining and Troubleshooting", Jean Andrews, Cengage Learning
4	"A+ Guide to Managing and Maintaining Your PC", Michael Meyers, McGraw-Hill
Reference Books:	
1	"Networking All-in-One For Dummies", Doug Lowe, Wiley
2	"The Complete PC Upgrade and Maintenance Guide", Mark Minasi, Sybex
3	"Practical Guide to Computer Hardware & Networking", Rajiv Mathur, Laxmi Publications
4	"Virtualization Essentials", Matthew Portnoy, Wiley

Liberal Learning II (Social Sciences & Community Services)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
25CC201	Liberal Learning II (Social Sciences & Community Services) LL-II	0	2	0	0	2	0	2

Examination Scheme				
Continuous Internal Assessment (CIA)				External
Activity	Test	Att	Total	Prac & Oral
30	10	10	50	-

Activity: [Assignment / Model / Mini Project/Mind Map / Peer Presentation / Role Play / Skit/ Storytelling or Short Film/ Poster Making or Infographic / Short Documentary] (30)

Minimum Two (02) of the above assessment tools each of 30 marks have to be conducted, covering the course outcomes. The average marks would be considered.

Test [Presentation / Open Book Test/Class Test/Multiple Choice Questions] (10)

Minimum Two (02) of the above mentioned tests each of 05 marks have to be conducted to ensure coverage of all Course Outcomes. The average marks would be considered.

Att: Attendance (10)

As per the rubric provided by the Attendance committee.

Course Objectives: The course will enable students to:	
1	Understanding knowledge from a range of disciplines
2	Connecting knowledge to other knowledge, ideas, and experiences
3	Constructing knowledge
4	Relating knowledge to daily life
5	Critical thinking

6	Reflective thinking, Effective reasoning, Creativity
Course Outcomes (COs): At the end of the course, students will be able to:	
CO1	Communicate effectively verbally and in writing by selecting proper content, tone, and demeanor for the situation (L3)
CO2	Demonstration effective use of technology for personal and professional activities, including electronic communication and information resources (L3)
CO3	Develop and actively pursue personal, academic and professional goals (L5)
CO4	Seek guidance and assistance as needed to achieve academic success, maintain good academic standing and progress toward a degree (L4)
CO5	Manage personal affairs by demonstrating empathy toward others, caring for one's self and seeking assistance as needed (L5)
CO6	Demonstrate professionalism toward peers, faculty, staff, employers and other members of the College community through social etiquette, effective communication and restraint (L5)

Week No.	**Detailed Contents**		**Hrs**
1to 4	**1. Nature and Care Activities:**		**8**
	1.1.1	Poster making/competition to spread Environmental Awareness	
	1.1.2	Best out of waste: article writing/model/ competition	
	1.1.3	Quiz on Environmental Awareness	
	1.1.4	Environment, pollution, solutions, recycling, etc: Essay writing/ competition	
5 to 14	**2. Community Service Activities**		**20**
	2.1	One Day Special Camp in village: Survey in the village, problem identification, etc	
	2.2	Conducting awareness programs on Health-related issues such as general health, mental health, spiritual health, HIV/AIDS, etc for students/community	
	2.3	Women empowerment programmes	

	2.4	Conducting consumer awareness programme	
	2.5	Arranging different camps such as blood donation, eye donation, etc	
	2.6	Celebrating state/national/international days and report writing on it	

Note: Faculty has liberty to take/conduct some other activities (such as disaster management, tree plantation, Swacchata Abhiyan, civil defence etc) than that mentioned above.

Textbooks:	
1	TEXTBOOK OF NATIONAL SERVICE SCHEME AND YOUTH; Vidya Kutir Publications.
2	NSS 1 & 2 (National Service Scheme), Nirali Prakashan
3	National Service Scheme (NSS), Himalaya Pbl house
Reference Books:	
1	National Service Scheme Manual (Revised) 2006
2	NSS and Youth Development, Dr. Sunita Agrawalla, Mahavir Pub.
3	National Service Scheme: A Youth Volunteers Programme for Under Graduate Students as Per UGC Guidelines, Amit Kumar Jain, Brijesh Kumar Rathi Panwar D S, Daya Publishing House.