Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY

SCHEME AND SYLLABUS

For I and II Semester

Academic Year 2025-26

Dr. Ambedkar Institute of Technology, Bangalore

(An Autonomous Institution, Affiliated to Visvesvaraya Technological University, Belagavi, Aided by Govt. of Karnataka, Approved by All India Council for Technical Education (AICTE), New Delhi)

Outer Ring Road, Mallathahalli, Bengaluru - 560 056

Engineering Science Courses (ESC)				
23	1BEST104A/204A	Building Sciences and Mechanics	Students will study the course (ESC) other than course not belonging to their stream	94-97
24	1BEST104B/204B	Introduction to Electrical Engineering		98-99
25	1BEST104C/204C	Introduction to Electronics & Communication Engineering		100-101
26	1BEST104D/204D	Introduction to Mechanical Engineering		102-105
27	1BEST104E/204E	Essentials of Information Technology		106-108
Programming Language Courses (PLC)				
28	1BPLU105A	Introduction to C (For none IT programes)	CV, ME, IEM, AE, EEE, ECE, ETE, EIE, , VLSI	109-111
29	1BPLU105B	Python Programming (For CSE and allied programmes)	CSE, ISE, CSBS, AIML, Data Science	112-115
Programme Specific Courses (PSC)				
30	1BCVT105/205	Engineering Mechanics	CV	116-120
31	1BEET105/205	Basics of Electrical Engineering	EEE	121-123
32	1BECT105/205	Fundamentals of Electronics & Communication Engineering	ECE, ETE, EIE, VLSI	124-126
33	1BMET105/205	Elements of Mechanical Engineering	ME	127-130
34	1BITT105/205	Programming in C	CSE, ISE, CSBS, AIML, Data Science	131-133
Program-Specific Course Lab (PSC-Lab)				
35	1BCVL106	Mechanics and Materials Lab	CV	134-139
36	1BITL106	C Programming Lab	CSE, ISE, CSBS, AIML, Data Science	140-143
37	1BEEL206	Basic Electrical Engineering Lab	EEE	144-145
38	1BECL206	Fundamentals of Electronics & Communication Engineering Lab	ECE	146-148
39	1BMEL206	Elements of Mechanical Engineering Lab	ME, IEM, AE	149-153
Humanities & Social Science Courses				
40	1BENGL106	Communication Skills	Common to all Programmes	154-156
41	1BICT107	Indian Constitution & Engineering Ethics		157-159
42	1BKST108/ 208 1BKBT108/208	Samskrutika Kannada / Balake Kannada		160-164
43	1BSST110	Soft Skills		165-167
Ability Enhancement Courses				
44	1BIDL108/208	Innovation and Design Thinking Lab	Common to all Programmes	168-170
Mandatory Courses				
45	1BCDN109	Career Development Skill – I	Common to all Programmes	171-172
46	1BCDN209	Career Development Skill – II		173-174

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System (CBCS
B.E. Name of the programme: ----------
Scheme of Teaching and Examination effective from the Academic Year 2025 - 26

I Semester **BRANCH: CV, CSE, CSBS, ISE, AIML, DS (Data Science)** **(Physic Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	1BMAU101x	Applied Mathematics -I (Stream Specific)	Maths Dept.	2	2	2		03	50	50	100	04
2	ASC(IC)	1BPHU102x	Applied Physics (Stream Specific)	PHY Dept	2	2	2		03	50	50	100	04
3	ESC	1BCED103x	Computer-Aided Engineering Drawing (Stream Specific)	ME Dept	2	0	2		03	50	50	100	03
4	ESC	1BEST104x	Engineering Science Courses-I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	1BXXT105x	Programme Specific Course	Respective Engg dept	3	0	0		03	50	50	100	03
6	PSC	1BXXL106	Program-Specific Course Lab	Respective Engg Dept	0	0	2		02	50	50	100	01
7	AEC/SDC	1BIDL107	Innovation and Design Thinking Lab (**Project-based learning)**	Respective Dept	0	0	2		02	50	50	100	01
8	HSMS	1BKST108/ 1BKBT108	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
9	NCMC	1BCDN109	Career Development Skill -I	Placement Cell	2	0	0		---	50	---	---	PP/NP
10	AEC (NCMC)	1BSST110	Soft Skills	Humanities Dept	1	0	0		-	100	---	100	PP/NP
				TOTAL	16	02	08		20	550	400	**900**	**20**
11	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semester)				Compulsory requirement for the award of a degree								

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System (CBCS
B.E. Name of the programme: ----------
Scheme of Teaching and Examination effective from the Academic Year 2025 - 26

I Semester **BRANCH: ECE, EEE, ETE, EIE, ME, AE, IEM** **(Chemistry Group)**

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Mark	
					L	T	P	S					
1	ASC(IC)	1BMAU101x	Applied Mathematics-I (Stream Specific)	Maths Dept	2	2	2		03	50	50	100	04
2	ASC(IC)	1BCHU102x	Applied Chemistry (Stream Specific)	CHE Dept	2	2	2		03	50	50	100	04
3	ETC	1BAIT103	Introduction to AI and Applications	Any Dept	3	0	0		03	50	50	100	03
4	ESC	1BEST104x	Engineering Science Course I	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	1BPLU105x	Programming Language Course	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	1BENGL106	Communication Skills	Humanities Dept	1	0	1		02	50	50	100	01
7	AEC (NCMC)	1BICT107	Indian Constitution & Engineering Ethics	Humanities Dept	1	0	0		--	100	--	100	PP/NP
8	AEC/SDC	1BIDL108	Innovation and Design Thinking Lab (Project-based learning)	Any Dept	0	0	2		02	50	50	100	01
9	MC	1BCDN109	Career Development Skill –I	Placement Cell	2	0	0		---	50	---	---	PP/NP
	TOTAL				17	02	07		20	500	350	800	20
9	**AICTE Activity Points** (students have to earn **100** activity points between 01 to 08 semesters)				Compulsory requirement for the award of a degree								

Applied Mathematics-I					Applied Physics				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMAU101A	Differential Calculus And Linear Algebra: CV Stream	2	2	2	1BPHU102A	Physics for Sustainable Structural Systems (CV stream)	2	2	2
1BMAU101B	Calculus and Linear Algebra: CSE Stream	2	2	2	1BPHU102B	Quantum Physics and Applications (CSE stream)	2	2	2
1BMAU101C	Differential Calculus and Linear Algebra: ME Stream	2	2	2	1BPHU102C	Physics of Materials (Mech stream)	2	2	2
1BMAU101D	Differential Calculus And Linear Algebra: EEE stream	2	2	2	1BPHU102D	Quantum Physics and Electronic Sensors (ECE , EIE, ETE)	2	2	2
					1BPHU102E	Electrical Engineering Materials (EEE)	2	2	2
Computer-Aided Engineering Drawing					**Engineering Science Courses-I(ESC-I)**				
1BCED103A	Computer-Aided Engineering Drawing for CV Stream	2	0	2	1BEST104A	Building Sciences and Mechanics	3	0	0
1BCED103B	Computer-Aided Engineering Drawing for CSE stream	2	0	2	1BEST104B	Introduction to Electrical Engineering	3	0	0
1BCED103C	Computer-Aided Engineering Drawing for ME stream	2	0	2	1BEST104C	Introduction to Electronics & Communication Engineering	3	0	0
1BCED103D	Computer-Aided Engineering Drawing for ECE stream	2	0	2	1BEST104D	Introduction to Mechanical Engineering	3	0	0
1BCED103E	Computer-Aided Engineering Drawing for EEE stream (only for EEE students)				1BEST104E	Essentials of Information Technology	3	0	0
Programme Specific Courses (PSC)					**Program-Specific Course Lab (PSCL)**				
1BCVT105	Engineering Mechanics	3	0	0	1BCVL106	Mechanics and Materials Lab	0	0	2
1BEET105	Basics of Electrical Engineering	3	0	0	1BEEL106	Basic Electrical Engineering Lab	0	0	2
1BECT105	Fundamentals of Electronics & Communication Engineering	3	0	0	1BECL106	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BMET105	Elements of Mechanical Engineering	3	0	0	1BMEL106	Elements of Mechanical Engineering Lab	0	0	2
1BITT105	Programming in C	3	0	0	1BITL106	C Programming Lab	0	0	2

Applied Mathematics-I					**Applied Chemistry**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMAU101A	Differential Calculus and Linear Algebra: CV Stream	2	2	2	1BCHU102A	Applied Chemistry for Metal Protection and Sustainable Energy (ME stream)	2	2	2
1BMAU101B	Calculus And Linear Algebra: CSE stream	2	2	2	1BCHU102B	Applied Chemistry for Futuristic Devices (EEE stream)	2	2	2
1BMAU101C	Differential Calculus and Linear Algebra: ME Stream	2	2	2	1BCHU102C	Applied Chemistry for Sustainable Built Environment (CV)	2	2	2
1BMAU101D	Differential Calculus and Linear Algebra; EEE stream	2	2	2	1BCHU102D	Applied Chemistry for Smart Systems (CSE stream)	2	2	2
Engineering Science Courses-I (ESC-I)					**Programming Language Courses (PLC)**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BEST104A	Building Sciences and Mechanics	3	0	0	1BPLU105A	Introduction to C (For none IT programmes)	3	0	2
1BEST104B	Introduction to Electrical Engineering	3	0	0	1BPLU105B	Python Programming (for CSE and allied programmes)	3	0	2
1BEST104C	Introduction to Electronics and Communication Engineering	3	0	0					
1BEST104D	Introduction to Mechanical Engineering	3	0	0					
1BEST104E	Essentials of Information Technology	3	0	0					

Scheme of Teaching and Examinations (2025)
Outcome-Based Education (OBE)and Choice-Based Credit System (CBCS) (Effective from the academic year 2025-26)

II Semester

BRANCH: CV, CSE, CSBS, ISE, AIML, DS (Data Science)

(For the students who have studied Physics group in I semester)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC	1BMAU201x	Applied Mathematics -II (Stream Specific)	Maths Dept	2	2	2		03	50	50	100	04
2	ASC(IC)	1BCHU202x	Applied Chemistry (Stream Specific)	CHE Dept	2	2	2		03	50	50	100	04
3	ETC	1BAIT203	Introduction to AI and Applications	Any Dept	3	0	0		03	50	50	100	03
4	ESC	1BEST204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PLC(IC)	1BPLU205x	Programming Language Course	CSE & allied Dept	3	0	2		03	50	50	100	04
6	AEC	1BENGL206	Communication Skills	Humanities Dept	1	0	1		02	50	50	100	01
7	AEC (NCMC)	1BICT207	Indian Constitution & Engineering Ethics	Humanities Dept	1	0	0		01	100	0	100	PP/NP
8	AEC/SDC	1BPRJ208	Interdisciplinary Project-Based Learning	Respective Dept (Multiple Dept)	0	0	0	2	02	50	50	100	01
9	MC	1BCDN209	Career Development Skill -II	Placement Cell	2	0	0		---	50	---	---	PP/NP
TOTAL					17	02	05	02	20	500	350	800	20

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Outcome Based Education(OBE) and Choice Based Credit System (CBCS
B.E. Name of the programme:----------
Scheme of Teaching and Examination effective from the Academic Year 2025 - 26

II Semester

BRANCH: ECE, EEE, ETE, EIE, ME, AE, IEM

(For the students who have studied the Chemistry group in I semester)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	SAAE	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	1BMAU201x	Applied Mathematics -II (Stream Specific)	Maths Dept	2	2	2		03	50	50	100	04
2	ASC(IC)	1BCHU202x	Applied Physics (Stream Specific)	PHY Dept	2	2	2		03	50	50	100	04
3	ESC	1BCED203x	Computer-Aided Engineering Drawing (Stream Specific)	ME dept	2	0	2		03	50	50	100	03
4	ESC	1BEST204x	Engineering Science Course-II	Respective Engg Dept	3	0	0		03	50	50	100	03
5	PSC	1BXXT205x	Programme Specific Courses	Respective Engg Dept	3	0	0		03	50	50	100	03
6	PSC/ESC	1BXXL206	Program-Specific Course Lab	Respective dept	0	0	2		02	50	50	100	01
7	AEC/SDC	1BPRJ207	Interdisciplinary Project-Based Learning	Combination of Departments	0	0	0	02	02	50	50	100	01
8	HSMC	1BKST208/ 1BKBT208	Samskrutika Kannada/ Balake Kannada	Humanities Dept	1	0	0		01	50	50	100	01
9	MC	1BCDN209	Career Development Skill -II	Placement Cell	2	0	0		---	50	---	---	PP/NP
10	AEC (NCMC)	1BSST210	Soft Skills	Humanities Dept	1	0	0		--	100	---	100	PP/NP
				TOTAL	**16**	**02**	**06**		**21**	**550**	**400**	**900**	**20**

Applied Mathematics-II					Applied Chemistry				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMAU201A	Differential Calculus and Numerical Methods: CV Stream	2	2	2	1BCHU202A	Applied Chemistry for Metal Protection and Sustainable Energy (ME stream)	2	2	2
1BMAU201B	Numerical Methods: CSE Stream	2	2	2	1BCHU202B	Applied Chemistry for Futuristic Devices (EEE stream)	2	2	2
1BMAU201C	Multivariable Calculus and Numerical Methods: ME Stream	2	2	2	1BCHU202C	Applied Chemistry for Sustainable Built Environment (CV)	2	2	2
1BMAU201D	Calculus, Laplace Transform And Numerical Techniques: EEE stream	2	2	2	1BCHU202D	Applied Chemistry for Smart Systems (CSE stream)	2	2	2
Engineering Sciences Courses II(ESC-II)					**Programming Language Courses (PLC)**				
1BEST204A	Building Sciences and Mechanics	3	0	0	1BPLU205A	Introduction to C Programming (for non-IT programmes)	3	0	2
1BEST204B	Introduction to Electrical Engineering	3	0	0	1BPLU205B	Python Programming (For CSE and allied programmes)	3	0	2
1BEST204C	Introduction to Electronics & Communication Engineering	3	0	0					
1BEST204D	Introduction to Mechanical Engineering	3	0	0					
1BEST204E	Essentials of Information Technology	3	0	0					

Applied Mathematics-II					**Applied Physics**				
Code	**Title**	**L**	**T**	**P**	**Code**	**Title**	**L**	**T**	**P**
1BMAU201A	Differential Calculus and Numerical Methods: CV stream	2	2	2	1BPHU202A	Physics for Sustainable Structural Systems (CV stream)	2	2	2
1BMAU201B	Numerical Methods: CSE Stream	2	2	2	1BPHU202B	Quantum Physics and Applications (CSE stream)	2	2	2
1BMAU201C	Multivariable Calculus and Numerical Methods: ME stream	2	2	2	1BPHU202C	Physics of Materials (ME stream)	2	2	2
1BMAU201D	Calculus, Laplace Transform, and Numerical Techniques: EEE stream	2	2	2	1BPHU202D	Quantum Physics and Electronic Sensors (ECE , EIE, ETE)	2	2	2
					1BPHU202E	Electrical Engineering Materials (EEE)	2	2	2
Programme Specific Courses (PSC)					**Programme Specific Courses Lab (PSCL)**				
1BCVT205	Engineering Mechanics	3	0	0	1BCVL206	Mechanics and Materials Lab	0	0	2
1BEET205	Basics of Electrical Engineering	3	0	0	1BEEL206	Basic Electrical Engineering Lab	0	0	2
1BECT205	Fundamentals of Electronics & Communication Engineering	3	0	0	1BECL206	Fundamentals of Electronics & Communication Engineering Lab	0	0	2
1BMET205	Elements of Mechanical Engineering	3	0	0	1BMEL206	Elements of Mechanical Engineering Lab	0	0	2
1BITT205	Programming in C	3	0	0	1BITL206	C Programming Lab	0	0	2
Engineering Science Courses-II (ESC-II)					**Computer-Aided Engineering Drawing**				
1BEST204A	Building Sciences and Mechanics	3	0	0	**Code**	**Title**	**L**	**T**	**P**
1BEST204B	Introduction to Electrical Engineering	3	0	0	1BCED203A	Computer-Aided Engineering Drawing for CV Stream	2	0	2
1BEST204C	Introduction to Electronics & Communication Engineering	3	0	0	1BCED203B	Computer-Aided Engineering Drawing for CSE stream	2	0	2
1BEST204D	Introduction to Mechanical Engineering	3	0	0	1BCED203C	Computer-Aided Engineering Drawing for ME stream	2	0	2
1BEST204E	Essentials of Information Technology	3	0	0	1BCED203D	Computer-Aided Engineering Drawing for ECE stream	2	0	2
					1BCED203E	Computer-Aided Engineering Drawing for EEE stream (only for EEE students)	2	0	2

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: I

Course Title	**Mathematics-I for Civil Engineering Stream (Differential Calculus, Differential Equations and Linear Algebra)**							
Course Code	**MAU101A**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of differential calculus, linear algebra and differential equations to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Differential Calculus** **Introduction to polar coordinates and curvature relating to Civil Engineering.** Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two polar curves. Pedal equations. Curvature and Radius of curvature- Cartesian, parametric and pedal forms (without proof). **Self-study:** Centre and circle of curvature, evolutes and involutes. **Applications:** Tracing of curves: Cartesian – cissoid, polar – cardioid. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Series Expansion and Multivariable Calculus** **Introduction to series expansion and partial differentiation in the field of Civil Engineering.** Taylor's and Maclaurin's series expansion for one variable (without proof). Partial differentiation, Euler's theorem, total derivative, composite and implicit functions. Jacobian. **Self-study:** Extended Euler's theorem and problems, Method of Lagrange's undetermined multipliers with single constraint. **Applications:** Maxima and minima for a function of two variables. **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Ordinary Differential Equations-I** **Introduction to ordinary differential equations pertaining to the applications for Civil Engineering.** Exact and reducible to exact differential equations. Higher order linear differential equations with constant coefficient- homogeneous and non-homogeneous, inverse differential operator: e^{ax}, $\sin(ax+b)$ or $\cos(ax+b)$, x^m. **Self-Study:** First order linear and Bernoulli's differential equations. **Applications:** Orthogonal trajectories. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Ordinary Differential Equations-II** **Introduction to higher ordinary differential equations pertaining to the applications for Civil Engineering**. Non-homogeneous differential equations – Method of variation of parameters, Cauchy's and Legendre's differential equations. Simultaneous differential equations. **Self-Study:** Method of undetermined multiplier for second order equations. **Applications:** Transmission lines. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Linear Algebra** **Introduction of linear algebra related to Civil Engineering.** Elementary row operation of a matrix, echelon form, rank of a matrix. Consistency, solution of system of linear equations: Gauss elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. **Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method, eigenvalues and eigenvectors-properties. **Applications:** To find the largest eigenvalue using Rayleigh's power method. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO2	**Analyze** the solution of linear ordinary differential equations and rank of the matrix.
CO3	**Make use of** the concept of differential equations, series expansion to solve domain related problems
CO4	**Understand** the concept of matrix theory for solving the system of linear equations, eigenvalues and eigenvectors.
CO5	**Develop** the modern mathematical tool-wxMAXIMA, the concept of derivatives to find extreme values, Jacobian, Orthogonal trajectories.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011

REFERENCE BOOKS

1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.

Weblinks and Video Lectures(e-Resources):

1. http://nptel.ac.in/courses.php? Discipline ID=111
2. http://www.class-central.com/subject/math (MOOCs)
3. http://academic earth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

List of Laboratory experiments (2 hours/week per batch/batch strength 15): 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
1	Analyzing standard 2D curves in polar, parametric and Cartesian forms. Also determining the point of intersection, nature of tangent and angle between polar curves.
2	Evaluation of bending of curves and nature at a given point on it.
3	Determination of flow of a multivariable function along the given direction and also identify the independence of given multivariable functions.
4	Determination of the optimal values of unconstrained function of atmost two variables.
5	Determination of the primitive of first order differential equations.
6	Solution of higher order ordinary differential equations.
7	Identifying the nature of given set of lines or planes using rank method.
8	Finding all the eigenvalues of a square matrix of order upto four using Rayleigh power method.
9	Solution of second order ordinary differential equations the method of variation of parameter.
10	Solution of simultaneous differential equations arises in circuit theory.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	2	3										
CO3	3	2										
CO4	2	3										
CO5	1	1	2		2							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: I

Course Title	**Mathematics-I for Computer Science and Engineering Stream (Differential Calculus, Differential Equations and Linear Algebra)**							
Course Code	**MAU101B**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of differential calculus, linear algebra, modular arithmetic and differential equations to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Differential Calculus** **Introduction to polar coordinates and curvature relating to Computer Science and Engineering.** Polar coordinates, polar curves, angle between the radius vector and the tangent, angle between two polar curves. Pedal equations. Curvature and Radius of curvature-Cartesian, parametric and pedal forms (without proof). **Self-study:** Centre and circle of curvature, evolutes and involutes. **Applications:** Tracing of curves: Cartesian – cissoid and polar – cardioid. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Series Expansion and Multivariable Calculus** **Introduction of series expansion and partial differentiation in the field of Computer Science and Engineering.** Taylor's and Maclaurin's series expansion of one variable (without proof). Partial differentiation, Euler's theorem, total derivative, composite and implicit functions. Jacobian. **Self-study:** Extended Euler's theorem. Method of Lagrange's undetermined multipliers with single constraint. **Applications:** Maxima and minima for a function of two variables. **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Ordinary Differential Equations (ODEs)** **Introduction to ordinary differential equations pertaining to the applications for Computer Science and Engineering.** Exact and reducible to exact differential equations. Higher order linear differential equations with constant coefficient - homogeneous and non-homogeneous, inverse differential operator: e^{ax}, $\sin(ax+b)$ or $\cos(ax+b)$, x^m. **Self-Study:** First order linear and Bernoulli's differential equations. **Applications:** Orthogonal trajectories. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Linear Algebra** **Introduction of linear algebra related to Computer Science and Engineering.** Elementary row operation of a matrix, echelon form, rank of a matrix. Consistency, solution of system of linear equations: Gauss elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. **Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method, eigenvalues and eigenvectors-properties. **Applications:** To find the largest eigenvalue using Rayleigh's power method. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Modular Arithmetic** **Introduction of modular arithmetic and its applications in Computer Science and Engineering.** Introduction to congruences, linear Diophantine equations, basic properties of congruences, linear congruences, system of linear congruences – remainder theorem, Fermat's little theorem, Wilson's theorem (without proof). **Self-Study:** GCD, Division algorithm, Euler's Theorem. **Applications:** Applications of congruence's – RSA algorithm. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO2	**Analyze** the solution of linear ordinary differential equations and rank of the matrix.
CO3	**Make use of** the concept of series expansion, modular arithmetic, differential equations to solve domain related problems.
CO4	**Understand** the concept of matrix theory for solving the system of linear equations, eigenvalues and eigenvectors.
CO5	**Develop** the modern mathematical tool-wxMAXIMA, the concept of derivatives to find extreme values, Jacobian, Orthogonal trajectories.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B.S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons,10th Ed. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011.
4. David M Burton**,** Elementary Number Theory, McGraw Hill, 7th Ed., 2010.

REFERENCE BOOKS

1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017.
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press,3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics,McGraw Hill Book Co.,New York, 6th Ed., 2017.
4. H.K.Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S.Chand Publication, 3rd Ed., 2014.
5. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
6. Gareth Williams, Linear Algebra with applications, Jones Bartlett Publishers Inc., 6th Ed., 2017.
7. William Stallings, Cryptography and Network Security, Pearson Prentice Hall, 6thEd., 2013.

Weblinks and VideoLectures (e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academic earth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

List of Laboratory experiments (2 hours/week per batch/batch strength 15): 10 lab sessions + 1 repetition class + 1 Lab Assessment.	
1	Analyzing standard 2Dcurves in polar, parametric and Cartesian forms. Also determining the point of intersection, nature of tangent and angle between polar curves.
2	Evaluation of bending of curves and nature at a given point on it.
3	Determination of flow of a multivariable function along the given direction and also identify the Independence of given multivariable functions.
4	Determination of the optimal values of unconstrained function of atmost two variables.
5	Determine the primitive of first order differential equations.
6	Solution of higher order ordinary differential equations.
7	Identifying the nature of given set of lines or planes using rank method.
8	Finding all the eigenvalues of a square matrix of order upto four using Rayleigh power method.
9	Solution of linear congruence's, Diophantine equations, second order ordinary differential equations by variation of parameter.
10	System of linear congruence's using chariness remainder theorem.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	2	3										
CO3	2	2										
CO4	2	3										
CO5	1	1	2		2							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: I

Course Title	**Mathematics-I for Mechanical Engineering Stream (Differential Calculus, Differential Equations and Linear Algebra)**							
Course Code	**MAU101C**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of differential calculus, linear algebra and differential equations to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Differential Calculus** **Introduction to polar coordinates and curvature relating to Mechanical Engineering.** Polar coordinates, polar curves, angle between the radius vector and the tangent, angle between two polar curves. Pedal equations. Curvature and Radius of curvature – Cartesian, parametric and pedal forms (without proof). **Self-study:** Centre and circle of curvature, evolutes and involutes. **Applications:** Tracing of curves: Cartesian – cissoid, polar – cardioid. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Series Expansion and Multivariable Calculus** **Introduction of series expansion and partial differentiation in the field of Mechanical Engineering.** Taylor's and Maclaurin's series expansion of one variable (without proof). Partial differentiation, Euler's theorem, total derivative, composite and implicit functions. Jacobian. **Self-study:** Extended Euler's theorem. Method of Lagrange's undetermined multipliers with single constraint. **Applications:** Maxima and minima for a function of two variables. **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Ordinary Differential Equations-I** **Introduction to ordinary differential equations pertaining to the applications for Mechanical Engineering.** Exact and reducible to exact differential equations. Higher order linear differential equations with constant coefficient- homogeneous and non-homogeneous, inverse differential operator: e^{ax}, $\sin(ax+b)$ or $\cos(ax+b)$, x^m. **Self-Study:** First order linear and Bernoulli's differential equations. **Applications:** Orthogonal trajectories. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Ordinary Differential Equations-II** **Introduction to Ordinary differential equations pertaining to the applications for Mechanical Engineering.** Non-homogeneous differential equations - Method of variation of parameters, Cauchy's and Legendre's differential equations, simultaneous linear differential equations. **Self-study:** Method of undetermined coefficient. **Applications:** Oscillation of a spring. **(RBT Levels: L1, L2, L3 and L4)**		
V	**Linear Algebra** **Introduction of linear algebra related to Mechanical Engineering.** Elementary row operation of a matrix, echelon form, rank of a matrix. Consistency, solution of system of linear equations: Gauss elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. **Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method, eigenvalues and eigenvectors-properties. **Applications:** To find the largest eigenvalue using Rayleigh's power method. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves and learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO2	**Analyze** the solution of linear ordinary differential equations and rank of the matrix.
CO3	**Make use of** the concept of series expansion, differential equations to solve domain related problems.
CO4	**Understand** the concept of matrix theory for solving the system of linear equations, eigenvalues and eigenvectors.
CO5	**Develop** the modern mathematical tool-wxMAXIMA, the concept of derivatives to find extreme values, Jacobian, Orthogonal trajectories.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons,10thEd.(Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011.

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1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education,11thEd., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.

Weblinks and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program

List of Laboratory experiments (2hours/week per batch/batch strength 15): 10 lab sessions + 1 repetition class + 1 Lab Assessment.	
1	Analyzing standard 2D curves in polar, parametric and Cartesian forms. Also determining the point of intersection, nature of tangent and angle between polar curves.
2	Evaluation of bending of curves and nature at a given point on it.
3	Determination of flow of a multivariable function along the given direction and also identify the independence of given multivariable functions.
4	Determination of the optimal values of unconstrained function of atmost two variables.
5	Determine the primitive of first order differential equations.
6	Solution of higher order ordinary differential equations.
7	Identifying the nature of given set of lines or planes using rank method.
8	Finding all the eigenvalues of a square matrix of order upto four using Rayleigh power method.
9	Solution of second order ordinary differential equations by variation of parameter.
10	Solution of simultaneous differential equations arises in circuit theory.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	2	3										
CO3	2	2										
CO4	2	3										
CO5	1	1	2		2							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: I

Course Title	**Mathematics-I for Electrical and Electronics Engineering Stream (Differential Calculus, Differential Equations and Linear Algebra)**							
Course Code	**MAU101D**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of differential calculus, linear algebra, multiple integrals and differential equations to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Differential Calculus** **Introduction to polar coordinates and curvature relating to Electrical and Electronics Engineering.** Polar coordinates, polar curves, angle between the radius vector and the tangent, angle between two polar curves. Pedal equations. Curvature and Radius of curvature - cartesian, parametric and pedal forms (without proof). **Self-study:** Derivative of arc length, envelope. **Applications:** Tracing of curves: Cartesian – cissoid, polar – cardioid. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Series Expansion and Multivariable Calculus** **Introduction of series expansion and partial differentiation in the field of Electrical and Electronics Engineering.** Taylor's and Maclaurin's series expansion of one variable (without proof). Partial differentiation, Euler's theorem, total derivative, composite and implicit functions. Jacobian. **Self-study:** Extended Euler's theorem. Method of Lagrange's undetermined multipliers with single constraint. **Applications:** Maxima and minima for a function of two variables. **(RBT Levels: L1, L2, L3 and L4)**	04	04
III	**Ordinary Differential Equations (ODEs)** **Introduction to ordinary differential equations pertaining to the applications for Electrical and Electronics Engineering.** Exact and reducible to exact differential equations. Higher order linear differential equations with constant coefficients-	04	04

	homogeneous and non-homogeneous, inverse differential operator: e^{ax}, $\sin(ax+b)$ or $\cos(ax+b)$, x^m. **Self-Study:** Linear and Bernoulli's differential equations**.** **Applications:** Orthogonal trajectories. **(RBT Levels: L1, L2, L3 and L4)**		
IV	**Linear Algebra** **Introduction of linear algebra related to Electrical and Electronics Engineering.** Elementary row operation of a matrix, echelon form, rank of a matrix. Consistency, solution of system of linear equations: Gauss elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. **Self-Study:** Solution of system of equations by Gauss-Jacobi iterative method, eigenvalues and eigenvectors – properties. **Applications:** To find the largest eigenvalue using Rayleigh power method. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Integral Calculus** **Introduction to Integral Calculus in Electrical and Electronics Engineering.** **Multiple Integrals:** Evaluation of double and triple integrals, evaluation of double integrals over the region, change of order of integration and changing into polar coordinates. **Beta and Gamma functions:** Definitions, properties, relation between Beta and Gamma functions. **Self-Study:** Center of gravity, volume by double integrals. **Applications:** Area by double integral and volume by triple integral. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Apply** the knowledge of calculus to solve problems related to polar curves, multiple integrals and learn the notion of partial differentiation to compute rate of change of multivariate functions.
CO2	**Analyze** the solution of linear ordinary differential equations, rank of the matrix.
CO3	**Make use of** the concept of series expansion, differential equations, multiple integrals to solve domain related problems.
CO4	**Understand** the concept of matrix theory for solving the system of linear equations, eigenvalues and eigenvectors and improper integrals.
CO5	**Develop** the modern mathematical tool-wxMAXIMA, the concept of derivatives to find extreme values, Jacobian, Orthogonal trajectories.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pears on Publications, 4ED., 2011.

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1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017.
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.

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2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program
6. https://www.wolfram.com/customer-stories/designing-hearing-aid-parts-with-mathematica.html
7. https://www.youtubeeducation.com/watch?v=3d6DsjIBzJ4

List of Laboratory experiments (2 hours/week per batch/batch strength 15) 10 lab sessions +1 repetition class + 1 Lab Assessment	
1	Analyzing standard 2D curves in polar, parametric and Cartesian forms. Also determining the point of intersection, nature of tangent and angle between polar curves.
2	Evaluation of bending of curves and nature at a given point on it.
3	Determination of flow of a multivariable function along the given direction and also identify the independence of given multivariable functions.
4	Determination of the optimal values of unconstrained function of atmost two variables.
5	Determine the primitive of first order differential equations
6	Solution of higher order ordinary differential equations.
7	Identifying the nature of given set of lines or planes using rank method.
8	Finding all the eigenvalues of a square matrix of order upto four using Rayleigh power method.
9	Evaluation of triple integrations, finding average values and centroid.
10	Evaluation of gamma and beta functions.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	2	3										
CO3	2	2										
CO4	2	3										
CO5	1	1	2		2							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: II

Course Title	**Mathematics-II for Civil Engineering Stream (Integral Calculus, Partial Differential Equations and Numerical methods)**							
Course Code	**MAU201A**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of integral calculus, vector calculus, partial differential equations and numerical techniques to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Introduction to Integral Calculus in the field of Civil Engineering.** **Multiple Integrals:** Evaluation of double and triple integrals. Evaluation of double integrals over the region, change of order of integration and changing into polar coordinates. **Beta and Gamma functions**: Definitions, properties, relation between Beta and Gamma functions. **Self-Study**: Center of gravity, volume by double integration, duplication formula. **Applications:** Area by double integration and volume by triple integration. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Vector Calculus** **Introduction to Vector Calculus in the field of Civil Engineering.** **Vector Differentiation**: Scalar and vector fields, gradient, directional derivative, curl and divergence, solenoidal and irrotational vector fields. **Vector Integration**: Line integrals, Green's theorem (without proof). **Self-Study**: velocity and acceleration. **Applications:** Surface integrals, Stoke's theorem (without proof). **(RBT Levels: L1, L2, L3 and L4)**	04	04
III	**Introduction to Partial Differential Equations in the field of Civil Engineering**. **Partial Differential Equations:** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solution of non-homogeneous partial differential equations by direct integration. Solution of homogeneous partial differential equations involving derivative with respect to one independent variable only, method of separation of variables. **Self-Study**: Lagrange linear partial differential equations.	04	04

	Applications: Solution of one-dimensional heat equation and wave equation by the method of separation of variables. **(RBT Levels: L1, L2, L3 and L4)**		
IV	**Numerical methods-1** **Importance of Numerical methods in the field of Civil Engineering.** **Solution of algebraic and transcendental equations:** Regula-falsi method, Newton-Raphson method and Ramanujan's method (without proof). **Interpolation:** Finite differences, Interpolation formula - Newton-Gregory forward and backward formulae, Gauss forward and backward formula, Newton's divided difference formula (without proof). **Self-Study:** Bisection method, Lagrange's interpolation. **Applications:** Estimation of input of an experiment for a known output by inverse interpolation. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Numerical methods-2** **Introduction to various numerical techniques pertaining to Civil Engineering application:** **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule and Weddle's rule (without proof). **Numerical Solution of Ordinary Differential Equations:** Solutions of first order and first-degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (without proof). **Self-Study**: Picard's method, Euler's method, Adam-Bashforth method. **Applications:** Solutions to ordinary differential equations related to Civil Engineering problems. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to

CO1	**Apply** the knowledge of multiple integrals to compute area and volume, vector differential operator to evaluate gradient, divergence, curl and numerical differences to evaluate interpolation problems.
CO2	**Understand** the knowledge of formation of partial differential equations, vector calculus refers to solenoidal, irrotational vectors and improper integrals.
CO3	**Demonstrate** the various methods of solution of partial differential equations, numerical methods to solve algebraic and transcendental equations.
CO4	**Analyze** the concept of multiple integrals, improper integrals, vector differentiation and vector integration to solve relevant problems.
CO5	**Develop** the skill of programming using the mathematical tool- wxMAXIMA, the concept of numerical methods to estimate the polynomial of best fit, to find approximate solution of initial value problem, numerical differentiation and integration.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons,10th Ed. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011.
4. Wei-Chau Xie, Differential Equations for Engineers, Cambridge University Press, 1st ED., 2010.

REFERENCE BOOKS

1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S.Chand Publication, 3rd Ed., 2014.

Weblinks and Video Lectures (e-Resources):

1. http://www.nptel.ac.in
2. https://en.wikipedia.org
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program
6. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php

List of Laboratory experiments (2 hours/week per batch/batch strength 15): 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
1	Evaluation of multiple integrals and application to determine area, volume and surface area of standard objects.
2	Evaluation of Gamma and Beta functions.
3	Vector differential operator applied on scalar and vector point functions and its application problems.
4	Verification of Green's theorem.
5	Solution of one-dimensional heat equation and wave equation.
6	Solution of algebraic and transcendental equations by Regula-falsi and Newton-Raphson method.
7	Interpolation/Extrapolation using Newton's forward and backward difference formula.
8	Application of quadrature formula.
9	Solution of linear first order ordinary differential equations by Modified Euler's method.
10	Solution of linear first order ordinary differential equations by Runge-Kutta IV order and Milne's predictor-corrector methods.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	2	3										
CO3	2	2										
CO4	2	3										
CO5	1	1	2		2							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: II

Course Title	**Mathematics-II for Computer Science and Engineering Stream (Integral Calculus, Vectors calculus, Numerical methods and Vector spaces)**							
Course Code	**MAU201B**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of integral calculus, vector calculus, vector spaces and numerical techniques to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Integral Calculus** **Introduction to Integral Calculus in the field of Computer Science and Engineering.** **Multiple Integrals:** Evaluation of double and triple integrals. Evaluation of double integrals over the region, change of order of integration and changing into polar coordinates. **Beta and Gamma functions**: Definitions, properties, relation between Beta and Gamma functions. **Self-Study**: Center of gravity, volume by double integration, duplication formula. **Applications:** Area by double integration and volume by triple integration. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Vector Calculus** **Introduction to Vector Calculus in the field of Computer Science and Engineering.** **Vector Differentiation**: Scalar and vector fields, gradient, directional derivative, curl and divergence, solenoidal and irrotational vector fields. **Curvilinear coordinates:** Scale factors, base vectors, cylindrical polar coordinates, spherical polar coordinates, transformation between Cartesian and curvilinear systems, orthogonally. **Self-Study:** Expressions of curl, divergence and gradient in orthogonal curvilinear coordinates. **Applications:**Velocity and acceleration. **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Vector Space and Linear Transformations** **Importance of Vector Space and Linear Transformations in the field of Computer Science and Engineering.** **Vector Spaces:** Definition and examples, subspace, linear span, linearly dependent and independent sets. Basis and dimension (without proof). **Linear transformations:** Definition and examples, Matrix of a linear transformation. **Self-study:** Rank and nullity of a linear operator, rank-nullity theorem. **Applications:** Projection, rotation, reflection, contraction and expansion. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Numerical methods-1** **Importance of numerical methods for discrete data in the field of Computer Science and Engineering.** **Solution of algebraic and transcendental equations:** Regula-falsi method, Newton-Raphson method and Ramanujan's method (without proof). **Interpolation:** Finite differences, Interpolation formula - Newton-Gregory forward and backward formulae, Gauss forward and backward formula, Newton's divided difference formula (without proof). **Self-Study:** Bisection method, Lagrange's interpolation. **Applications:** Estimation of input of an experiment for a known output by inverse interpolation. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Numerical methods-2** **Introduction to various numerical techniques for handling Computer Science and Engineering applications.** **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule and Weddle's rule (without proof). **Numerical Solution of Ordinary Differential Equations:** Solutions of first order and first-degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (without proof). **Self-Study**: Picard's method, Euler's method, Adam-Bashforth method. **Applications:** Solutions to ordinary differential equations related to Computer Science and Engineering problems. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply** the knowledge of multiple integrals to compute area and volume, vector differential operator to evaluate gradient, divergence, curl and numerical differences to evaluate interpolation problems.
CO2	**Understand** the knowledge of vector calculus refer to solenoidal and irrotational vectors, orthogonal curvilinear coordinates and improper integrals.
CO3	**Demonstrate** the idea of sub space, linearly dependent sets, linear transformation of vector space, numerical methods to solve algebraic and transcendental equations.
CO4	**Analyze** the concept of multiple integrals, improper integrals, vector differentiation to solve relevant problems.
CO5	**Develop** the skill of programming using the mathematical tool- wxMAXIMA, the concept of numerical methods to estimate the polynomial of best fit, to find approximate solution of initial value problem, numerical differentiation and integration.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons, 10th Ed. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011
4. David M Burton, Elementary Number Theory, McGraw Hill, 7thEd., 2010.
5. Kenneth Hoffman and Ray Kunze, Linear Algebra, Person 2ED., 2016.

REFERENCE BOOKS

1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11th Ed., 2017.
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett**,** Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.
5. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
6. Gareth Williams, Linear Algebra with applications, Jones Bartlett Publishers Inc.,6th Ed., 2017.
7. William Stallings, Cryptography and Network Security, Pearson Prentice Hall, 6th Ed., 2013.

Weblinks and Video Lectures (e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program
6. https://www.youtube.com/watch?v=TjIrEYWlonE
7. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php

List of Laboratory experiments (2 hours/week per batch/batch strength 15): 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
1	Evaluation of multiple integrals and application to determine area, volume and surface area of standard objects.
2	Evaluation of Gamma and Beta functions.
3	Vector differential operator applied on scalar and vector point functions and its application problems.
4	Verification of Vector identities.
5	Solution of algebraic and transcendental equations by Regula-falsi and Newton-Raphson method.
6	Interpolation using Newton's forward, backward difference formula and central difference formula.
7	Application of quadrature formula.
8	Solution of linear first order ordinary differential equations by Modified Euler's method.
9	Solution of linear first order ordinary differential equations by Runge-Kutta IV order and Milne's predictor-corrector methods.
10	Testing independence of vectors, computation of basis and dimension a vector space.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	1			3							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: II

Course Title	**Mathematics-II for Mechanical Engineering Stream (Integral Calculus, Partial Differential Equations and Numerical methods)**							
Course Code	**MAU201C**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of integral calculus, vector calculus, partial differential equations and numerical techniques to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Introduction to Integral Calculus in the field of Mechanical Engineering.** **Multiple Integrals:** Evaluation of double and triple integrals. Evaluation of double integrals over the region, change of order of integration and changing into polar coordinates. **Beta and Gamma functions**: Definitions, properties, relation between Beta and Gamma functions. **Self-Study**: Center of gravity, volume by double integration, duplication formula. **Applications:** Area by double integration and volume by triple integration. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Vector Calculus** **Introduction to Vector Calculus in the field of Mechanical Engineering.** **Vector Differentiation**: Scalar and vector fields, gradient, directional derivative, curl and divergence, solenoidal and irrotational vector fields. **Vector Integration**: Line integrals, Green's theorem (without proof). **Self-Study**: velocity and acceleration. **Applications:** Surface integrals, Stoke's theorem (without proof). **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Introduction to Partial Differential Equations in the field of Mechanical Engineering**. **Partial Differential Equations:** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions. Solution of non-homogeneous partial differential equations by direct integration. Solution of homogeneous partial differential equations involving derivative with respect to one independent variable only, method of separation of variables. **Self-Study**: Lagrange linear partial differential equations. **Applications: S**olution of one-dimensional heat equation and wave equation by the method of separation of variables. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Numerical methods-1** **Importance of Numerical methods for discrete data in the field of Mechanical Engineering.** **Solution of algebraic and transcendental equations:** Regula-falsi method, Newton-Raphson method and Ramanujan's method (without proof). **Interpolation:** Finite differences, Interpolation formula - Newton-Gregory forward and backward formulae, Gauss forward and backward formula, Newton's divided difference formula (without proof). **Self-Study:** Bisection method, Lagrange's interpolation. **Applications:** Estimation of input of an experiment for a known output by inverse interpolation. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Numerical methods-2** **Introduction to various numerical techniques for handling Mechanical Engineering application:** **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule and Weddle's rule (without proof). **Numerical Solution of Ordinary Differential Equations:** Solutions of first order and first degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge-Kutta method of IV order and Milne's predictor-corrector formula (without proof). **Self-Study**: Picard's method, Euler's method, Adam-Bashforth method. **Applications:** Solutions to ordinary differential equations related to Mechanical Engineering problems. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply** the knowledge of multiple integrals to compute area and volume, vector differential operator to evaluate gradient, divergence, curl and numerical differences to evaluate interpolation problems.
CO2	**Understand** the knowledge of formation of partial differential equations, vector calculus refers to solenoidal, irrotational vectors and improper integrals.
CO3	**Demonstrate** the various methods of solution of partial differential equations, numerical methods to solve algebraic and transcendental equations.
CO4	**Analyze** the concept of multiple integrals, improper integrals, vector differentiation and vector integration to solve relevant problems.
CO5	**Develop** the skill of programming using the mathematical tool- wxMAXIMA, the concept of numerical methods to estimate the polynomial of best fit, to find approximate solution of initial value problem, numerical differentiation and integration.

TEACHING-LEARNING PROCESS: Chalk and Talk, PowerPoint presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons,10thEd. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications, 4ED., 2011

REFERENCE BOOKS

1. B. V. Ramana Higher Engineering Mathematics, McGraw–Hill Education,11th Ed., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. C. Ray Wylie, Louis C. Barrett, Advanced Engineering Mathematics, McGraw Hill Book Co.,New York, 6th Ed., 2017.
4. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.

Weblinks and Video Lectures(e-Resources):

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program
6. https://www.youtube.com/watch?v=TjIrEYWlonE
7. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php

List of Laboratory experiments (2 hours/week per batch/batch strength 15): 10 lab sessions+ 1 repetition class+ 1 Lab Assessment.	
1	Evaluation of multiple integrals and application to determine area, volume and surface area of standard objects.
2	Evaluation of Gamma and Beta functions.
3	Vector differential operator applied on scalar and vector point functions and its application problems.
4	Verification of Green's theorem.
5	Solution of one-dimensional heat equation and wave equation.
6	Solution of algebraic and transcendental equations by Regula-falsi and Newton-Raphson Method.
7	Interpolation using Newton's forward, backward difference formula and central difference formula.
8	Application of quadrature formulae.
9	Solution of linear first order ordinary differential equations by Modified Euler's method.
10	Solution of linear first order ordinary differential equations by Runge-Kutta IV order and Milne's predictor-corrector methods.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	1			3							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Mathematics
Scheme and Syllabus 2025 - 26

Semester: II

Course Title	**Mathematics-II for Electrical and Electronics Engineering Stream (Laplace transforms, Vectors, Numerical methods and Vector spaces)**							
Course Code	**MAU201D**							
Category	**ASC (Applied Science Course)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	02	02	02	00	04	40	20	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**			

COURSE LEARNING OBJECTIVES

This course is proposed to impart to the students the skills of employing the basic tools of Laplace transform, vector calculus, vector spaces and numerical techniques to solve basic and complex engineering problems with related applications.

Unit	Syllabus content	No. of hours	
		Theory	Tutorial
I	**Laplace Transform** **Importance of Laplace Transform for Electrical and Electronics Engineering.** **Laplace Transforms:** Definition of Laplace transform, transform of elementary functions, Properties–linearity, scaling, first shifting property, multiplication by t^n, division by t. Laplace transform of the derivative and the integral, Laplace transform of periodic functions and Heaviside unit step function. (All properties without proof). **Inverse Laplace Transforms:** Definition, evaluation using partial fraction method, convolution theorem (without proof). **Self-Study:** Verification of convolution theorem. **Applications:** Applications to solve ordinary differential equations. **(RBT Levels: L1, L2, L3 and L4)**	04	04
II	**Vector Calculus** **Introduction to Vector Calculus in the field of Electrical and Electronics Engineering.** **Vector Differentiation**: Scalar and vector fields, gradient, directional derivative, curl and divergence, solenoidal and irrotational vector fields. **Vector Integration**: Line integrals, Green's theorem (without proof). **Self-Study**: Velocity and acceleration. **Applications:** Surface integrals, Stokes' theorem (without proof). **(RBT Levels: L1, L2, L3 and L4)**	04	04

III	**Vector Space and Linear Transformations** **Importance of Vector Space and Linear Transformations in the field of Electrical and Electronics Engineering.** **Vector Spaces:** Definition and examples, subspace, linear span, linearly dependent and independent sets. Basis and dimension (without proof). **Linear transformations:** Definition and examples, Matrix of a linear transformation. **Self-study:** Rank and nullity of a linear operator, rank-nullity theorem. **Applications:** Projection, rotation, reflection, contraction and expansion. **(RBT Levels: L1, L2, L3 and L4)**	04	04
IV	**Numerical methods-1** **Importance of numerical methods for discrete data in the field of Electrical and Electronics Engineering.** **Solution of algebraic and transcendental equations:** Regula-falsi method, Newton-Raphson method and Ramanujan's method (without proof). **Interpolation:** Finite differences, Interpolation formula - Newton-Gregory forward and backward formulae, Gauss forward and backward formula, Newton's divided difference formula (without proof). **Self-Study:** Bisection method, Lagrange's interpolation. **Applications:** Estimation of input of an experiment for a known output by inverse interpolation. **(RBT Levels: L1, L2, L3 and L4)**	04	04
V	**Numerical methods-2** **Introduction to various numerical techniques for Electrical and Electronics Engineering.** **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule and Weddle's rule (without proof). **Numerical Solution of Ordinary Differential Equations:** Solutions of first order and first degree ordinary differential equations – Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (without proof). **Self-Study**: Picard's method, Euler's method, Adam-Bashforth method. **Applications:** Solutions to ordinary differential equations related to Electrical and Electronics Engineering problems. **(RBT Levels: L1, L2, L3 and L4)**	04	04

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	**Apply** the knowledge of Laplace transform to solve differential equations, vector differential operator to evaluate gradient, divergence, curl and numerical differences to evaluate interpolation problems.
CO2	**Understand** the knowledge of vector calculus refer to solenoidal, irrotational vectors and numerical differences to evaluate interpolation problems.
CO3	**Demonstrate** the idea of sub space, linearly dependent sets, linear transformation of vector space, numerical methods to solve algebraic and transcendental equations.
CO4	**Analyze** the concept of Laplace transforms, vector differentiation and vector integration to solve relevant problems.
CO5	**Develop** the skill of programming using the mathematical tool- wxMAXIMA, the concept of numerical methods to estimate the polynomial of best fit, to find approximate solution of initial value problem, numerical differentiation and integration.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. B. S. Grewal, Higher Engineering Mathematics (44th Edition 2018), Khanna Publishers, New Delhi.
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley and sons,10thEd. (Reprint) 2016.
3. Glyn James, Advanced modern Engineering Mathematics, Pearson Publications,4thED., 2011
4. Peter O'Neil, Advanced Engineering Mathematics, Cengage learning,7th ed., 2012.
5. Kenneth Hoffman and Ray Kunze, Linear Algebra, Person 2ED., 2016.

REFERENCE BOOKS

1. B. V. Ramana, Higher Engineering Mathematics, McGraw–Hill Education, 11thEd., 2017
2. Srimanta Pal & Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 3rd Ed., 2016.
3. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
4. C. Ray Wylie, Louis C. Barrett, Advanced Engineering Mathematics, McGraw Hill Book Co., New York, 6th Ed., 2017.
5. H.K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014.

Weblinks and Video Lectures(e-Resources)

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU e-Shikshana Program
5. VTU EDUSAT Program
6. https://www.youtube.com/watch?v=TjIrEYWlonE
7. http://mcatutorials.com/mca-tutorials-numerical-methods-tutorial.php
8. http://nitttrc.edu.in/nptel/courses/video/108106171/108106171.html

List of Laboratory experiments (2 hours/week per batch/batch strength 15) 10 lab sessions +1 repetition class + 1 Lab Assessment	
1	Computing Laplace transform and inverse Laplace transform of standard function.
2	Laplace transform of convolution of two functions.
3	Vector differential operator applied on scalar and vector point functions and its application problems.
4	Verification of Green's theorem.
5	Solution of algebraic and transcendental equations by Regula-falsi and Newton-Raphson method.
6	Interpolation using Newton's forward, backward difference formula and central difference formula.
7	Application of quadrature formula.
8	Solution of linear first order ordinary differential equations by Modified Euler's method.
9	Solution of linear first order ordinary differential equations by Runge-Kutta IV order and Milne's predictor-corrector methods.
10	Testing independence of vectors, computation of basis and dimension a vector space.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1										
CO2	3	2										
CO3	2	3										
CO4	3	2										
CO5	2	1			3							
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Physics

Scheme and Syllabus-2025-2026

Course Title	**Applied Physics: Physics for Sustainable Structural Systems (CV Stream)**						
Course Code	**1BPHU102A**						
Category	Applied Science Course (ASC) (Integrated Course)						
Scheme and Credits	No. of Hours / Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02		06	40+10-12labs	04
CIEMarks:50	**SEEMarks:50**		**Total Max. marks =100**		**Duration of SEE:03Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of oscillations, Waves and their role in structural behavior, Acoustics, Radiometry and Photometry, Smart Materials for Sustainable Structures with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease

UNIT I

Oscillations: Simple harmonic motion (SHM), Differential equation for SHM, Theory of free vibrations, theory of damped vibration types of damping (Graphical Approach). Engineering applications of damped oscillations, theory of forced vibrations, Resonance: condition for resonance, sharpness of resonance. Resonance in LCR Circuits (Qualitative), Numerical Problems.	**8 Hrs**

UNIT II

Elasticity: Review Stress-Strain Curve, Hooke's law and its limits. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. Torsion: Expression for couple per unit twist of Cylindrical wire (derivation). Torsional Pendulum: Expression for time period of oscillation and Rigidity modulus (Derivation), Beams, Bending of beams: neutral surface and neutral axis. Expression for bending moment beam (derivation), Cantilever, Expression for depression in loaded cantilever (Derivation): Applications of beams In Engineering. Numerical problems.	**8 Hrs**

UNIT III

Waves and their role in structural behavior:	**8 Hrs**

Types of waves, Wave propagation in beams, rods, and slabs, Boundary effects, Wave dispersion, Damping in structures, Energy dissipation techniques in structures, Introduction to earthquakes, General characteristics, P-waves, S-waves, Love waves, and Rayleigh waves, Ground motion and structural response, Site effects and soil-structure interaction, Physics of earthquakes, Richter scale of measurement and earthquake-resistant measures, Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to with stand tsunami), Seismometer and Seismograph.	
UNIT IV	
Acoustics, Radiometry and Photometry: Acoustics: Introduction to Acoustics, Types of Acoustics, Reverberation and reverberation time, Absorption power and Absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (Qualitative), Measurement of absorption coefficient, Factors affecting the acoustics and remedial measures, Sound insulation and its measurements. Noise and its measurements, Impact of noise in multi-storied buildings. **Radiometry and Photometry:** Radiation quantities, Spectral quantities, Relation between luminance and Radiant quantities, Reflectance and Transmittance, Photometry (cosine law and inverse square law).	**8 Hrs**
UNITV	
Smart Materials for Sustainable Structures: Types of smart materials, Piezo, Magnetostrictive, Electro strictive, Electro-rheological, Magneto-rheological, Shape memory alloys, Phase transformation in shape memory alloys, Overview of sensor technology, uses of sensors in intelligent structures, Classification of sensors, Temperature sensor, Vibration Sensor, Strain Gauge sensors, Basic concepts of structural health monitoring.	**8 Hrs**
Experimental Components	
Any Ten Experiments have to be completed from the list of experiments	
1 Series & Parallel LCR Circuits 2 Determination of Fermi energy of a copper 3 Wavelength of LASER using Grating	

4	Numerical Aperture using optical fiber
5	Charging and Discharging of a Capacitor
6	Energy Gap of the given Semiconductor
7	Planck's constant using LEDs.
8	Transistor Characteristics
9	Zener Diode Characteristics
10	Radius of curvature of Plano convex lens using Newton's rings
11	GNU Step Interactive Simulations
12	Study of Electrical quantities using spreadsheet
13	Online Circuit Simulator Online Circuit Simulator (https://www.partsim.com/simulator)
14	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

At the end of the course, the student will be able to:

1. Analyze the behavior of simple harmonic, free, damped, and forced oscillatory systems in mechanical and electrical contexts.
2. Apply the concepts of stress, strain, and elastic moduli to evaluate the elastic behavior of solids under various loading conditions.
3. Evaluate wave propagation and structural response to dynamic loads such as earthquakes and blasts, incorporating modern mitigation strategies and smart materials.
4. Apply the principles of acoustics, radiometry, and photometry to design and evaluate systems for sound, light, and radiation measurements.
5. Assess the properties and applications of smart materials to enhance the performance and sustainability of engineering systems.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025
2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
3. Dynamics of Structures - Theory and Applications to Earthquake Engineering Anil K. Chopra, University of California at Berkeley, Fourth Edition. Prentice Hall
4. Smart Materials in Structural Health Monitoring, Control and Biomechanics, Suresh Bhalla (IIT Delhi), C. K. Soh, Yaowen Yang, Springer.

Reference books / Manuals:

1. Vibrations and Waves, A P French, MIT introductory Physics, 2003.
2. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002,
3. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018.
4. Introduction to Seismology, Earthquakes, and Earth Structure, Stein, Seth, and Michael Wysession. Blackwell Publishing, 2003.
5. Photometry Radiometry and Measurements of Optical Losses, Micheal Bukshtab, Springer, 2nd edition.
6. Engineering Physics, S Mani Naidu, Pearson,2025
7. Building Science: Lighting and Accoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.,
8. Lagoudas, D. C. Shape Memory Alloys: Modeling and Engineering Applications. Springer, 2008. ISBN: 978-0-387-47684-1.
9. Holnicki-Szulc, J., & Rodellar, J. (Eds.). Smart Structures: Requirements and Potential Applications in Mechanical and Civil Engineering. Springer, 1999. ISBN: 978-0-7923-5612-7.

SCHEMEFOREXAMINATIONS

1) Two full questions to be set from each unit with internal choice
   - Minimum number of subquestions:2
   - Maximum number of subquestions:3
2) Each full question shall be for a maximum of 20marks
3) Answer any Five full questions choosing at least One full question from each unit

Note:1. Questions from Experiments shall be included in the SEE question paper

2. Questions from Self-study component will not be asked for CIE and

Level-3: Highly Mapped, Level-2: Moderately Mapped, Level-1: Low Mapped

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**
CO2	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**
CO3	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**
CO4	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**
CO5	**3**	**2**	-	-	-	-	-	-	-	-	-	**2**

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Physics

Scheme and Syllabus-2025-2026

Course Title	**Quantum Physics And Applications (CSE stream)**						
Course Code	**1BPHU102B**						
Category	Applied Science Course (ASC) (Integrated Course)						
Scheme and Credits	No. of Hours / Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02		06	40+10-12labs	04
CIEMarks:50	**SEEMarks:50**		**Total Max. marks =100**		**Duration of SEE:03Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of Quantum Mechanics, Electrical Properties of Metals and Semiconductors, Superconductivity, Photonics with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

UNIT I

Quantum Mechanics: de Broglie hypothesis, Heisenberg's uncertainty principle and its application (Broadening of Spectral Lines), principle of complementarity, wave function, time independent Schrödinger wave equation (Derivation), physical significance of a wave function and Born Interpretation, expectation value and its physical significance, Eigen functions and Eigen values, Particle inside one dimensional infinite potential well, role of higher dimensions (Qualitative), Wave function and probability densities for n=1, 2 and 3. Quantum tunneling, Numerical Problems.	**8 Hrs**

UNIT II

Electrical Properties of Metals and Semiconductors: Assumptions and failures of classical free electron theory, mechanisms of electron scattering in solids, Matheissen's rule, assumptions of Quantum free electron theory, density of states (Qualitative), Fermi Dirac statistics, Fermi Energy, variation of Fermi factor with temperature and energy, expression for carrier concentration: derivation of electron and hole concentrations in an intrinsic semiconductor, Fermi level for intrinsic (derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems	**8 Hrs**

UNIT III	
Superconductivity: Zero resistance state, persitent current, Meissner effect, critical temperature, critical current (Silsbee Effect). Formation of Cooper pairs - BCS Theory (Qualitative) Limitations of BCS theory, high temperature superconductors, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair Tunneling (Andreev reflection), Josephson junction, Flux quantization, SQUID (DC), Numerical Problems.	**8 Hrs**
UNIT IV	
Photonics: Interaction of radiation with matter– Einstein's A and B coefficients, prerequisites for lasing actions, types of LASER–semiconductor diode LASER, applications laser in detecting pollutants. use of attenuators for single photon sources, optical modulators Pockel's effect, Kerr effect, photo detectors – single photon Avalanche diode, Superconducting Nanowire single photon detector, optical fiber, derivation of numerical aperture, V-number, Number of modes, losses in optical fiber, Numerical problems.	**8 Hrs**
UNITV	
Quantum Computing: Moore's law - limitation of VLSI, Classical vs Quantum Computation, bit, Qubit and its properties, Bloch Sphere, Dirac notation, Brief discussion on types of qubit, Superconducting qubits, Harmonic oscillator (qualitative) – Need for anharmonicity, Charge qubit, Quantum Gates – Pauli Gates, Phase gate (S, T), Hadamard Gate, Two qubit gates –CNOT gate, Predicting the outputs of various combinations of single and two-qubit gates, Numerical Problems.	**8 Hrs**

Experimental Components
Any Ten Experiments have to be completed from the list of experiments
1 Series & Parallel LCR Circuits
2 Determination of Fermi energy of a copper
3 Wavelength of LASER using Grating
4 Numerical Aperture using optical fiber
5 Charging and Discharging of a Capacitor

6	Energy Gap of the given Semiconductor
7	Planck's constant using LEDs.
8	Transistor Characteristics
9	Zener Diode Characteristics
10	Radius of curvature of Plano convex lens using Newton's rings
11	GNU Step Interactive Simulations
12	Study of Electrical quantities using spreadsheet
13	Online Circuit Simulator Online Circuit Simulator (https://www.partsim.com/simulator)
14	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

At the end of the course, the student will be able to:

1. Explain the core concepts of quantum mechanics such as matter waves, uncertainty principle, wave functions, and quantization of energy, with relevance to computational applications.
2. Analyze the behavior of electrons in metals and semiconductors using classical and quantum models to derive key material properties such as conductivity and carrier concentration.
3. Evaluate the principles and characteristics of superconductivity, including Meissner's effect, critical parameters, and Cooper pair formation, and their relevance in quantum systems.
4. Interpret the interaction of radiation with matter and the operational principles of photonic devices such as lasers, optical fibers, modulators, and photodetectors.
5. Summarize the basic concepts of quantum computing including qubits, quantum gates, and quantum logic, and predict simple outcomes using theoretical circuit models.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018.
3. Solid State Physics, S. O. Pillai, New Age International.

4. Quantum Computing, Parag K Lala, McGraw Hill, 2020

Reference books / Manuals:

1. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education.
2. Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.
3. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
4. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books
5. LASERS and Non-Linear Optics, B B Loud, New Age International,
6. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley
7. Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information (10th Anniversary ed.). Cambridge University Press.
8. Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.
9. Solid State Physics, A J Dekker (2000), Indian Ed., Macmillan Publishers India, New Delhi.

Weblinks and Video Lectures (e-Resources):

1. **Laser:** https://**Laser:**https://nptel.ac.in/courses/115/102115102124/
2. **Quantum mechanics:** https://nptel.ac.in/courses/115/104/115104096/
3. **Physics:** http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
4. **Numerical Aperture of fiber:** https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement
5. **NPTEL Superconductivity:** https://archive.nptel.ac.in/courses/115/103/115103108/

Activity-BasedLearning(SuggestedActivitiesinClass)/Practical-BasedLearning

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
4. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5. https://virtuallabs.merlot.org/vl_physics.html
6. https://phet.colorado.edu
7. https://www.myphysicslab.com

SCHEMEFOREXAMINATIONS

1) Two full questions to be set from each unit with internal choice
   - Minimum number of subquestions:2
   - Maximum number of subquestions:3
2) Each full question shall be for a maximum of 20marks
3) Answer any Five full questions choosing at least One full question from each unit

Note:1. Questions from Experiments shall be included in the SEE question paper

2. Questions from Self-study component will not be asked for CIE and

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

Level-3: Highly Mapped, Level-2: Moderately Mapped, Level-1: Low Mapped

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Physics

Scheme and Syllabus-2025-2026

Course Title	**Physics of Materials (ME Stream)**						
Course Code	**1BPHU202C**						
Category	Applied Science Course (ASC) (Integrated Course)						
Scheme and Credits	No. of Hours / Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02		06	40+10-12labs	04
CIEMarks:50	**SEEMarks:50**		**Total Max. marks =100**		**Duration of SEE:03Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of oscillations, Elasticity, Thermoelectric materials and devices, Quantum mechanics Material Characterization and Instrumentation Techniques, Materials Properties with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

UNIT I

Oscillations: **8 Hrs**

Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations, and discuss the cases (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations with derivation, Resonance: Condition for resonance, Sharpness of resonance, Resonance in LCR circuits (Qualitative), Numerical problems.

UNIT II

Elasticity: **8 Hrs**

Review Stress-Strain Curve, Hooke's law and its limits. Elastic Moduli, Poisson's ratio, Relation between Y, n and σ (with derivation), mention relation between K, Y and σ, limiting values of Poisson's ratio. Torsion: Expression for couple per unit twist of Cylindrical wire (Derivation). Torsional Pendulum: Expression for time period of oscillation and Rigidity modulus (Derivation), Beams, Bending of beams: neutral surface and neutral axis. Expression for bending moment beam (derivation

), Cantilever, Expression for depression in loaded cantilever (Derivation): Applications of beams In Engineering. Numerical problems.	
UNIT III	
Thermoelectric materials and devices: Thermo emf and thermo current, Seebeck effect, Peltier effect, Seeback and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of $T_1$and T_2, Thermo couples, thermopile, Construction and working of thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of automobiles, Refrigerator, Space program (Radioisotope Thermoelectric Generator- RTG), Numerical Problems	**8 Hrs**
UNIT IV	
Quantum mechanics: Schrodinger equation, Interpretation of wave function, Particle in an infinite 1D potential well, Quantum confinement in 0, 1, 2 and 3 Dimension (Qualitative), Eigen values and Eigen functions, Density of states (Qualitative) . Discussion of wave functions and probability density for a particle in a box for a particle in one dimensional box. Quantum tunneling Numerical Problems.	**8 Hrs**
UNITV	
Material Characterization and Instrumentation Techniques: **Materials Properties:** Nanomaterials: Introduction to nanomaterials, surface area to volume ratio, size effects, types of nanomaterials, Synthesis: Top-Down approach- high energy Ball-milling and Bottom-Up approach- sol-gel method, Braggs formula (Derivation) **Instrumentation Techniques:** X-Ray Diffractometer (XRD), Schrerrer equation, Atomic Force Microscope (AFM), Transmission electron microscope (TEM), Scanning Electron Microscope (SEM), Numerical Problems.	**8 Hrs**
Experimental Components	
Any Ten Experiments have to be completed from the list of experiments	
1 Series & Parallel LCR Circuits 2 Determination of Fermi energy of a copper	

3	Wavelength of LASER using Grating
4	Numerical Aperture using optical fiber
5	Charging and Discharging of a Capacitor
6	Energy Gap of the given Semiconductor
7	Planck's constant using LEDs.
8	Transistor Characteristics
9	Zener Diode Characteristics
10	Radius of curvature of Plano convex lens using Newton's rings
11	GNU Step Interactive Simulations
12	Study of Electrical quantities using spreadsheet
13	Online Circuit Simulator Online Circuit Simulator (https://www.partsim.com/simulator)
14	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

At the end of the course, the student will be able to:

1. Analyze the principles of simple harmonic, damped, and forced oscillations, and apply them to solve problems involving mechanical and electrical oscillatory systems.
2. Apply the concepts of stress, strain, and elastic moduli to evaluate the elastic behavior of solids under various loading conditions.
3. Evaluate the principles of thermoelectric effects and assess the performance of thermoelectric materials and devices for energy conversion and thermal management.
4. Demonstrate an understanding of low-temperature physics, including methods of cryogen production, and analyze the applications of cryogenics in scientific and engineering contexts.
5. Explain the material characterization techniques and instrumentation to analyze the macroscopic and microscopic properties of engineering materials.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Physics, Oscillations and Waves, Optics and Quantum Mechanics, H M Agarwal and R M Agarwal, Pearson, 2025

2. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
3. A Text book of Engineering Physics by M.N. Avadhanulu, P G. Kshirsagar, S Chand, 2014, Revised Edition.
4. Quantum Computing, Parag K Lala, McGraw Hill, 2020.
5. Characterization of Materials- Mitra P.K. Prentice Hall India Learning Private Limited.

Reference books / Manuals:

1. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition.
2. Elements of Properties of Matter, D S Mathus, S Chand, Reprint 2016
3. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt.Ltd.
4. Treatise on Heat, M N Saha and B N Srivastava, 2nd Edition, Indian Press, 1935 ; Original from, the University of California,
5. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.

Activity-BasedLearning(SuggestedActivitiesinClass)/Practical-BasedLearning

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
4. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5. https://virtuallabs.merlot.org/vl_physics.html
6. https://phet.colorado.edu
7. https://www.myphysicslab.com

SCHEMEFOREXAMINATIONS

1) Two full questions to be set from each unit with internal choice
   - Minimum number of subquestions:2
   - Maximum number of subquestions:3
2) Each full question shall be for a maximum of 20marks
3) Answer any Five full questions choosing at least One full question from each unit

Note:1. Questions from Experiments shall be included in the SEE question paper

2. Questions from Self-study component will not be asked for CIE and

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	-	-	-	2

Level-3: Highly Mapped, Level-2: Moderately Mapped, Level-1: Low Mapped

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Physics

Scheme and Syllabus-2025-2026

Course Title	**Quantum Physics and Electronic Sensors (ECE stream)**						
Course Code	**1BPHU202D**						
Category	Applied Science Course (ASC) (Integrated Course)						
Scheme and Credits	No. of Hours / Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02		06	40+10-12labs	04
CIEMarks:50	**SEEMarks:50**		**Total Max. marks =100**		**Duration of SEE:03Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of Quantum Mechanics, Electrical Properties of Metals and Semiconductors Superconductivity, Photonics, Semiconductor devices and Sensors with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

UNIT I

Quantum Mechanics: de Broglie hypothesis, Heisenberg's uncertainty principle and its application (Broadening of Spectral Lines), principle of complementarity, wave function, time independent Schrödinger wave equation (Derivation), physical significance of a wave function and Born Interpretation, expectation value and its physical significance, Eigen functions and Eigen values, Particle inside one dimensional infinite potential well, role of higher dimensions (Qualitative), Wave function and probability densities for n=1, 2 and 3. Quantum tunneling, Numerical Problems.	**8 Hrs**

UNIT II

Electrical Properties of Metals and Semiconductors: Assumptions and failures of classical free electron theory, mechanisms of electron scattering in solids, Matheissen's rule, assumptions of Quantum free electron theory, density of states (Qualitative), Fermi Dirac statistics, Fermi Energy, variation of Fermi factor with temperature and energy, expression for carrier concentration:	**8 Hrs**

derivation of electron and hole concentrations in an intrinsic semiconductor, Fermi level for intrinsic (derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems	
UNIT III	
Superconductivity: Zero resistance state, persitent current, Meissner effect, critical temperature, critical current (Silsbee Effect). Formation of Cooper pairs - BCS Theory (Qualitative) Limitations of BCS theory, high temperature superconductors, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair Tunneling (Andreev reflection), Josephson junction, Flux quantization, SQUID (DC), Numerical Problems.	**8 Hrs**
UNIT IV	
Photonics: Interaction of radiation with matter– Einstein's A and B coefficients, prerequisites for lasing actions, types of LASER–semiconductor diode LASER, applications laser in detecting pollutants. use of attenuators for single photon sources, optical modulators Pockel's effect, Kerr effect, photo detectors – single photon Avalanche diode, Superconducting Nanowire single photon detector, optical fiber, derivation of numerical aperture, V-number, Number of modes, losses in optical fiber, Numerical problems.	**8 Hrs**
UNITV	
Semiconductor devices and Sensors Direct and indirect band gap, Band gap engineering, Zener Diode, LED, Photo Diode, Photo Transistor, Light dependent resistor, Resistance temperature detectors (high, medium, low), Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) sensors, Hall sensor, Superconducting Nanowire Single Photon Detector, Numerical Problems	**8 Hrs**

Experimental Components
Any Ten Experiments have to be completed from the list of experiments
1 Series & Parallel LCR Circuits
2 Determination of Fermi energy of a copper
3 Wavelength of LASER using Grating

4	Numerical Aperture using optical fiber
5	Charging and Discharging of a Capacitor
6	Energy Gap of the given Semiconductor
7	Planck's constant using LEDs.
8	Transistor Characteristics
9	Zener Diode Characteristics
10	Radius of curvature of Plano convex lens using Newton's rings
11	GNU Step Interactive Simulations
12	Study of Electrical quantities using spreadsheet
13	Online Circuit Simulator Online Circuit Simulator (https://www.partsim.com/simulator)
14	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

At the end of the course, the student will be able to:

1. Apply fundamental principles of quantum mechanics to analyze microscopic physical systems and predict quantized energy states and tunneling phenomena.
2. Analyze electrical conduction mechanisms in metals and semiconductors using classical and quantum models, and interpret carrier concentration and Fermi energy calculations.
3. valuate superconductivity phenomena including Meissner effect, Cooper pair formation, and Josephson junction behavior for advanced material applications.
4. Describe light-matter interaction, laser operations, optical modulators, and photonic devices to il-lustrate principles of photonics in sensor technologies.
5. Demonstrate the principles, characteristics, and applications of semiconductor and optical devices, sensors, and transducers used in electronic and photonic systems.

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd.
3. Solid State Physics, S. O. Pillai, New Age International

4. Basic Electronics, B L Theraja, Multi-color Edition, S Chand, 2006

Reference books / Manuals:

1. Engineering Physics, S Mani Naidu, Pearson, Fourteenth Impression, 2024.
2. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education.
3. Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.
4. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
5. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books.
6. Ghatak, A., & Thyagarajan, K. (2005). Optical Electronics. Oxford University Press.
7. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley
8. Nielsen, M. A., & Chuang, I. L. (2010). Quantum Computation and Quantum Information (10th Anniversary ed.). Cambridge University Press.
9. Solid State Physics, A J Dekker (2000), Indian Ed., Macmillan Publishers India, New Delhi.
10. Principles of Electronics, V K Mehta & Rohit Mehta, S Chand and Company, 7th Edition 2008.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
4. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5. https://virtuallabs.merlot.org/vl_physics.html
6. https://phet.colorado.edu
7. https://www.myphysicslab.com

SCHEMEFOREXAMINATIONS

1) Two full questions to be set from each unit with internal choice
   - Minimum number of subquestions:2
   - Maximum number of subquestions:3
2) Each full question shall be for a maximum of 20marks

3) Answer any Five full questions choosing at least One full question from each unit

Note:1. Questions from Experiments shall be included in the SEE question paper

2. Questions from Self-study component will not be asked for CIE and

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

Level-3: Highly Mapped, Level-2: Moderately Mapped, Level-1: Low Mapped

Dr. Ambedkar Institute of Technology, Bengaluru-56

Department of Physics

Scheme and Syllabus-2025-2026

Course Title	**Physics Of Electrical And Electronic Materials**						
Course Code	**1BPHU202E**						
Category	Applied Science Course (ASC) (Integrated Course)						
Scheme and Credits	No. of Hours / Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02		06	40+10-12labs	04
CIEMarks:50	**SEEMarks:50**		**Total Max. marks =100**		**Duration of SEE:03Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of Quantum Mechanics, Electrical Properties of Metals and Semiconductors, Superconductivity, Dielectric and Magnetic Materials, Thermoelectric materials and devices, with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

UNIT I

Quantum Mechanics: **8 Hrs**

de Broglie hypothesis, Heisenberg's uncertainty principle and its application (Broadening of Spectral Lines), principle of complementarity, wave function, time independent Schrödinger wave equation (Derivation), physical significance of a wave function and Born Interpretation, expectation value and its physical significance, Eigen functions and Eigen values, Particle inside one dimensional infinite potential well, role of higher dimensions (Qualitative), Wave function and probability densities for n=1, 2 and 3. Quantum tunneling, Numerical Problems.

UNIT II

Electrical Properties of Metals and Semiconductors: **8 Hrs**

Assumptions and failures of classical free electron theory, mechanisms of electron scattering in solids, Matheissen's rule, assumptions of Quantum free electron theory, density of states (Qualitative), Fermi Dirac statistics, Fermi Energy, variation of

Fermi factor with temperature and energy, expression for carrier concentration: derivation of electron and hole concentrations in an intrinsic semiconductor, Fermi level for intrinsic (derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems	
UNIT III	
Superconductivity: Zero resistance state, persitent current, Meissner effect, critical temperature, critical current (Silsbee Effect). Formation of Cooper pairs - BCS Theory (Qualitative) Limitations of BCS theory, high temperature superconductors, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair Tunneling (Andreev reflection), Josephson junction, Flux quantization, SQUID (DC), Numerical Problems.	**8 Hrs**
UNIT IV	
Dielectric and Magnetic Materials: **Dielectrics:** Introduction, Electrical Polarization Mechanisms, Internal fields in solids (qualitative), Clausius-Mossotti relation (Derivation) and its implications, Properties and Frequency dependence of Dielectric constant, Dielectric loss, Solid, Liquid and Gaseous dielectrics. Application of dielectrics in Capacitors, Transformers (Oils). Numerical Problems. **Magnetic material:** Classification of magnetic materials, Weiss Molecular field theory of ferromagnetism (Qualitative), Importance of Curie Temperature, Ferromagnetic Hysteresis and Explanation using Domain theory, Energy loss, Hard and soft ferromagnetic materials and Applications, Numerical Problems	**8 Hrs**
UNITV	
Thermoelectric materials and devices: Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of T1 and T2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermo electric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (Radioisotope Thermoelectric	**8 Hrs**

Generator), Numerical Problems	

Experimental Components

Any Ten Experiments have to be completed from the list of experiments

1. Series & Parallel LCR Circuits
2. Determination of Fermi energy of a copper
3. Wavelength of LASER using Grating
4. Numerical Aperture using optical fiber
5. Charging and Discharging of a Capacitor
6. Energy Gap of the given Semiconductor
7. Planck's constant using LEDs.
8. Transistor Characteristics
9. Zener Diode Characteristics
10. Radius of curvature of Plano convex lens using Newton's rings
11. GNU Step Interactive Simulations
12. Study of Electrical quantities using spreadsheet
13. Online Circuit Simulator Online Circuit Simulator (https://www.partsim.com/simulator)
14. PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

At the end of the course, the student will be able to:

1. Explain dielectric and magnetic properties of materials and apply them in electrical components like transformers, capacitors, and magnetic switches.
2. Analyze thermoelectric phenomena, device construction, and identify suitable materials and applications for energy conversion.
3. Evaluate electrical transport mechanisms in metals and semiconductors using classical and quantum models, and perform relevant calculations.
4. Describe superconducting principles, distinguish between types of superconductors, and explain their physical properties and technological uses.
5. Describe the principles, properties, and applications of rare earth, ceramic, and smart materials in energy systems

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Engineering Physics, Satyendra Sharma and Jyotsna Sharma, Pearson, 2018.
2. Engineering Physics, S L Kakani, Shubra Kakani, 3rd Edition, 2020, CBS Publishers and Distributers Pvt. Ltd., 2018.
3. Solid State Physics, S. O. Pillai, New Age International.
4. Quantum Computing, Parag K Lala, McGraw Hill, 2020

Reference books / Manuals:

1. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education.
2. Griffiths, D. J. (2018). Introduction to Quantum Mechanics (2nd or 3rd ed.). Pearson.
3. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
4. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books
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6. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley
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8. Vishal Sahani, Quantum Computing, McGraw Hill Education, 2007 Edition.
9. Solid State Physics, A J Dekker (2000), Indian Ed., Macmillan Publishers India, New Delhi.

Weblinks and Video Lectures (e-Resources):

1. **Laser:** https://**Laser:**https://nptel.ac.in/courses/115/102115102124/
2. **Quantum mechanics:** https://nptel.ac.in/courses/115/104/115104096/
3. **Physics:** http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
4. **Numerical Aperture of fiber:** https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement
5. **NPTEL Superconductivity:** https://archive.nptel.ac.in/courses/115/103/115103108/

Activity-BasedLearning(SuggestedActivitiesinClass)/Practical-BasedLearning

1. http://nptel.ac.in
2. https://swayam.gov.in

3. https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
4. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5. https://virtuallabs.merlot.org/vl_physics.html
6. https://phet.colorado.edu
7. https://www.myphysicslab.com

SCHEMEFOREXAMINATIONS

1) Two full questions to be set from each unit with internal choice
   - Minimum number of subquestions:2
   - Maximum number of subquestions:3
2) Each full question shall be for a maximum of 20marks
3) Answer any Five full questions choosing at least One full question from each unit

Note:1. Questions from Experiments shall be included in the SEE question paper

2. Questions from Self-study component will not be asked for CIE and

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

Level-3: Highly Mapped, Level-2: Moderately Mapped, Level-1: Low Mapped

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Chemistry
Scheme and Syllabus 2025 – 26

SUBJECT TITLE : APPLIED CHEMISTRY FOR ADVANCED METAL PROTECTION AND SUSTAINABLE ENERGY SYSTEMS		
Subject Code : 1BCHU102A	**No. of credits: 2 : 2 : 2 (L-T-P)**	**No. of lecture hour per week : 4**
Exam duration : 3 hours.	**CIE + SEE = 50 + 50 = 100**	**Total No. of lecture hours : 50 (lab+Theory)**

Course Objectives:

To interconnect the acquaintance of Chemistry involved in Basics of Electrochemical cells, Corrosion and its control; renewable sources of energy; Polymers for Electronic materials; memory and display systems; sensors in instrumental analytical methods and water treatment; e-waste management; Nanomaterials and its application.

Unit No.	Syllabus content	No. of hours
1	**UNIT-1: Corrosion Science and Coating Technologies**	8
	Electrochemistry: Introduction, electrode potential, concentration cell, numerical problems. Reference electrode-Calomel electrode-construction, working. Ion selective electrode – pH electrode- construction, working. **Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion-differential metal and differential aeration corrosion, corrosion control-metal coating; galvanization, surface conversion coating; anodization of Aluminium and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems. **Coating Technologies:** Introduction, technological importance, electroplating - electroplating of chromium; hard and decorative, electro-less plating - electroless plating of Nickel, difference between electroplating and electrolessplating.	
2	**UNIT-2: Sustainable Green Fuels**	8
	Fuels: Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. Petroleum cracking ; Fluidized be catalytical cracking, Reformation of petrol- definition with an example. Knocking in internal combustion engines - knocking mechanism and anti-knocking agents - methyl tertiary butyl ether (MTBE) and ethyl tert-butyl ether (ETBE), importance of octane and	

	cetane rating of fuel. **Green Fuels**: Introduction, power alcohol – properties, applications and its limitations, biodiesel - synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages, hydrogen storage – introduction, advantages and limitations of metal hydride and ammonia as chemical hydrogen carriers.	
3	**UNIT-3: Materials for Energy Systems** **Nanomaterials:** Introduction, size-dependent properties of nanomaterial-surface area, catalytical, electrical and thermal conductivity, synthesis of TiO_2 nanoparticles by sol-gel method for catalytic converter application, Carbon nanotubes (CNTs) - Synthesis by chemical vapour deposition method, properties and role of (CNTs) in energy devices. **Energy Systems:** Batteries - Introduction, classification of batteries, characteristics-capacity, power density, Shelf Life and cycle life, construction, working and applications of Li-ion battery. **Fuel cells** - Introduction, construction and working of solid oxide fuel (SOFCs) for auxiliary power units (APUs) applications, difference between fuel cell and battery, photovoltaic cells (PV cells) - construction, working, advantages and limitations.	8
4	**UNIT-4: Polymers for Engineering Applications** **Engineering Polymers:** Introduction, molecular weight of polymers - numerical problems, synthesis, properties and engineering applications of polyvinyl chloride (PVC), and polymethyl methacrylate (PMMA), Glass transition temperature (Tg), factor affecting Tg and its significance in structure and property relationship of polymers. **Polymer Composites:** Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. **3D Printing materials:** Introduction to Bio polymer, synthesis, properties and applications of polylactic acid (PLA) resin	8
5	**UNIT-5: Fluid Technology and Smart Sensors** **Lubricants:** Introduction, classification, ideal properties and applications. Lubricant testing; experimental determination of viscosity. **Industrial Coolants:** Introduction, types-water and oil-based coolants, properties and industrial applications. **Industrial effluents:** Introduction, determination of COD and numerical problems. **Sensors:** Introduction, potentiometric sensor - principle and its application in the estimation of iron in steel industry effluent, conductometric sensor - principle and its	8

	application in the estimation of acids in electrochemical bath effluent. pH sensor - principle and its application in the estimation of pKa of acid electrolyte.	

TEACHING AND LEARNING PROCESS	Chalk and talk method, power point presentation, Videos, Animations. Practical topic: Demonstration and Virtual Lab along with Performing experiments

Course outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	Apply the principles of chemistry involved in corrosion, energy systems, materials and sensors for advanced metal protection and sustainable energy.	PO1	3
CO2	Analyze the engineering problems and draw meaningful inferences through concepts of chemistry.	PO2	1
CO3	Implement sustainable solutions through concepts of applied chemistry in the field of materials, energy and metal protection.	PO6	2
CO4	Engage in making an effective presentation on contribution of chemistry to society.	PO11	1
CO5	Apply the knowledge of chemistry to investigate engineering materials by analytical techniques.	PO1, PO5	2,1

MAPPING of COs with POs for Applied Chemistry

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2		1										
CO3						2						
CO4												1
CO5	2				1							
Strength of correlation: Low-1, Medium- 2, High-3												

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
2. A Textbook of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
3. A Textbook of Engineering Chemistry, R.V. Gadag and Nityananda Shetty I. K. International Publishing house. 2nd Edition, 2016.

Reference books / Manuals:

1. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
2. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
3. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.

4. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
5. Applied Chemistry for Mechanical Engineering and Allied Branches, C Manasa, Vrushabendra B, Srikantamurthy N. ISBN: 978-93-58380-90-3, Astitva Prakashan
6. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
7. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022
8. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4th Edition, 2021
9. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
10. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch

Web links and Video Lectures (e-Resources):

1. https://www.vturesource.com/post/1570/News/Bomb-calorimeter-construction-working-vtu-chemistry.html?utm_source
2. https://pubs.acs.org/doi/10.1021/acsomega.3c00963?utm_source
3. https://youtu.be/qTw_p9dkiVU
4. https://youtu.be/wdCYXj-bI-U
5. https://youtu.be/Y0EkLYK5i-c
6. https://youtu.be/tzTxMF7CDd4
7. https://youtu.be/YxrpQEX9ORA
8. https://youtu.be/Gxv4r9qoRf8
9. https://youtu.be/XIjDw5Sw9c4
10. https://youtu.be/j_rNjiIiBKE
11. https://youtu.be/GpbcjWstzEE
12. https://youtu.be/ygtbo5KDXeI

Practical Module

Sl. No.	Syllabus content
	A – Compulsory Experiments:
1	Estimation of iron in rust sample using potentiometric sensor.
2	Determination of pKa of a weak acid using pH sensor.
3	Estimation of mixture of strong and weak acid using conductometric sensor.
4	Estimation of copper in e-waste by optical sensor.
5	Determination of viscosity coefficient of lubricant using Ostwald's viscometer.
6	Estimation of total hardness of water by EDTA method.
7	Determination of chemical oxygen demand (COD) of an industrial effluent sample.
8	Determination of Alkalinity of water using standard NaOH solution
9	Estimation of percentage of copper in brass by iodometry.
10	Estimation of iron in TMT bar by external indicator method.
	B – Open Ended Experiments:
1	Green synthesis of copper nanoparticles for conductive ink applications
2	Determination of corrosion penetration rate (CPR) by weight-loss method.
3	Smartphone based colorimetric estimation of total phenolic content in beverages.
4	Chemical structure drawing using software: Chem Draw/ Chem Sketch.

References Books:

1. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
2. Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J.Bassett, ,J.Mendham and R.C Denney.

VIRTUAL LAB LINK DETAILS:

- https://www.labster.com/chemistry-virtual-labs/
- https://youtu.be/OwZbw6Mhrqc
- https://youtu.be/UOLOsKZxi6Y

HOP

Department of Chemistry

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Chemistry
Scheme and Syllabus 2025 – 26

SUBJECT TITLE : APPLIED CHEMISTRY FOR EMERGING ELECTRONICS AND FUTURISTIC DEVICES		
Subject Code : 1BCHU102B	No. of credits: 2: 2: 2 (L-T-P)	No. of lecture hour per week : 4
Exam duration : 3 hours.	CIE + SEE = 50 + 50 = 100	Total No. of lecture hours : 50 (Lab + Theory)

Course Objectives:

To interconnect the acquaintance of Chemistry involved in Basics of Electrochemical cells, Corrosion and its control; renewable sources of energy; Polymers for Electronic materials; memory and display systems; sensors in instrumental analytical methods and water treatment; e-waste management; Nanomaterials and its application.

Unit No.	Syllabus content	No. of hours
1	**UNIT-1 Electrode System and Corrosion science** **Electrode System:** Electrochemistry: Introduction, Nernst equation (Preview), concentration cell, numerical problems, types of electrodes, Reference electrode-Calomel electrode-construction, working and application. Ion selective electrode – pH electrode- construction, working, determination of pH using glass electrode. **Corrosion Chemistry:** Introduction, electrochemical theory of corrosion, types of corrosion differential metal corrosion in electronic circuits and differential aeration corrosion, corrosion control-galvanization and anodization, cathodic protection and impressed current method, corrosion penetration rate (CPR)- definition, importance and numerical problems. **Metal Finishing:** Introduction, difference between electroplating & electroless plating, electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs.	8
	UNIT-2 Energy – Sources, Conversion and Storage **Chemical fuel:** Calorific values, determination of calorific values by Bomb calorimeter, numerical. Petroleum cracking- Definition with an example, Reformation of petrol- Definition with an example.	

2	**Energy Storage Devices:** Introduction, classification of batteries-primary, secondary and reserve battery, characteristics (capacity, power density, energy efficiency, shelf life &cycle life), construction and working of lithium-ion battery - advantages in EV applications. Introduction to super capacitors, construction and working of ultra-small asymmetric super capacitor in IoT/wearable device applications. **Energy Conversion Devices:** Introduction, construction, working, advantages and applications of photovoltaic cell of (PV cell), Introduction to MEMS-Based Energy Harvesters, working principle and applications.	8
3	**UNIT-3 Functional Polymers in Flexible Electronics** **Polymer:** Introduction, terminology, molecular weight of polymers - number and weight average molecular weight of polymers, numerical problems, Synthesis, properties and applications of polydimethylsiloxane (PDMS) in RFID (radio frequency identification). Synthesis, properties and applications of polyvinylidene fluoride (PVDF) in E-nose devices. **Polymeric semiconductors:** Introduction, n-type and p-type polymeric semiconductor materials, organic photovoltaics - Poly(3-hexylthiophene) (P3HT) as a donor and Phenyl C61-butyric acid methyl ester (PCBM) as an acceptor, construction, working and applications. Difference between organic and inorganic semiconductors. **Polymer Composites:** Introduction, synthesis and properties of epoxy resin- Fe_3O_4 composite for sensors applications, synthesis of Kevlar Fiber Reinforced Polymer (KFRP)-properties and smart electronic devices applications.	8
4	**UNIT- 4 Quantum Dot Materials for Electronics Applications** **Nanomaterials:** Introduction, size dependent properties of nanomaterials -Surface area, Catalytic, optical and electrical, Synthesis of TiO2 nanoparticles by sol gel method for sensor application. **Quantum Dot Materials:** introduction, optical and electronic properties of Quantum dot (QDs) **Inorganic Quantum Dot Materials (IQDMs):** Introduction, synthesis and properties of silicon based QDs by Sol-Gel method and CdSe Quantum Dots by hot injection method and	8

	applications in optoelectronic devices (QLED). Wet chemical synthesis, properties and applications of quantum dot-based copper conductive ink. **Organic Quantum Dot Materials (OQDMs):** Introduction, synthesis and properties of chitosan-carbon quantum dots hydrogel applications in next-generation flexible and wearable electronics. Synthesis, properties and applications of Graphene Quantum Dots (using citric acid method) in emerging electronics.	
5	**UNIT 5 Advanced Electronic Materials and E-waste Management**	8
	Sensing Methods: Introduction, principle and instrumentation of colorimetric sensors, application in the estimation of copper in PCB industry. Principle and working of potentiometric sensors, applications in the estimation of iron in steel. Conductometric sensors. Application in the estimation of acid mixture in a sample. **E-waste:** Introduction, need of e-waste management, sources & effects of e-waste on environment and human health, extraction of gold from e-waste from bioleaching method. **Stretchable and Wearable Microelectronics**: Introduction, basic principle and working of Lithography for micro-patterned copper deposition. Applications of PDMS (Polydimethylsiloxane) in e-skin (electronic skin) applications	

TEACHING AND LEARNING PROCESS	Chalk and talk method, power point presentation, Videos, Animations. Practical topic: Demonstration and Virtual Lab along with Performing experiments

Course outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	Apply the principles of chemistry involved in corrosion, energy systems, materials, quantum dots, sensors for emerging electronics and futuristic devices.	PO1	3
CO2	Analyze the engineering problems and draw meaningful inferences through concepts of chemistry.	PO2	1

CO3	Implement sustainable solutions through concepts of applied chemistry in the field of materials, energy and electronic devices.	PO6	2
CO4	Engage in self-study and make an effective presentation on contribution of chemistry to society.	PO11	1
CO5	Apply the knowledge of chemistry to investigate engineering materials by analytical techniques.	PO5	2, 1

MAPPING of COs with POs for Applied Chemistry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		1										
CO3						2						
CO4												1
CO5	2				1							
Strength of correlation: Low-1, Medium- 2, High-3												

REFERENCE:

1. **Electrochemical Energy System:**Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
2. **Electrochemical Energy System:**Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
3. **Engineering Chemistry:** Jain & Jain, **Publisher:** Dhanpat Rai Publishing Company, **ISBN:** 978-9353161181.
4. Smart materials, Harvey, James A. Handbook of materials selection, 2002, John Wiley & Sons Canada, Limited, ISBN: 9780471359241.
5. Smart materials, Harvey, James A. Handbook of materials selection, 2002, John Wiley & Sons Canada, Limited, ISBN: 9780471359241.

Web links and Video Lectures (e-Resources):

1. https://youtu.be/HT21wrGl6oM
2. https://youtu.be/aG2F-fd2drM
3. https://youtu.be/ivWXuOd5SrI
4. https://www.youtube.com/watch?v=BGdCj3-PEoE
5. https://www.youtube.com/watch?v=xvtOPHsukzE
6. https://www.youtube.com/watch?v=VxMM4g2Sk8U
7. https://www.youtube.com/watch?v=0bjRNq1PKak
8. https://youtu.be/XIjDw5Sw9c4
9. https://youtu.be/lB2zbQvnwXw
10. https://youtu.be/FNohb7ZKxMI
11. https://www.youtube.com/watch?v=Y-nZbZzBOPg
12. https://en.wikipedia.org/wiki/Graphene_quantum_dot
13. https://youtu.be/NCOwWEMEQN8
14. https://youtu.be/u_2YRTmOTWQ

15. https://youtu.be/ygtbo5KDXeI

16. https://youtu.be/whyIdJab1kM

17. https://youtu.be/3TYH-8pPDV4

18. https://youtu.be/xS60SGWSw4s

19. https://youtu.be/zJTQLce-WC8

NPTEL/SWAYAM/MOOCs

1. http://nptel.ac.in/
2. https://swayam.gov.in/

Practical Module

Sl. No.	Syllabus content
	A – Compulsory Experiments:
1	Estimation of iron in rust sample using potentiometric sensor.
2	Determination of pKa of a weak acid using pH sensor.
3	Estimation of mixture of strong and weak acid using conductometric sensor.
4	Estimation of copper in e-waste by optical sensor.
5	Determination of viscosity coefficient of lubricant using Ostwald's viscometer.
6	Estimation of total hardness of water by EDTA method.
7	Determination of chemical oxygen demand (COD) of an industrial effluent sample.
8	Determination of Alkalinity of water using standard NaOH solution
9	Estimation of percentage of copper in brass by iodometry.
10	Estimation of iron in TMT bar by external indicator method.
	B – Open Ended Experiments:
1	Green synthesis of copper nanoparticles for conductive ink applications
2	Determination of corrosion penetration rate (CPR) by weight-loss method.
3	Smartphone based colorimetric estimation of total phenolic content in beverages.
4	Chemical structure drawing using software: Chem Draw/ Chem Sketch.

References Books:

1. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
2. Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J.Bassett, ,J.Mendham and R.C Denney.

VIRTUAL LAB LINK DETAILS:

- https://www.labster.com/chemistry-virtual-labs/
- https://youtu.be/OwZbw6Mhrqc
- https://youtu.be/UOLOsKZxi6Y

HOP

Department of Chemistry

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Chemistry
Scheme and Syllabus 2025 – 26

SUBJECT TITLE : APPLIED CHEMISTRY FOR SUSTAINABLE STRUCTURES & MATERIAL DESIGN (CIVIL)		
Subject Code : 1BCHU202C	**No. of credits:** 2 : 2 : 2 (L-T-P)	**No. of lecture hour per week :** 4
Exam duration : 3 hours.	**CIE + SEE =** 50 + 50 = 100	**Total No. of lecture hours :** 50 (Lab+Theory)

Course Objectives:

To interconnect the acquaintance of Chemistry involved in Basics of Electrochemical cells, Corrosion and its control; renewable sources of energy; Polymers for Electronic materials; memory and display systems; sensors in instrumental analytical methods and water treatment; e-waste management; Nanomaterials and its application.

Unit No.	Syllabus content	No. of hours
1	**UNIT-1 Electrochemistry and Corrosion science** **Electrochemistry**: Introduction, electrode potential, numerical problems to find EMF of cell using Nernst equation concentration cell, numerical problems. Reference electrode-Calomel electrode-construction, working. Ion selective electrode – pH electrode-construction, working. **Corrosion**: Introduction, electrochemical corrosion of steel in concrete, types- differential metal corrosion and differential aeration corrosion, stress corrosion in civil structures. Corrosion control by galvanization and anodization, corrosion penetration rate (CPR) - definition, importance and numerical problems.	8
2	**UNIT-2 energy systems, Surface protection and Green fuels** **Metal Finishing**: Introduction, technological importance of metal finishing, electroplating of Chromium-decorative and hard coating. **Energy systems**: Introduction, classification of batteries, characteristics; capacity, power density, Shelf Life & cycle life, construction & working of Lithium-ion battery, advantages and disadvantages, fuel cell- definition, difference between battery and fuel cell, construction and working of solid oxide fuel cell, silicon solar cell-advantages,	8

	applications and limitations. **Green Fuels**: Introduction, green hydrogen production by TiO_2-Photocatalytical method and applications.	
3	**UNIT-3 Polymers and Nanomaterials as sustainable structural constituents** **Polymer**: Introduction, terminology, molecular weight of polymers: number average and weight average molecular weight of polymers, numericals, synthesis, properties and engineering applications of PVC, PMMA, Kevlar fiber and epoxy resins, properties and industrial applications of graphene and carbon nano-tubes as reinforced composites. **Nanomaterials**: Introduction, size dependent properties *viz*; surface area, water absorption, permeability, thermal properties and antimicrobial activity, concrete as composite material, composition of nano-concrete, synthesis of TiO_2 nanoparticles by sol-gel method for sensor application.	8
4	**UNIT -4 Water Chemistry and Analytical Techniques** **Water Chemistry**: Introduction, significance of water quality parameters-pH, turbidity, chlorides, dissolved oxygen and alkalinity for environmental and construction applications. Hard water; types, determination of total hardness by EDTA method. Waste water-definition of domestic and industrial effluents. Determination of dissolved oxygen by Winkler's method, Determination of COD in waste water. **Analytical Techniques:** Introduction, potentiometric sensors: principle, instrumentation and application in estimation of iron in industrial effluents, conductometric sensors: principle, instrumentation and application in determination of acid mixture in water and industrial effluents: colorimetric sensor- principle, instrumentation and estimation of copper in brass alloy, determination of dissolved oxygen by Winkler's method, COD and numerical.	8
5	**Module-5 Materials for Structural reliability** **Metals and Alloys:** Introduction, classification of metals: ferrous and non-ferrous, composition, properties, applications of iron and its alloys-wrought iron, cast iron, pig iron and steel, aluminium and its alloys-Duralumin and Magnalium. **Cement**: Introduction, composition, manufacturing process of cement-wet process, process of setting and hardening of cement, special cements-composition, properties and applications. **Geopolymer Concrete**: Introduction, mechanism of geopolymerization and manufacturing process of geopolymer concrete. **Biopolymers**: Polylactic Acid (PLA)-synthesis, properties and applications.	8

	Photochromic Coatings: Introduction, spiropyran as photochromic coating, working principle with chemical reactions and applications in construction activities.	

TEACHING AND LEARNING PROCESS	Chalk and talk method, power point presentation, Videos, Animations. Practical topic: Demonstration and Virtual Lab along with Performing experiments

Course outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	Apply the principles of chemistry involved in corrosion, energy systems, materials, sensors and water treatment for sustainable structures & material design.	PO1	3
CO2	Analyze the engineering problems and draw meaningful inferences through concepts of chemistry.	PO2	1
CO3	Implement sustainable solutions through concepts of applied chemistry in the field of materials, energy and environment.	PO6	2
CO4	Engage in making an effective presentation on contribution of chemistry to society.	PO11	1
CO5	Apply the knowledge of chemistry to investigate engineering materials by analytical techniques.	PO1, PO5	2, 1

MAPPING of COs with POs for Applied Chemistry

	PO	**PO**	**PO**	**PO4**	**PO5**	**PO6**	**PO**	**PO**	**PO9**	**PO10**	**PO1**	**PO1**
CO	3											
CO		1										
CO							2					
CO												1
CO	2				1							
Strength of correlation: Low-1, Medium- 2, High-3												

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals): Text books:

1. Textbook of Engineering Chemistry: S. S. Dara & S. S. Umare, S. Chand Publishing, ISBN:9788121903593
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
3. Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai Publishing Company,

Reference books

1. Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978- 8122418713.

2. Electrochemical Energy System: Dr. K. K. Rajeshwar (IIT Madras), Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).

3. Materials Science: S. K. Malik, Publisher: New Age International Publishers, ISBN: 978- 8122418713.

NPTEL/SWAYAM/MOOCs

1. http://nptel.ac.in/
2. https://swayam.gov.in/

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/113/104/113104021/
2. https://nptel.ac.in/courses/103/102/103102103/
3. https://www.youtube.com/watch?v=JvzH4QQOfSw
4. https://www.youtube.com/watch?v=1F9Vjae7k60
5. https://www.youtube.com/watch?v=xrsK9FUdvRE

Practical Module

Sl. No.	Syllabus content
	A – Compulsory Experiments:
1	Estimation of iron in rust sample using potentiometric sensor.
2	Determination of pKa of a weak acid using pH sensor.
3	Estimation of mixture of strong and weak acid using conductometric sensor.
4	Estimation of copper in e-waste by optical sensor.
5	Determination of viscosity coefficient of lubricant using Ostwald's viscometer.
6	Estimation of total hardness of water by EDTA method.
7	Determination of chemical oxygen demand (COD) of an industrial effluent sample.
8	Determination of Alkalinity of water using standard NaOH solution
9	Estimation of percentage of copper in brass by iodometry.
10	Estimation of iron in TMT bar by external indicator method.
	B – Open Ended Experiments:
1	Green synthesis of copper nanoparticles for conductive ink applications
2	Determination of corrosion penetration rate (CPR) by weight-loss method.
3	Smartphone based colorimetric estimation of total phenolic content in beverages.
4	Chemical structure drawing using software: Chem Draw/ Chem Sketch.

References Books:

1. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
2. Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J.Bassett, ,J.Mendham and R.C Denney.

VIRTUAL LAB LINK DETAILS:

- https://www.labster.com/chemistry-virtual-labs/
- https://youtu.be/OwZbw6Mhrqc
- https://youtu.be/UOLOsKZxi6Y

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Chemistry
Scheme and Syllabus 2025 – 26

SUBJECT TITLE : APPLIED CHEMISTRY FOR SMART SYSTEMS (CSE STREAM - CSE, CS-BS, ISE, AI-ML)		
Subject Code : 1BCHU202D	**No. of credits:** 2 : 2 : 2 (L-T-P)	**No. of lecture hour per week :** 4
Exam duration: 3 hours.	**CIE + SEE =** 50 + 50 = 100	**Total No. of lecture hours :** 50 (Lab+Theory)

Course Objectives:

To interconnect the acquaintance of Chemistry involved in Basics of Electrochemical cells, Corrosion and its control; renewable sources of energy; Polymers for Electronic materials; memory and display systems; sensors in instrumental analytical methods and water treatment; e-waste management; Nanomaterials and its application.

Unit No.	Syllabus content	No. of hours
1	**UNIT-1 Chemical Sensors and Corrosion Control**	8
	Electrochemistry: Introduction, electrode potential, concentration cell, numerical problems. Reference electrode-Calomel electrode-construction, working. Ion selective electrode – pH electrode- construction, working. **Corrosion:** Introduction, electrochemical theory of corrosion, types-differential metal and differential aeration corrosion, corrosion control- Galvanization and anodization, corrosion penetration rate (CPR)- definition, importance and numerical problems. **Sensors:** Introduction, terminologies- Transducer, Actuators and Sensors, working principle and applications- conductometric sensor and colorimetric sensor, electrochemical gas sensors for the detection of NOx & SOx in air sample, Biosensor-principle and working mechanism for detection of glucose in biofluids.	
	UNIT-2 Sustainable Chemistry for Energy Devices	
	Batteries: Introduction, classification of batteries, construction, working and applications of Ni-MH Battery.	

2	**Next-Generation Energy Systems**: Introduction, construction and working of sodium ion battery and Li ion battery for EV applications. Introduction to super capacitors, construction and working of ultra-small asymmetric super capacitor in IoT / wearable device applications. **Clean Energy Chemistry:** Introduction, fuel cell, difference between fuel cell and battery, construction, working principle, applications and limitations of solid-oxide fuel cell (SOFCs) and solar photovoltaic cell (PV cell). Production of green hydrogen by photocatalytic water splitting using TiO2 method and its advantages.	8
3	**Module-3 Green Materials and E-Waste Management**	8
	Green Chemistry: Introduction, 12 principles of green chemistry, properties and applications of green solvents for server heat management, biosynthesis and properties of glycerol trioleate ester for server and IT infrasrtrure applications. Green synthesis of ZnO nanoparticles for magnetic Radio Frequency Identification (RFID) & Internet of Nano Things (IONT) system applications **Biomaterials:** Introduction, synthesis and properties of polylactic Acid (PLA) and polyethylene glycol (PEG) for touch screen applications, synthesis and properties of Alginate Hydrogel for Brain-Computer Interfaces (BCIs) applications. **E-waste:** Introduction, sources, composition of e-waste, effects of e-waste on environment and human health, Artificial intelligence in e-waste management and its applications, extraction of gold from e-waste by bioleaching method, direct recycling method of lithium-ion batteries.	
4	**Module-4 Functional Materials for Memory and Display Systems**	8
	Memory Devices: Introduction, organic semiconductors; types of organic semiconductors used in memory devices, p-type semiconductor-pentacene and n- type semiconductor - perfluoropentacene, difference between organic and inorganic memory devices, construction, working and advantages of pentacene semiconductor chip. **Resistive RAM (ReRAM) Materials:** Introduction, synthesis of nano TiO_2 by sol-gel method, properties and its applications in ReRAM **Display Systems:** Introduction, liquid crystals (LCs)- classification, properties and its applications in Liquid Crystal Displays (LCDs), Jablonski diagram , construction, working principle and applications of OLEDs, Quantum Light Emitting Diodes (QLEDs).	
	Module-5 Quantum Materials and Polymers	

5	**Quantum Dots:** Introduction, size dependent properties -quantum confinement effect, surface-to-volume ratio & band gap, quantum dot sensitized solar cells (QDSSCs)-construction, working principle and applications.	8
	Polymer: Introduction, terminologies, molecular weight of polymers - number and weight average molecular weight of polymers, numerical problems, Glass transition temperature (Tg) –factors affecting Tg, and significance in structure-property relationship of polymers, synthesis and properties of nylon-12 advantages in 3D printing applications, synthesis and properties of PVC and PMMA for device applications. **Conducting polymers**- Introduction, synthesis of polyaniline, conductions mechanism and its engineering applications.	

TEACHING AND LEARNING PROCESS	Chalk and talk method, power point presentation, Videos, Animations. Practical topic: Demonstration and Virtual Lab along with Performing experiments

Course outcomes: On completion of the course, the student will have the ability to:		**POs Mapped**	**Strength of mapping**
CO1	Apply the principles of chemistry involved in Electrochemistry corrosion, energy systems, materials and sensors for smart systems.	PO1	3
CO2	Analyze the engineering problems and draw meaningful inferences through concepts of next generation energy systems.	PO2	1
CO3	Implement sustainable solutions through concepts of applied chemistry in the field of materials, energy and environment.	PO6	2
CO4	Explain role of Functional Materials for Memory and Display Systems in energy and electronic systems.	PO11	1
CO5	Apply concepts of quantum materials, conducting polymers in modern electronics systems	PO1, PO5	2,1

MAPPING of COs with POs for Applied Chemistry

	PO	PO	PO	PO4	PO5	PO6	PO	PO	PO9	PO10	PO1	PO1
CO	3											
CO		1										
CO						2						
CO												1
CO	2				1							
Strength of correlation: Low-1, Medium- 2, High-3												

Suggested Learning Resources: (Text Book/ Reference Book/ Manuals):

Text books:

1. Engineering Chemistry, Suba Ramesh, Vairam, Ananda Murthy,2011, Wiley, India, ISBN: 9788126519880.
2. Engineering Chemistry, Shubha Ramesh et.al., Wiley India, 1st Edition, 2011, ISBN: 9788126519880.
3. Chemistry For Engineering Students by Dr B S Jai Prakash , Prof R Venugopal, Dr Shivakumaraiah.

Reference books / Manuals:

1. Semiconducting Materials and Devices-Deepak Verma, ISBN: 978 9394777712,
2. Organic Thin Film Transistor Applications: Materials to Circuits-Brajesh K. Kaushik et al. ISBN 10: 9781498736534
3. High Quality Liquid Crystal Displays and Smart Devices – Ishihara, Kobayashi & Ukai (2019,IET), ISBN: 9781785619397
4. Quantum Dots and Polymer Nanocomposites: Synthesis, Chemistry, and Applications- yotishkumar Parameswaranpillai, Poushali Das, Sayan Ganguly, Publisher: CRC Press, 2022,ISBN 13: 978 1032210148
5. Green Carbon Quantum Dots: Environmental Applications; Vijay Kumar, Pardeep Singh, Devendra Kumar Singh (India), Springer Nature Singapore, Oct 2024, ISBN 13: 978 9819762026.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

Web links and Video Lectures (e-Resources):

1.https://youtu.be/1TGTVQbMlIc

2.https://www.youtube.com/watch?v=IzWONUYlQ5E&t=56s

3.https://youtu.be/3j0jLuOs0v4

Practical Module

Sl. No.	Syllabus content
	A – Compulsory Experiments:
1	Estimation of iron in rust sample using potentiometric sensor.
2	Determination of pKa of a weak acid using pH sensor.
3	Estimation of mixture of strong and weak acid using conductometric sensor.
4	Estimation of copper in e-waste by optical sensor.
5	Determination of viscosity coefficient of lubricant using Ostwald's viscometer.
6	Estimation of total hardness of water by EDTA method.
7	Determination of chemical oxygen demand (COD) of an industrial effluent sample.
8	Determination of Alkalinity of water using standard NaOH solution
9	Estimation of percentage of copper in brass by iodometry.
10	Estimation of iron in TMT bar by external indicator method.
	B – Open Ended Experiments:
1	Green synthesis of copper nanoparticles for conductive ink applications
2	Determination of corrosion penetration rate (CPR) by weight-loss method.
3	Smartphone based colorimetric estimation of total phenolic content in beverages.
4	Chemical structure drawing using software: Chem Draw/ Chem Sketch.

References Books:

1. Laboratory manual in Engineering Chemistry Sudharani, Dhanpatrai Publishing Company.
2. Vogel's Text Book of Quantitative Chemical Analysis revised by G.H.Jeffery, J.Bassett, ,J.Mendham and R.C Denney.

VIRTUAL LAB LINK DETAILS:

- https://www.labster.com/chemistry-virtual-labs/
- https://youtu.be/OwZbw6Mhrqc
- https://youtu.be/UOLOsKZxi6Y

Computer Aided Engineering Drawing for CV Stream		Semester	I/II
Course Code	1BCED103A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

At the end of the course, the student will be able to:

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create 3D models of basic building components.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Building Components Drafting (For CIE Only):

Modeling Basic Building Components: foundations, columns, beams, slabs, walls, doors windows, staircase, assigning materials and rendering building components.
Drafting a 2D floor plan for a simple single-storey residential/commercial building, Converting the floor plan into 3D model with walls, openings, and roof structure.
Concept of building drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021
3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
4. V.B. Sikka, A Course in Civil Engineering Drawing, 11th edition, S.K. Kataria & Sons, reprint 2024.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.gsourcedata.com/a-guide-to-the-world-of-civil-engineering-drawings-the-architectural-atlas/

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least 5**0% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE**, a student must score at least 40**% of 50 marks**, i.e., 20 **marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 45 out of 100 marks**.

Continuous Internal Evaluation (CIE):

SCHEME FOR INTERNAL ASSESSMENT (IA)		
	DETAILS	**MAX. MARKS**
Manual Sketching (25)	Classwork	15
	Assignment	10
Computer Printout (15)	Classwork	15
	CIE*	10
	TOTAL IA MARKS	50
* Continuous Internal Evaluation (CIE) is based on the one test conducted during the end-semester.		

Semester End Examination (SEE):

Scheme of Evaluation for Semester End Examination (SEE)			
Unit	Maximum Marks	Manual Sketching	Computer solution and print out
1	10	10	00
2	20	10	10
3	20	10	10
OR			
4	20	10	10
Total	**50**	**30**	**20**

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION (SEE)						
UNIT	1		2		3	4
Max. Marks	10		20		20	20
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6

NOTE:

1. Each Full question shall cover all the topics of the Unit.
2. Unit 2, Unit 3 and Unit 4 to have both manual sketching and computer solution/print out.
3. Unit 1 have only manual sketching.
4. Model question paper may be referred for distribution of topics in each Full Question.

Question no	**Topics**	**Sketching**	**Drafting**	
1	Projection of lines	10 M	-------	**10 M**
	OR			
2	Projection of planes	10 M	-----	
3	Projection of solids	10 M	10 M	**20M**
	OR			
4	Projection of solids	10 M	10 M	
5	Isometric projection	10 M	10 M	**20 M**
	OR			
6	Development of solids	10 M	10 M	
	Total Marks			**50 M**

MAPPING OF COs WITH POs												
COs/POs	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO12**
CO1	3	2	2	1	2	0	1	1	2	2	0	2
CO2	3	2	2	1	2	0	1	1	2	2	0	2
CO3	3	2	2	1	2	0	1	1	2	2	0	2
CO4	3	2	2	1	2	0	1	1	2	2	0	2
CO5	3	2	2	1	2	0	1	1	2	2	0	2
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not												

Computer Aided Engineering Drawing for CS Stream		Semester	I/II
Course Code	1BCED103B	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

At the end of the course, the student will be able to:

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create 3D models of embedded, networking, and IoT devices.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Computer Network Drawing (For CIE Only):

2D Network drawing with wired and wireless, Network topology - wired and wireless.
3D Modeling: Raspberry Pi / Arduino boards, Router & switches, IoT devices - Concept of converting to 3D printing format (stl)
Concept of Industrial drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021
3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
4. Frederick E. Giesecke, et al., Technical Drawing with Engineering Graphics, Prentice Hall, 2016

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.youtube.com/watch?v=zbqrNg4C98U

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least 5**0% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE**, a student must score at least 40**% of 50 marks**, i.e., 20 **marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 45 out of 100 marks**.

Continuous Internal Evaluation (CIE):

SCHEME FOR INTERNAL ASSESSMENT (IA)		
	DETAILS	**MAX. MARKS**
Manual Sketching (25)	Classwork	15
	Assignment	10
Computer Printout (15)	Classwork	15
	CIE*	10
	TOTAL IA MARKS	50
* Continuous Internal Evaluation (CIE) is based on the one test conducted during the end-semester.		

Semester End Examination (SEE):

Scheme of Evaluation for Semester End Examination (SEE)			
Unit	Maximum Marks	Manual Sketching	Computer solution and print out
1	10	10	00
2	20	10	10
3	20	10	10
OR			
4	20	10	10
Total	**50**	**30**	**20**

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION (SEE)						
UNIT	1		2		3	4
Max. Marks	10		20		20	20
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6

NOTE:

1. Each Full question shall cover all the topics of the Unit.
2. Unit 2, Unit 3 and Unit 4 to have both manual sketching and computer solution/print out.
3. Unit 1 have only manual sketching.
4. Model question paper may be referred for distribution of topics in each Full Question.

Question no	**Topics**	**Sketching**	**Drafting**	
1	Projection of lines	10 M	-------	**10 M**
	OR			
2	Projection of planes	10 M	-----	
3	Projection of solids	10 M	10 M	**20M**
	OR			
4	Projection of solids	10 M	10 M	
5	Isometric projection	10 M	10 M	**20 M**
	OR			
6	Development of solids	10 M	10 M	
	Total Marks			**50 M**

MAPPING OF COs WITH POs												
COs/POs	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO12**
CO1	3	2	2	1	2	0	1	1	2	2	0	2
CO2	3	2	2	1	2	0	1	1	2	2	0	2
CO3	3	2	2	1	2	0	1	1	2	2	0	2
CO4	3	2	2	1	2	0	1	1	2	2	0	2
CO5	3	2	2	1	2	0	1	1	2	2	0	2
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not												

Computer Aided Engineering Drawing for ME Stream		Semester	I/II
Course Code	1BCED203C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

At the end of the course, the student will be able to:

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create basic 3D models of engineering components and parts.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Concept of Part Design (For CIE Only):

3D Modeling: Simple machine parts / engineering components. (Applying material properties and rendering for realistic visualization)
Sheet Metal & Surface Design: Automotive panels, HVAC ducting
Concept of Industrial drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
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3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009

Web links and Video Lectures (e-Resources):

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- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://www.classcentral.com/subject/sheet-metal-design?utm

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

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- Simulation and Virtual Labs
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- ICT-Enabled Teaching

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least 5**0% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE**, a student must score at least 40**% of 50 marks**, i.e., 20 **marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 45 out of 100 marks**.

Continuous Internal Evaluation (CIE):

SCHEME FOR INTERNAL ASSESSMENT (IA)		
	DETAILS	**MAX. MARKS**
Manual Sketching (25)	Classwork	15
	Assignment	10
Computer Printout (15)	Classwork	15
	CIE*	10
	TOTAL IA MARKS	50
* Continuous Internal Evaluation (CIE) is based on the one test conducted during the end-semester.		

Semester End Examination (SEE):

Scheme of Evaluation for Semester End Examination (SEE)			
Unit	Maximum Marks	Manual Sketching	Computer solution and print out
1	10	10	00
2	20	10	10
3	20	10	10
OR			
4	20	10	10
Total	**50**	**30**	**20**

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION (SEE)						
UNIT	1		2		3	4
Max. Marks	10		20		20	20
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6

NOTE:

1. Each Full question shall cover all the topics of the Unit.
2. Unit 2, Unit 3 and Unit 4 to have both manual sketching and computer solution/print out.
3. Unit 1 have only manual sketching.
4. Model question paper may be referred for distribution of topics in each Full Question.

Question no	**Topics**	**Sketching**	**Drafting**	
1	Projection of lines	10 M	-------	**10 M**
	OR			
2	Projection of planes	10 M	-----	
3	Projection of solids	10 M	10 M	**20M**
	OR			
4	Projection of solids	10 M	10 M	
5	Isometric projection	10 M	10 M	**20 M**
	OR			
6	Development of solids	10 M	10 M	
	Total Marks			**50 M**

MAPPING OF COs WITH POs												
COs/POs	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO12**
CO1	3	2	2	1	2	0	1	1	2	2	0	2
CO2	3	2	2	1	2	0	1	1	2	2	0	2
CO3	3	2	2	1	2	0	1	1	2	2	0	2
CO4	3	2	2	1	2	0	1	1	2	2	0	2
CO5	3	2	2	1	2	0	1	1	2	2	0	2
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not												

Computer Aided Engineering Drawing for ECE Stream		Semester	I/II
Course Code	1BCED203D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

At the end of the course, the student will be able to:

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create basic 3D models of electronic components and parts.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Electronic Components Visualisation (For CIE Only):

3D Modelling: Optical fibre cable with core and cladding, photonic crystal fibers, Antenna: Single element patch antenna, antenna array.
Sheet Metal & Surface Design: PCB Enclosures: Creation of different geometry with slots as per Standards: NMEA-0183, applying material properties for heat sink and water/dust proofing and rendering for realistic visualization.
Concept of Industrial drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021
3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
4. A K Mittal & Kapeel Dev, Electronics Engineering Drawing, Computech Publications Limited, 2025
5. John Frostad, Electronics Drafting, Goodheart-Willcox Pub; 4th Edition, 2010.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://fiberopticx.com/optical-fiber-cable-structure/
- https://www.newport.com.cn/t/photonic-crystal-fibers

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least 5**0% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE**, a student must score at least 40**% of 50 marks**, i.e., 20 **marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 45 out of 100 marks**.

Continuous Internal Evaluation (CIE):

SCHEME FOR INTERNAL ASSESSMENT (IA)		
	DETAILS	**MAX. MARKS**
Manual Sketching (25)	Classwork	15
	Assignment	10
Computer Printout (15)	Classwork	15
	CIE*	10
	TOTAL IA MARKS	50
* Continuous Internal Evaluation (CIE) is based on the one test conducted during the end-semester.		

Semester End Examination (SEE):

Scheme of Evaluation for Semester End Examination (SEE)			
Unit	Maximum Marks	Manual Sketching	Computer solution and print out
1	10	10	00
2	20	10	10
3	20	10	10
OR			
4	20	10	10
Total	**50**	**30**	**20**

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION (SEE)						
UNIT	1		2		3	4
Max. Marks	10		20		20	20
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6

NOTE:

1. Each Full question shall cover all the topics of the Unit.
2. Unit 2, Unit 3 and Unit 4 to have both manual sketching and computer solution/print out.
3. Unit 1 have only manual sketching.
4. Model question paper may be referred for distribution of topics in each Full Question.

Question no	**Topics**	**Sketching**	**Drafting**	
1	Projection of lines	10 M	-------	**10 M**
	OR			
2	Projection of planes	10 M	-----	
3	Projection of solids	10 M	10 M	**20M**
	OR			
4	Projection of solids	10 M	10 M	
5	Isometric projection	10 M	10 M	**20 M**
	OR			
6	Development of solids	10 M	10 M	
	Total Marks			**50 M**

MAPPING OF COs WITH POs												
COs/POs	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO12**
CO1	3	2	2	1	2	0	1	1	2	2	0	2
CO2	3	2	2	1	2	0	1	1	2	2	0	2
CO3	3	2	2	1	2	0	1	1	2	2	0	2
CO4	3	2	2	1	2	0	1	1	2	2	0	2
CO5	3	2	2	1	2	0	1	1	2	2	0	2
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not												

Computer Aided Engineering Drawing for EEE Stream		Semester	I/II
Course Code	1BCED203E	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2 :0 :2 : 0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory (Conducted in batches similar to practical's)		

Course Outcomes

At the end of the course, the student will be able to:

CO 1. Generate orthographic projections of points, lines, planes, and solids manually and with computer-aided tools.

CO 2. Develop the lateral surfaces of solids for real-world applications.

CO 3. Draw isometric views and convert isometric drawings to orthographic views.

CO 4. Create schematic diagrams of Electrical Systems.

Module-1

Introduction:

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales.

Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

Orthographic Projections of Points, Lines and Planes:

Introduction to Orthographic projections, Orthographic projections of points in 1st and 3rd quadrants.

Orthographic projections of lines (Placed in First quadrant only as per BIS)

Orthographic projections of planes: triangular, square, rectangular, pentagonal, hexagonal and circular lamina (Placed in First quadrant only using change of position method).

Number of Hours: 08

Module-2

Orthographic Projection of Solids:

Orthographic projection of right regular solids (Resting on HP only and inclined to both the planes); Prisms, Pyramids, Cylinders & Cones.

Number of Hours: 08

Module-3

Section of Solids:

Introduction, Section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No Problems for practice)

Development of Lateral Surfaces of Solids:

Development of lateral surfaces of right regular Prisms, Pyramids, Cylinders & Cones and their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

Number of Hours: 08

Module-4

Isometric Views:

Introduction to Isometric views, Isometric projections, Isometric scale.
Isometric view of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres, Isometric view of combination of two simple solids, step block.

Conversion of simple isometric drawings into orthographic views: Problems on conversion of Isometric view of simple objects / engineering components into orthographic views.

Number of Hours: 08

Module-5

Electrical Drawing (For CIE Only):

2D drawing of switches, sockets, panels, junction boxes, antenna, electric circuits.
Schematic diagrams of Automatic fire alarm, Call bell system, UPS system, Basic power system diagram.
Concept of Industrial drawing

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K. R. Gopalakrishna, & Sudhir Gopalakrishna: A Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
2. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd Edition, Charotar Publishing House Pvt. Limited, 2023.

Reference books:

1. S. N. Lal and T. Madhusudhan, Engineering Visualisation, engage Learning India Pvt. Ltd.; First Edition, 2022
2. P.J. Shah, Computer Aided Engineering Drawing, S. Chand Publishing, 2021
3. M. B. Shah & B.C. Rana., Engineering Drawing, Pearson Education, Revised Edition, 2009
4. Bhattacharya S. K., Electrical Engineering Drawing, New Age International Publishers, Second edition 1998, reprint 2005.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104172
- https://nptel.ac.in/courses/112102304
- https://nptel.ac.in/courses/112105294
- https://www.coursera.org/courses?query=3d%20modeling&utm
- https://elion.co.in/understanding-electrical-drawings-a-beginners-guide/

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Case-Based Teaching
- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least 5**0% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE**, a student must score at least 40**% of 50 marks**, i.e., 20 **marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 45 out of 100 marks**.

Continuous Internal Evaluation (CIE):

SCHEME FOR INTERNAL ASSESSMENT (IA)		
	DETAILS	**MAX. MARKS**
Manual Sketching (25)	Classwork	15
	Assignment	10
Computer Printout (15)	Classwork	15
	CIE*	10
	TOTAL IA MARKS	50
* Continuous Internal Evaluation (CIE) is based on the one test conducted during the end-semester.		

Semester End Examination (SEE):

Scheme of Evaluation for Semester End Examination (SEE)			
Unit	Maximum Marks	Manual Sketching	Computer solution and print out
1	10	10	00
2	20	10	10
3	20	10	10
OR			
4	20	10	10
Total	**50**	**30**	**20**

QUESTION PAPER PATTERN FOR SEMESTER END EXAMINATION (SEE)						
UNIT	1		2		3	4
Max. Marks	10		20		20	20
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6

NOTE:

1. Each Full question shall cover all the topics of the Unit.
2. Unit 2, Unit 3 and Unit 4 to have both manual sketching and computer solution/print out.
3. Unit 1 have only manual sketching.
4. Model question paper may be referred for distribution of topics in each Full Question.

Question no	**Topics**	**Sketching**	**Drafting**	
1	Projection of lines	10 M	-------	**10 M**
	OR			
2	Projection of planes	10 M	-----	
3	Projection of solids	10 M	10 M	**20M**
	OR			
4	Projection of solids	10 M	10 M	
5	Isometric projection	10 M	10 M	**20 M**
	OR			
6	Development of solids	10 M	10 M	
	Total Marks			**50 M**

MAPPING OF COs WITH POs												
COs/POs	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO1**	**PO1**	**PO12**
CO1	3	2	2	1	2	0	1	1	2	2	0	2
CO2	3	2	2	1	2	0	1	1	2	2	0	2
CO3	3	2	2	1	2	0	1	1	2	2	0	2
CO4	3	2	2	1	2	0	1	1	2	2	0	2
CO5	3	2	2	1	2	0	1	1	2	2	0	2
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Civil Engineering
Scheme and Syllabus 2025 - 26

Course Title	**BUILDING SCIENCE AND MECHANICS**						
Course Code	**1BEST104A / 1BEST204A**						
Category	**Engineering Science Course (ESC) - I/II**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Objectives:

To provide students with a foundational understanding of the discipline, including its various sub-disciplines, fundamental concepts, real-world applications, infrastructure planning, material properties, and structural analysis in the Civil Engineering field.

UNIT – I **08 Hours**

INTRODUCTION TO BUILDING SCIENCE:

IMPORTANCE AND SCOPE OF VARIOUS FIELDS OF CIVIL ENGINEERING:

Surveying, Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Environmental Engineering, Construction Planning and Project Management.

BASIC MATERIALS OF CONSTRUCTION:

Types and Uses of Bricks, Stones, Cement, Structural Steel, Wood and Concrete.

STRUCTURAL ELEMENTS OF A BUILDING:

Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab, Flooring and Staircase.

UNIT – II **08 Hours**

SUSTAINABLE BUILT ENVIRONMENT:

Introduction to sustainable development goals, Smart city concept, Clean city concept, Safe city concept.

EMERGING MATERIALS:

Types and Uses of Autoclaved Aerated Concrete (AAC) blocks, Bamboo, Recycled plastics, Material selection criteria, Durability, Sustainability, Smart City concept.

GREEN BUILDING:

Green building materials and rating systems IGBC, LEED, GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose – Key highlights – Point System with Differential weightage.

UNIT – III **08 Hours**

FORCE SYSTEMS:

Concept of idealization, System of forces, Principles of transmissibility of a force, Resolution and composition of forces, Law of Parallelogram of forces, Concurrent and non-concurrent coplanar force systems, Moment of forces, Couple, Varignon's theorem, Numerical examples.

UNIT – IV **08 Hours**

EQUILLIBRIUM AND SUPPORT REACTIONS:

Free body diagram, equations of equilibrium, Lami's Theorem, Equilibrium of Coplanar Concurrent and Non-concurrent force systems: Numerical examples.

Types of loadings, beams and supports, Concept of Statically determinate and indeterminate structures (Definitions with examples only).

Support reactions: Numerical examples on Statically determinate beams.

UNIT – V **08 Hours**

CENTROID OF PLANE AREAS:

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle and quadrant of a circle using method of integration, centroid of composite areas and simple built up sections: Numerical examples.

Teaching & Learning Process:

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Flipped class
2. Chalk and talk
3. NPTEL and other videos for theory topics
4. Partial Delivery of course by Industry expert/ industrial visits
5. ICT-Enabled Teaching
6. Individual teachers can device innovative pedagogy to improve teaching-learning

Course Outcomes: The students will be able to	
CO1	Explain the fundamental concepts of building science, disciplines of civil engineering, construction materials, and structural elements of buildings.
CO2	Evaluate the sustainability aspects of the built environment through appropriate selection of green materials and interpretation of rating systems.
CO3	Analyse the principles of force systems.
CO4	Analyse equilibrium to determine support reactions.
CO5	Locate the centroid of simple and composite plane areas using first principles.

Text Books:	
1	Rangwala, Building Construction, 33rd Edition, 2016, Charotar Publishing House Pvt. Ltd., ISBN-10 : 9385039040, ISBN-13 : 978-9385039041
2	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 3rd Edition, 2015, Laxmi Publications, ISBN: 9789380856674.
3	Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 11th Edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896

Reference Books:	
1	Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, 4th Edition, 1987, McGraw Hill, ISBN: 9780070045842
2	Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–6th Edition, 2008, Wiley publication.
3	Irving H. Shames, Engineering Mechanics-Statics and Dynamics, 4th Edition, 2002, Prentice-Hall of India(PHI).
4	Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi, ISBN:9789332584747.
5	Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017, McGraw Hill Publisher, ISBN: 9781259062667

6	Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications.
7	Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, third edition 2013, BS Publications.

Web links and Video Lectures (e-Resources)	
1	https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
2	https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2
3	https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
4	https://www.youtube.com/watch?v=3YBXteL-qY4
5	https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
6	https://www.youtube.com/watch?v=ksmsp9OzAsI
7	https://www.youtube.com/watch?v=x1ef048b3CE
8	https://www.youtube.com/watch?v=l_Nck-X49qc
9	https://www.youtube.com/watch?v=R8wKV0UQtlo
10	https://www.youtube.com/watch?v=0RZHHgL8m_A
11	https://www.youtube.com/watch?v=Bls5KnQOWkY
	Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning
12	https://www.youtube.com/watch?v=Zrc_gB1YYS0
13	https://www.youtube.com/watch?v=Hn_iozUo9m4

Assessment Structure: (Both CIE and SEE)
The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.

Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.
Learning Activity -1: (Marks- ___)
Learning Activity -2 (optional): (Marks- ___)

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator- 1(CO/PO Mapping)					
PerformanceIndicator-2(CO/PO Mapping)					
….					
Performance Indicator-n (CO/PO Mapping)					

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching
- Role Play

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3						1				1
CO2	3						1				1
CO3	3	1									1
CO4	3	1									1
CO5	3	1									1

Dr . Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Scheme and Syllabus 2025 -2026

Course Title	**INTRODUCTION TO ELECTRICAL ENGINEERING**						
Course Code	**1BEST104B/204B**						
Category	**Engineering Science Course (ESC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**03**	**40**	**03**
CIE Marks**: 50**	SEE Marks**: 50**		Total Max. marks = **100**		Duration of SEE**: 03** Hours		

COURSE OBJECTIVE:

1. Describe the basic laws of electrical engineering and energy billing.
2. Explain the working of basic electrical parameters under sinusoidal excitation.
3. Make use of three phase system of power supply
4. Predict the values of electrical parameters and quantities.
5. Explain electric, wiring schemes and equipment and personal safety measures.

UNIT I **8 hours**

Power Generation: Conventional and nonconventional energy sources. Single-line diagram of power supply system showing power station, transmission system and distribution system. Definition of power grid.

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.

UNIT II **8 hours**

Single-Phase Circuits: Generation of single-phase system. Equation of AC voltage and current, average value, RMS value, form factor, peak factor and their relation [No derivations]. Voltage and current relationships in R, L and C circuits, concept of power, reactive power, apparent power and power factor, analysis of R-L, R-C and R-L-C series circuits, parallel circuits, illustrative examples.

Three-Phase Circuits: Generation of three-phase systems, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections. Definition of balanced and unbalanced source and load. Power, reactive power and power factor. Problems with balanced loads.

UNIT III **8 hours**

DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Simple problems.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control of DC shunt motor. Applications of DC motors. Simple problems.

UNIT IV **8 hours**

Transformers: Introduction to transformers, necessity of transformer, principles of operation, constructional features of single phase transformers. EMF equation, losses, variation of losses with respect to load. Calculation of efficiency at different loads.

Three-phase induction Motors: Definition of rotating magnetic field (without derivation), Principle of operation. Constructional features of squirrel cage type and wound rotor type induction motor. Slip and its significance, problems. Applications.

UNIT V **8 hours**

Domestic Wiring: Two-way and three-way control of loads.

Electricity Bill: Definition of "unit" used for consumption of electrical energy, power rating of common household appliances. Two-part electricity tariff.

Equipment Safety measures: Working principle of fuse and miniature circuit breaker (MCB), merits and

demerits.

Personal safety measures: Electric shock, safety precautions to avoid shock. Earthing and types: Plate earthing and pipe earthing.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1. Explain the generation of power and the laws used in DC circuits.
CO2. Analyse single-phase and three-phase circuits.
CO3. Describe the construction, operation and applications of DC machines.
CO4. Describe the construction, operation and applications of transformers and induction motors.
CO5. Explain electricity billing and safety measures

TEXTBOOKS

1. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.

REFERENCE BOOKS

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.0
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.
3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.
4. Basic Electrical and Electronics Engineering, K.Vijayarekha, et al, Cengage. Reprint 2023.
5. Handbook of Electrical Engineering formulae, Harish C Rai, CBS Publications, 2018.

ONLINE RESOURCES

Web links and Video Lectures (e-Resources): www.nptel.ac.in
(1) Principle of Electrical Sciences, Prof Sanjay Agrawal, Indira Gandhi National Open University.
(2)Electricity and Electrical Wiring, Dr. Antara Mahanta Barua, Krishna Kanta Handiqui State Open University, Guwahati.

SCHEME FOR EXAMINATIONS

i. The question paper will have ten full questions carrying equal marks.
ii. Each full question will be for 20 marks.
iii. There will be two full questions from each module
iv. Each full question will have sub-questions (subject to a maximum of four sub-questions)
v. The students have to answer five full questions, selecting one full question from each module.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2											3		
CO 2	3	3											3		
CO 3	3	2	2										3		
CO 4	3	2											3		
CO 5	2					3	2	2		2					3

Strength of correlation: Low-1, Medium- 2, High-3

I/II Semester

INTRODUCTION TO ELECTRONICS AND COMMUNICATION ENGINEERING			
Course Code:	1BEST104C/204C	**CIE Marks:**	50
Teaching Hours/Week (L:T:P:S):	3:0:0:0	**SEE Marks:**	50
Total Hours of Pedagogy:	40	**Total Marks:**	100
Credits:	03	**Exam Hours:**	03

Course objectives:

1.To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.

2. To equip students with a foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

3. Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

Module-1	**08 hrs**

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Voltage multipliers. (Numerical on Rectifiers & Regulators)

Amplifiers – Bipolar Junction Transistor-Current components and Voltages, Amplifying action, BJT as a switch: Cut-off and saturation modes. (Text 1)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-2	**08 hrs**

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op- amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, Subtractor, integrator, differentiator. (Text 1) Numerical

Oscillators – Barkhausen criterion, Ladder network oscillator, Wein bridge oscillator, Crystal controlled oscillators

(Only Concepts, working, and waveforms. No mathematical derivations) Numerical

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-3	**08 hrs**

Binary Systems: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements (1's, 2's, 9's and 10's complements).

Boolean Algebra and Logic Circuits: Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Digital Logic Gates (Text 2)

Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder (Text 2)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-4	**08 hrs**

Embedded Systems: Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC (Text 3)
Sensors and Interfacing: Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display. (Text 3)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-5	**08 hrs**

Analog Communication Schemes: Modern communication system scheme, Information source and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Types of communication systems. Types of modulation (only concepts) – AM, FM, PM.
Concept of Radio wave propagation (Ground, space, sky).
Digital Modulation Schemes: Advantages of digital communication over analog communication, ASK, FSK, PSK, Multiple access techniques: TDMA, FDMA, CDMA. (Text 4)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Course outcomes:

At the end of the course the student will be able to:

CO1. Understand the diode based and transistor-based circuits like Power supplies and Amplifiers.
CO2. Analyse and design transistor-based Oscillators and Operational amplifiers.
CO3. Apply the digital electronics knowledge to build arithmetic blocks for digital systems.
CO4. Understand the basics of microprocessor, microcontroller, RISC, CISC and Sensors based circuits.
CO5. Explain the operation and applications of modern communication systems.

Suggested Learning Resources:

Text Books:

1: Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015.
2: Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2017.
3: K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India) Private Limited, 2016.
4: S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher,2017. https://elib4u.ipublishcentral.com/pdfreader/communication-systems

Reference Books:

1: Mitchel E. Schultz, 'Grob's Basic Electronics', 11th Edition, McGraw-Hill, 2011.

Web Links: https://onlinecourses.nptel.ac.in/noc21_ee55/preview

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1								1		2	1	2	
CO2	3	3								1		2	1	2	
CO3	3	2	2							1		2	1	2	
CO4	3									1		2	1	2	
CO5	3									1		2	1	2	

High-3, Medium-2, Low-1

INTRODUCTION TO MECHANICAL ENGINEERING		Semester	I/II
Course Code	1BEST104D/204D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3-0-0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	50
Credits	3	Exam Hours	3
Examination type (SEE)	**Theory**		

Course outcomes

At the end of the course, the student will be able to:

1. Recognize the significance of mechanical engineering principles to solve the problems of social relevance.
2. Understand the working of I.C. engines, power transmission elements and future mobility vehicles.
3. Discuss the properties and applications of engineering materials, composite materials and smart materials.
4. Describe the working principles and applications of various manufacturing processes.
5. Explain the advances in mechanical engineering.

Module-1

Introduction: Streams in mechanical engineering and their relevance/significance, role of mechanical engineers in solving the real case problems (with examples), careers in mechanical engineering.

Realization of some of the engineering solutions through principles of mechanical engineering(with a schematic diagram):

Energy conversion: Introduction and basic working principles of Pelton Turbine and Centrifugal pump.

Vehicle systems: Identification of parts of vehicle systems such as steering system, brake system, gear system, working principle of Power steering.

Flying machines: Classification, basic parts involved in drone making, working principle of Drones.

Refrigeration and air conditioning principles.

Number of Hours:8

Module-2

Engines: Introduction, petrol engine, diesel engines, Working of four Stroke engines, applications.

Insight into Future Mobility: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles.

Power Transmission systems: Classification of gears, simple & compound gear trains, concepts of automatic and CVT transmission.

Number of Hours:8

Module-3

Engineering materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties and their applications.

Composite materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials.

Smart materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys and Advantages, Disadvantages and Applications.

Number of Hours:8

Module-4

Manufacturing overview, classification of manufacturing processes, process selection criterion.
Principles of Welding, soldering, brazing.
Introduction to machine tools – lathe, drilling and milling machine.
Lathe operations: Turning, facing, knurling,
Drilling machine operations: Drilling, reaming, tapping.
Milling machine operations: End milling, face milling.
Introduction to CNC, components, advantages and applications.
Basic principles of 3D printing.

Number of Hours:8

Module-5

Advances in mechanical engineering
Automation technology: Definition of automation, types of automation, basic elements of automation.
Mechatronic systems: Definition of mechatronics, elements of mechatronics systems, examples.
Elementary sensors: Working principle and applications of Potentiometer, capacitive sensor and optical encoders.
Integrated system: Need for integration of technologies, ADAS (Advanced Driver Assistance System).

Number of Hours:8

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2008
2. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012

Reference books / Manuals:

1. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.
2. William D. Callister, Materials Science & Engineering, An Introduction, John Wiley & Sons Inc, 2010.
3. V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Education; 4th edition, 2017.
4. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1
5. Groover M. P.(2008). Automation, production systems, and computer integrated manufacturing, 3rd ed. Prentice Hall.
6. Dr SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A Practical Approach", ETI Labs

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104526
- https://nptel.ac.in/courses/112104616
- https://nptel.ac.in/courses/112104769
- https://theconstructor.org/practical-guide/pelton-turbine-parts-working-design-aspects/2894/
- https://www.mechstudies.com/centrifugal-pump/
- https://cfdflowengineering.com/working-principle-and-components-of-drone/
- https://youtu.be/i1ojp09VXHY
- https://www.theengineerspost.com/automatic-transmission/
- https://learnmech.com/continuously-variable-transmission-components-working-types/

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Simulation and Virtual Labs
- Partial Delivery of course by Industry experts
- ICT-Enabled Teaching
- Video demonstration

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50).

Continuous Internal Evaluation (CIE) (Marks)				
Test 1	**Test 2**	**Assignment**	**Group discussion**	**Total**
20	**20**	**05**	**05**	**50**

Semester End Examination (SEE):

QUESTION PAPER PATTERN (SEE)										
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

MAPPING OF COs WITH POs												
COs/POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1	1	2	2	1	1	1	1	3
CO2	3	2	2	1	1	2	2	1	1	1	1	3
CO3	2	1	1	1	2	2	2	1	1	1	1	3
CO4	3	1	2	1	2	2	2	1	1	1	1	3
CO5	3	2	2	1	1	2	2	1	1	1	1	3
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0												
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Information Science and Engineering
Scheme and Syllabus - 2025 -2026

Course Title	**ESSENTIALS OF INFORMATION TECHNOLOGY**						
Course Code	**1BEST104E / 1BEST204E**						
Category	**Engineering Science Courses-I(ESC-I)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**39**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

Course Objectives:

1. Explain the concept of Data storage and Data Manipulation.
2. Illustrate the concepts of Algorithm and Operating systems.
3. Explain the concepts of networking and cybersecurity.
4. Demonstrate the use of Software Life Cycle and Database Fundamentals.
5. Basics on HTML, Artificial Intelligence and Computer Graphics

UNIT I : **08 hours**

Data Storage: Bits and Their Storage, Main Memory, Mass Storage, Representing Information as Bit Patterns, The Binary System, Storing Integers, Storing Fractions.

Data Manipulation: Computer Architecture, Machine Language, Program Execution, Arithmetic/Logic Instructions, Communicating with Other Devices.

Textbook 1: Chapter-1 (1.1-1.7), Chapter-2 (2.1-2.5)

UNIT II **08 hours**

Operating Systems: The History of Operating Systems, Operating System Architecture, Coordinating the
Machine's Activities, Handling Competition Among Processes, Security.

Algorithms: The Concept of an Algorithm, Algorithm Representation, Algorithm Discovery.

Textbook 1: Chapter-3, Chapter-5 (5.1-5.3)

UNIT III **08 hours**

Networking and the Internet: Network Fundamentals, The Internet, The World Wide Web, Internet Protocols, Security.

Cybersecurity: Overview—What is Cybersecurity?, Brief History of Cybersecurity Events, The Basic Information Security Model, Cyber Hygiene, Teams in Cybersecurity.

Ethical Issues in Information Technology: Overview, Ownership Rules, Ethics and Online Content.

Textbook 1: Chapter-4
Textbook 2: Chapter-16, Chapter-17

UNIT IV **08 hours**

Software Engineering: The Software Engineering Discipline, The Software Life Cycle, Software Engineering Methodologies, Modularity, Tools of the Trade.

Database Systems: Database Fundamentals, The Relational Model.

Textbook 1: Chapter-7 (7.1-7.5), Chapter-9 (9.1-9.2)

UNIT V **07 hours**

Introduction to HTML and Website Development: What is HTML?, Cascading Style Sheets (CSS), Website
Design and Storyboarding, Structure of a Website.

Artificial Intelligence: Intelligence and Machines, Perception, Reasoning

Computer Graphics: The Scope of Computer Graphics, Overview of 3D Graphics, Modeling, Rendering.

Textbook 2: Chapter-12.
Textbook 1: Chapter-10 (10.1-10.4)
Textbook 1:Chapter-11

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Course Outcome:

At the end of the course, the student will be able to:

CO1: Illustrate different information representation and manipulation schemes.
CO2: Make use of Information Technology (IT) infrastructure for information exchange.
CO3: Apply basic software engineering concepts for Website and application development.
CO4: Develop queries for quick insert, access and updating of structured information.
CO5: Identify role of cybersecurity and ethics issues in Information Technology (IT).

TEXT BOOKS:

1. J. Glenn Brookshear and Dennis Brylow, Computer Science: An Overview, 12th Edition, Pearson Education Limited, 2017.
2. Roy, Shambhavi; Daniel, Clinton; and Agrawal, Manish, "Fundamentals of Information Technology", Digital Commons at The University of South Florida (2023). https://digitalcommons.usf.edu/dit_tb_eng/19

REFERENCE BOOKS:

1. V. Rajaraman, "Introduction to Information Technology", Third Edition, PHI Learning, 2018.
2. Pelin Aksoy, Information Technology in Theory, First Edition, Cengage.

EBOOKS/ONLINE RESOURCES

- Information Technology: https://onlinecourses.swayam2.ac.in/cec20_cs05/preview
- Computer Organization and Architecture: https://nptel.ac.in/courses/106103068
- Introduction To Internet: https://nptel.ac.in/courses/106105084

SCHEME FOR EXAMINATIONS:

The theory part of the PCC shall be evaluated both by CIE and SEE.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								2	2		2		2		1
CO2	2	2	2	2	2			2	2		2		2		1
CO3	2	2	2	2	2			2	2		2		2		1
CO4	2	2	2	2	2			2	2		2		2		1
CO5	2		2					2	2		2		2		1
Strength of correlation: Low-1, Medium- 2, High-3															

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Computer Science & Engineering
Scheme and Syllabus 2025 – 26

Course Title	**INTRODUCTION TO C PROGRAMMING**						
Course Code	**1BPLU105A /1BPLU205A**						
Category	**Programming Language Courses (PLC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	**02**	00	**02**	52	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES

1. To provide a strong foundation in the fundamental concepts and structure of C programming.
2. To enable learners to apply control structures for decision-making and iteration in computational problem-solving.
3. To build problem-solving skills using arrays, strings, and related operations for real-world applications.
4. To develop the ability to design modular and reusable programs through user-defined functions.
5. To enhance understanding of advanced C features like structures and pointers for efficient data representation and manipulation.

UNIT-1 (08 hrs)
Flowchart and Algorithms: Art of Programming through Algorithms & Flowcharts. **Overview of C:** History of C, Importance of C, Basic Structure of C Programs, Programming Style, Compiling and Executing a 'C' Program. **Constants, Variables and Data Types:** Character Set, C Tokens, Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning Values to Variables, Defining Symbolic Constants, Declaring a Variables as Constants and Volatile, Input/Output Statements in C. **Textbook: Chapter 1. 6, 2.1, 2.2, 2.8, 2.9, 2.10, Chapter 3.2 to 3.14, Chapter 5.1 to 5.5**
UNIT-2 (08 hrs)
Operators: Introduction to Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Precedence of Arithmetic Operators. **Decision Making, Branching, Looping:** Introduction, Decision Making with IF Statement, Simple IF Statement, The IF..ELSE Statement, Nesting of IF..ELSE Statements, The ELSE IF Ladder, The Switch Statement, The ?: Operator, The GOTO Statement, WHILE, DO, FOR, Jumps in LOOPS. **Textbook: Chapter 4.1 to 4.7, 4.12, Chapter 6.1 to 6.9, Chapter 7.1 to 7.5**

UNIT-3 (08 hrs)

Arrays and Strings: Introduction, Declaration and Initialization of One-dimensional and Two-Dimensional Arrays, Declaring and Initializing String Variables, Example programs using arrays, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, Comparison of Two Strings, String-handling Functions.

Textbook: Chapter 8.1 to 8.6, Chapter 9.2 to 9.5, 9.7, 9.8

UNIT-4 (08 hrs)

User-defined Functions: Introduction, Need for User-defined Functions, A Multi-functional Program, Elements of User-defined Functions, Definition of Function, Return Values and their Types, Function Calls, Function Declaration, No Arguments and no Return Values, Arguments but no Return Values, Nesting of Functions.

Textbook: Chapter 10.1 to 10.8, 10.10 to 10.14

UNIT-5 (08 hrs)

Structures and Pointers: Introduction, Defining a Structure, Declaring and Accessing Structure Variables and Members, Structure Initialization, Copying and Comparing Structure Variables, Array of Structures, Arrays within Structures.

Pointers: Introduction, Understanding Pointers, Accessing the Address of Variable, Declaring pointer variables, initialization of pointers, accessing variables through its pointer.

Textbook: Chapter 11.1 to 11.6, 11.8, 11.19, Chapter 12.1 to 12.6

Programming Exercises

Lab Component-12 Hours

1. Develop a program to calculate the temperature converter from degree to Fahrenheit.
2. Develop a program to find the roots of quadratic equations.
3. Develop a program to find whether a given number is prime or not.
4. Develop a program to find key elements in an array using linear search.
5. Given age and gender of a person, develop a program to categorise senior citizen (male & female).
6. Generate Floyd's triangle for given rows.
7. Develop a program to find the transpose of a matrix.
8. Develop a program to concatenate two strings, find length of a string and copy one string to other using string operations.
9. Develop a modular program to find GCD and LCM of given numbers.
10. Develop a program to declare the structure of employees and display the employee records with higher salary among two employees.
11. Develop a program to add two numbers using the pointers to the variables.
12. Develop a program to find the sum of digits of a given number.
13. Develop a program to perform Matrix Multiplication.
14. Develop a program to create an array of structures to store book details and check whether a specific book, as requested by the user, is available or not

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to,

CO1: Explain the fundamental structure of a C program and primitive constructs.
CO2: Apply decision-making and iterative control structures to solve simple computational problems.
CO3: Develop programs using arrays and string operations to solve real-world problems.
CO4: Construct user-defined functions to modularize the solution to the given problems.
CO5: Build programs using structures and pointers for complex data representation and access.

TEXT BOOKS

1. Programming in ANSI C, 9e, E Balaguruswamy, Tata McGraw Hill Education

REFERENCE BOOKS

1. PROGRAMMING IN C, Reema Thareja, Oxford University, Third Edition, 2023.
2. The 'C' Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Second Edition, Prentice Hall of India, 2015.

ONLINE RESOURCES

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. https://nptel.ac.in/courses/106/105/106105171/ MOOC

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	-	-	-	-	-	-	-
CO2	2	2	2	1	3	-	-	-	-	-	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	-
CO4	2	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-
Strength of correlation: Low-1, Medium- 2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Computer Science & Engineering
Scheme and Syllabus 2025 – 26

Course Title	**PYTHON PROGRAMMING**						
Course Code	**1BPLU105B / 1BPLU205B**						
Category	**Programming Language Courses (PLC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	**02**	00	**02**	52	**04**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES

Describe the core syntax and semantics of Python programming language.

1. Discover the need for working with the strings and functions.
2. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
3. Indicate the use of built-in functions to navigate the file system.
4. Infer the Object-oriented Programming concepts in Python.

UNIT-1 (08 hrs)
The way of the program: The Python programming language, what is a program? What is debugging? Syntax errors, Runtime errors, Semantic errors, Experimental debugging. **Variables, Expressions and Statements:** Values and data types, Variables, Variable names and keywords, Statements, Evaluating expressions, Operators and operands, Type converter functions, Order of operations, Operations on strings, Input, Composition, The modulus operator. **Iteration:** Assignment, Updating variables, the for loop, the while statement, The Collatz 3n + 1 sequence, tables, two-dimensional tables, break statement, continue statement, paired data, Nested Loops for Nested Data. **Functions:** Functions with arguments and return values. **Chapters: 1.1-1.7, 2.1-2.12, 3.3, 4.4, 4.5**
UNIT-2 (08 hrs)
Strings: Working with strings as single things, working with the parts of a string, Length, Traversal and the for loop, Slices, String comparison, Strings are immutable, the in and not in operators, A find function, Looping and counting, Optional parameters, The built-in find method, The split method, Cleaning up your strings, The string format method. **Tuples:** Tuples are used for grouping data, Tuple assignment, Tuples as return values, Composability of Data Structures. **Lists:** List values, accessing elements, List length, List membership, List operations, List slices, Lists are mutable, List deletion, Objects and references, Aliasing,

cloning lists, Lists and for loops, List parameters, List methods, Pure functions and modifiers, Functions that produce lists, Strings and lists, list and range, Nested lists, Matrices.

Chapter: 5.1, 5.2, 5.3

UNIT-3 (08 hrs)

Dictionaries: Dictionary operations, dictionary methods, aliasing and copying.
Numpy: About, Shape, Slicing, masking, Broadcasting, dtype.
Files: About files, writing our first file, reading a file line-at-a-time, turning a file into a list of lines, Reading the whole file at once, working with binary files, Directories, fetching something from the Web.
Chapter: 5.4, 6.1-6.5, 7.1-7.8

UNIT-4 (08 hrs)

Modules: Random numbers, the time module, the math module, creating your own modules, Namespaces, Scope and lookup rules, Attributes and the dot Operator, Three import statement variants.
Mutable versus immutable and aliasing Object oriented programming: Classes and Objects — The Basics, Attributes, Adding methods to our class, Instances as arguments and parameters, Converting an instance to a string, Instances as return values.
Chapter: 8.1-8.8, 9.1, 11.1

UNIT-5 (08 hrs)

Object oriented programming: Objects are mutable, Sameness, Copying.
Inheritance: Pure functions, Modifiers, Generalization, Operator Overloading, Polymorphism.
Exceptions: Catching Exceptions, Raising your own exceptions.
Chapter: 11.2.2-11.2.4, 11.3.2-11.3.9, 12.1, 12.2

Programming Exercises

PART – A: FIXED SET OF EXPERIMENTS---12 HOURS

1. a. Develop a python program to read 2 numbers from the keyboard and perform the basic arithmetic operations based on the choice. (1-Add, 2-Subtract, 3-Multiply, 4-Divide).
b. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.

2. a. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
b. Write a python program to create a list and perform the following operations
• Inserting an element
• Removing an element
• Appending an element
• Displaying the length of the list
• Popping an element
• Clearing the list

3. a. Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.

b. Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with a suitable message.

4. Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use a dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display the dictionary slice of the first 10 items.
5. Develop a program to read 6 subject marks from the keyboard for a student. Generate a report that displays the marks from the highest to the lowest score attained by the student. [Read the marks into a 1-Dimesional array and sort using the Bubble Sort technique].

6.Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(),readlines(), and write()].

7.Develop a function named DivExp which takes TWO parameters a, b, and returns a value c (c=a/b). Write a suitable assertion for a>0 in the function DivExp and raise an exception for when b=0. Develop a suitable program that reads two console values and calls the function DivExp.

8. Define a function that takes TWO objects representing complex numbers and returns a new complex number with the sum of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.

9. Text Analysis Tool: Build a tool that analyses a paragraph: frequency of each word, longest word, number of sentences, etc.

10. Develop Data Summary Generator: Read a CSV file (like COVID data or weather stats), convert to dictionary form, and allow the user to run summary queries: max, min, average by column.

11. Develop Student Grade Tracker: Accept multiple students' names and marks. Store them in a list of tuples or dictionaries. Display summary reports (average, topper, etc.).

12. Develop a program to display contents of a folder recursively (Directory) having sub-folders and files (name and type).

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to,

CO1: Develop scripts using primitive language constructs of python.
CO2: Identify the methods to manipulate primitive python data structures.
CO3: Make use of Python standard libraries for programming.
CO4: Build scripts for performing file operations.
CO5: Illustrate the concepts of Object-Oriented Programming as used in Python.

TEXT BOOKS

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers- How to think like a computer scientist: learning with python 3. Green Tea Press, Wellesley, Massachusetts,2020
   https://media.readthedocs.org/pdf/howtothink/latest/howtothink.pdf

REFERENCE BOOKS

1. Al Sweigart,“ Automate the Boring Stuff with Python, 2nd Edition: Practical Programming for Total Beginners”,2nd Edition, No Starch Press, 2022. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/)
2. Kyla McMullen, Elizabeth Matthews and June Jamrich Parsons, Programming with Python, Cengage, 2023.
3. Gowrishankar S, Veena A, **“Introduction to Python Programming”,** 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

ONLINE RESOURCES

1. https://www.learnbyexample.org/python/
2. https://www.learnpython.org/
3. https://pythontutor.com/visualize.html#mode=edit

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	-	-	-	-	-	-	-
CO2	2	2	2	1	3	-	-	-	-	-	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	-
CO4	2	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-

Strength of correlation: Low-1, Medium- 2, High-3

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Civil Engineering
Scheme and Syllabus 2025 - 26

Course Title	**ENGINEERING MECHANICS**						
Course Code	**1BCVT105/205**						
Category	**Professional Specific Course (PSC)**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	3	**0**	**0**	**0**	**3**	**40**	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 03 hours**		

Course Learning Outcomes:
To make students analyze the problems involving forces, moments with their applications, understand the concept of equilibrium and friction along with their applications and develop the student's ability to find out the center of gravity and moment of inertia and their applications.

UNIT – I **08 Hours**

FORCE SYSTEMS:

Basic dimensions and units, Idealisation, Force, Classification of force system, Principle of transmissibility of a force, Composition and Resolution of forces, Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Moment, Couple and Characteristics of couple, Varignon's theorem, Numerical Examples.

UNIT – II **08 Hours**

EQUILIBRIUM:

Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems, Lami's theorem, Equilibrium of coplanar non-concurrent force system, Numerical examples.

Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams.

Support reactions for statically determinate beams subjected to various loadings, Numerical examples.

UNIT – III **08 Hours**

FRICTION:

Introduction, Types of friction, Concept of static friction, Kinetic (Dynamic) friction, Laws of friction, Angle of friction, Angle of repose, Cone of friction, Equilibrium of blocks on horizontal and inclined plane, Ladder friction, Wedge friction, Numerical examples.

UNIT – IV **08 Hours**

CENTROID:

Introduction, Definitions of centroid and centre of gravity, Axes of reference, Axes of symmetry, Locating the centroid of square, rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, Centroid of composite areas and simple built-up sections, Numerical examples.

UNIT – V **08 Hours**

MOMENT OF INERTIA OF PLANE AREAS:

Introduction, Moment of inertia about an axis, Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration, Moment of inertia of square, rectangular, triangular and circular areas from the method of Integration, Moment of inertia of composite areas and simple built-up sections, Numerical Examples.

Teaching & Learning Process:

Chalk and talk, Power point presentations, Animations and Videos.

Course Outcomes: The students will be able to	
CO1	Understand the concept of engineering mechanics, force system and Compute the resultant of various force systems, examine the types of loads on rigid bodies.
CO2	Analyze the forces for equilibrium and the reactive forces in various members of the structure.
CO3	Analyze the forces and behavior of bodies in contact with different surfaces.
CO4	Locate the centroid of the plane and built-up sections.
CO5	Compute the moment of inertia of the plane and built-up sections.

Text Books:	
1	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674.
2	Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896.

Reference Books:	
1	Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, Fourth edition, 1987, McGraw Hill, ISBN: 9780070045842.

2	Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition, 2008, Wiley publication.
3	Irving H. Shames, Engineering Mechanics-Statics and Dynamics, fourth edition, 2002, Prentice-Hall of India (PHI)
4	Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi. ISBN:9789332584747.
5	Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017, McGraw Hill Publisher, ISBN: 9781259062667
6	Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications.
7	Reddy Vijaykumar K and Suresh Kumar K, Engineering Mechanics, third edition 2013, BS Publications
8	J K Gupta and S K Gupta, Engineering Mechanics and Applied Mechanics, first edition, 2021, Cengage learning. ISBN: 9789353505851.

Web links and Video Lectures (e-Resources)	
1.	https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT
2.	https://www.youtube.com/watch?v=nkg7VNW9UCc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=2
3.	https://www.youtube.com/watch?v=ljDIIMvxeg&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=5
4.	https://www.youtube.com/watch?v=VQRcChR9IkU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=18
5.	https://www.youtube.com/watch?v=3YBXteL-qY4
6.	https://www.youtube.com/watch?v=z95UW4wwzSc&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=10
7.	https://www.youtube.com/watch?v=lheoBL2QaqU&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT&index=7
8.	https://www.youtube.com/watch?v=atoP5_DeTPE
9.	https://www.youtube.com/watch?v=ksmsp9OzAsI
10.	https://www.youtube.com/watch?v=x1ef048b3CE
11.	https://www.youtube.com/watch?v=l_Nck-X49qc
12.	https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force

13.	https://www.youtube.com/watch?v=RIBeeW1DSZg
14.	https://www.youtube.com/watch?v=R8wKV0UQtlo
15.	https://www.youtube.com/watch?v=0RZHHgL8m_A
16.	https://www.youtube.com/watch?v=Bls5KnQOWkY

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

• To qualify and become eligible to appear for SEE, a student must score at least 40% of 50 marks i.e., 20marks in the CIE.

• To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks.

• A student is considered to have passed the course, provided the combined total of CIE and SEE is at least40 out of 100 marks.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course objectives and promote higher-order thinking and application-based learning.

Learning Activity -1: (Marks- ___)

Learning Activity -2 (optional): (Marks- ___)

Rubrics for Learning Activity (Based on the nature of learning activity, design the rubrics for each activity):

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator - 1(CO/PO Mapping)					
PerformanceIndicator - 2(CO/PO Mapping)					
….					
Performance Indicator-n (CO/PO Mapping)					

Suggested Learning Activities may include (but are not limited to):

- Course Project
- Case Study Presentation
- Programming Assignment
- Tool/Software Exploration
- Literature Review
- Open Book Test (preferably at RBL4 and RBL5 levels)
- GATE-based Aptitude Test
- Assignment (at RBL3, RBL4, or RBL5 levels)
- Any other relevant and innovative academic activity
- Use of MOOCs and Online Platforms

Suggested Innovative Delivery Methods may include (but are not limited to):

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching- Simulation and Virtual Labs
- Partial Delivery of course by Industry expert/ industrial visits
- ICT-Enabled Teaching- Role Play

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1									1
CO2	3	1									1
CO3	3	1									1
CO4	3	1									1
CO5	3	1									1

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Syllabus - CBCS – for AY 2025 -2026 - First Year Syllabus

Course Title	**BASICS OF ELECTRICAL ENGINEERING**						
Course Code	**1BEET105/205**						
Category	**PROGRAMME SPECIFIC COURSES (PSC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	**00**	**00**	**00**	**03**	**40**	**03**
CIE Marks**: 50**	SEE Marks**: 50**		Total Max. marks = **100**		Duration of SEE**: 03** Hours		

COURSE OBJECTIVE:

1. Understand the basic laws of electrical engineering and energy billing.
2. Explain the working of basic electrical parameters under sinusoidal excitation.
3. Analyze the series and parallel electrical circuits for voltage, current, power, and energy.
4. Describe the construction and working principles of electrical machines.
5. Explain electric power generation, transmission and distribution, wiring schemes and equipment and personal safety measures.

UNIT I **8 hours**

DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. Problems.

Electrostatics: Coulombs law, definitions of absolute and relative permittivity, electric field, electric flux, electric field strength, flux density. Capacitor: Expression of parallel plate capacitor, factors affecting capacitance, capacitors in series and capacitors in parallel, energy stored in an electrostatic field, problems.

Electromagnetism: Electromagnets-direction of flux produced, right-hand rule, definition-magnetic circuit, mmf, magnetic field strength, free space and relative permeability, reluctance, permeance, useful and leakage flux, simple series circuits and parallel circuit problems.

UNIT II **8 hours**

Electromagnetic Induction: Faraday's law of electromagnetic induction, Lenz's law, dynamically and statically induced emf, Fleming's right-hand rule. Simple problems. Inductance and mutual inductance, coefficient of coupling, energy stored and its applications. Force experienced by a current-carrying conductor placed in the magnetic field. Fleming's left-hand rule. Force between conductors carrying current in the same and in the opposite directions.

UNIT III **8 hours**

Single-phase Circuits: Generation of sinusoidal voltage, frequency of generated voltage, Expression of average value, RMS value, form factor and peak factor of sinusoidal voltage and current. Phasor representation of alternating quantities. Analysis of R, L and C circuits. Series and parallel R-L, R-C and R-L-C circuits with phasor diagrams, calculation of real power, reactive power, apparent power, and power factor, illustrative examples.

UNIT IV **8 hours**

Three- phase Circuits: Generation of three-phase system, definition of phase sequence, star and delta (mesh) connections, relation between phase and line values of voltages and of currents of star and delta connections, considering the phasor diagram. Definition of balanced and unbalanced source and load. Power,

reactive power and power factor. Problems on balanced loads. Measurement of 3-phase power by 2-wattmeter method. Expression of power factor in terms wattmeter readings. Effect of power factor on wattmeter readings. Comparison between single phase and three-phase systems.

UNIT V **8 hours**

Domestic Wiring: Service mains – overhead and underground. Types of wiring: Exposed to open space – wooden batten wiring and casing and capping. Concealed wiring: conduit wiring. Wiring for two-way and three-way control of load.

Domestic Electricity Bill: Power-rating of household connected loads. Sanctioned Load. Practical unit of measuring energy, energy expressed for commercial purposes - Unit, its definition.

Electricity bill [as per Electricity Supply Companies (escoms)]: Tariff method considered: two-part tariff. Particulars considered for billing: sanctioned load and units consumed. Calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principles of fuse and miniature circuit breaker (MCB), the merits and demerits of fuse and MCB.

Personal safety measures: Electric shock, possible effects of shocks. Safety precautions to avoid personal shock while dealing with electricity. Permanent measure: Earthing: Pipe and plate.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, video

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1. Apply the basic laws used in the analysis of DC circuits, Electrostatics and Electromagnetism.
CO2. Assess implications of electromagnetic induction.
CO3. Analyse the single phase circuits.
CO4. Analyse the three phase circuits and measure power.
CO5. Explain electricity billing, domestic wiring and safety measures against electricity.

TEXTBOOKS:

1. A textbook of Electrical Technology by B.L. Theraja, Volume-1, S Chand and Company, Reprint Edition 2014. [Covers modules 1 to 4]
2. Basic Electrical Engineering, D.C. Kulshreshtha, McGraw Hill, 2nd Edition, 2024. [Covers all modules]

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, McGraw Hill 2nd edition, 3rd Reprint 2024.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016.
4. Basic Electrical and Electronics Engineering, S.K Bhattacharya, et al, Pearson. 2nd edition, 2017.
5. Handbook of Electrical Engineering formulae, Harish C Rai, CBS Publications, 2018.

ONLINE RESOURCES

Web links and Video Lectures (e-Resources): www.nptel.ac.in

(1)Principle of Electrical Sciences, Prof Sanjay Agrawal, Indira Gandhi National Open University.

(2)Electricity and Electrical Wiring, Dr. Antara Mahanta Barua, Krishna Kanta Handiqui State Open University, Guwahati.

SCHEME FOR EXAMINATIONS

(i) The question paper will have ten full questions carrying equal marks.
(ii) Each full question will be for 20 marks.
(iii) There will be two full questions from each module
(iv) Each full question will have sub-questions (subject to a maximum of four sub-questions)
(iv) The students have to answer five full questions, selecting one full question from each module.

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2											3		
CO 2	3	2											3		
CO 3	3	3	2										3	2	
CO 4	3	3	2										3	2	
CO 5	2					3	2	2		2					3

I/II Semester

FUNDAMENTALS OF ELECTRONICS AND COMMUNICATION ENGINEERING			
Course Code:	**1BECT105/205**	**CIE Marks:**	50
Teaching Hours/Week (L:T:P:S):	3:0:0:0	**SEE Marks:**	50
Total Hours of Pedagogy:	40	**Total Marks:**	100
Credits:	03	**Exam Hours:**	03

Course objectives:

1. To make the students familiar with the basics of diodes and their applications.
2. To equip the students with basic knowledge of Bipolar Junction Transistors and Field Effect Transistor characteristics and their working.
3. To instil the fundamental concepts and applications of Op-Amp.
4. To introduce the communication concepts, modulation techniques and applications.
5. To acquaint with the basics of Digital Systems and Boolean Algebra.

Module-1	**08 hrs**

Diodes and Their Application: Introduction, Characteristics and Parameters, Diode Approximation, DC Load Line Analysis, Half Wave Rectifier, Full Wave Bridge Rectifier, Capacitor Filter Circuit (Only Qualitative Approach), Zener Diode and Its Use in Voltage Regulation, Diode Logic Circuit.
(Text 1: 2.1, 2.2, 2.3, 2.4, 2.9, 3.1, 3.2, 3.3, 3.7, 3.12)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-2	**08 hrs**

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT Amplification, BJT Switching, Common Base Characteristics, Common Emitter Characteristics, BJT Biasing, Fixed Biasing and Voltage Divider, DC Load Line and Bias Point.
Field Effect Transistor: Junction Field Effect Transistor (N-Channel), JFET Characteristics, MOSFETS: Enhancement MOSFETs. Case Study MOSFET as a Switch.
(Text 1: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 5.1,5.2, 5.4, 9.1, 9.2, 9.5)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-3	**08 hrs**

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical OpAmp, Schematic Symbol.
Op-Amp Parameters: Gain, Input Resistance, Output Resistance, CMRR, Slew Rate, Bandwidth, Input Offset Voltage, Input Bias Current and Input Offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp Configurations, Differential Amplifier, Inverting & Non Inverting Amplifier.
Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator.
(Text 2: 1.2, 1.3, 1.5, 2.2, 2.3, 2.4, 2.5, 2.6, 6.5, 6.12, 6.13)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-4	**08 hrs**

Fundamentals Of Communication: Elements of a Communication System, Communication Channels and

Their Characteristics: Wireline, Fiber Optic, Wireless Electromagnetic Channels.

Introduction to Analog Modulation Types: Amplitude Modulation, Frequency and Phase Modulation, Waveforms. (Excluding Derivation and Spectral Diagrams)

Applications: AM Radio Broadcasting, Superheterodyne FM Receiver, Mobile Wireless Telephone Systems. Case Study of Converting Analog Signal to Digital Signal Using PCM.

(Text 3: 1.2, 1.3, 3.1)

(Text 4: 3.5, 4.4.1, 4.5, 18.3.1, 18.3.2)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Module-5	**08 hrs**

Digital Systems and Binary Numbers: Digital Systems, Numbering System (Binary, Octal, Decimal and Hexadecimal), Number Base Conversion – (Binary to Decimal, Hexadecimal And Vice Versa), 1's and 2's Complement Operation, Signed Binary Numbers-Arithmetic Addition and Subtraction, Binary Logic.

Boolean Algebra: Basic Definitions, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Digital Logic Gates (Excluding Extension to Multiple Inputs, Positive and Negative Edge) NAND And NOR As Universal Gates (Excluding Multilevel Presentation), Binary Adders. (Half Adder and Full Adder) Case Study with 4-Bit Adder Simulation.

(Text 5: 1.1,1.2, 1.3, 1.4, 1.5, 1.6, 1.9, 2.2,2.4, 2.5, 2.6, 2.8, 3.6, 4.5)

Teaching Learning Method:	Chalk and Talk, power point presentation, animations, videos
RBT Level:	L1, L2

Course outcomes:

At the end of the course the student will be able to:

CO1. Apply the working principles, fundamental characteristics of various semiconductor devices including diodes, transistors and operational amplifiers in basic electronic circuits.

CO2. Analyse basic rectifier and amplifier circuits using the principles of diodes, BJTs, and operational amplifiers.

CO3. Illustrate the fundamental concepts of communication systems and their applications.

CO4. Design basic combinational circuits using the fundamental principles of digital systems.

CO5. Analyse the fundamental concepts of electronic circuits, communication systems, and digital systems for their role in building basic electronic applications.

Suggested Learning Resources:

Text Books:

1: David A Bell, Electronic Devices and Circuits, 5th Edition, Oxford University Press, 30th Impression, 2025.

2: Ramakanth A Gayakwad, Op-amps and Linear Integrated Circuits, 4th Edition, Pearson Education, 2015.

3: John G. Proakis, Masoud Saleh, Fundamentals of Communication Systems, Second Edition, Pearson Educations, Inc., 2014.

4: D.P Kothari and I J Nagrath, Basic electronics, Second Edition, McGraw Hill Education Pvt ltd, 2018.

5: M.Morris Mano and Michael D.Ciletti, Digital Design - With an Introduction to the Verilog HDL, VHDL and System Verilog 6th Edition, Pearson Education Inc, 2024.

Reference Books:

1: Mike Tooley, Electronic Circuits, Fundamentals & Applications, 5th Edition, Elsevier, 2020.

2: Albert Malvino, Electronic Principles, 9th Edition, McGraw Hill Publications, 2021.

3: Electronic Devices and Circuit Theory, R Nashelsky and L Nashelsky, 11th Edition, Pearson, 2012

Web Links:

• Introduction to Basic Electronics: https://nptel.ac.in/courses/122106025

• Digital Electronic Circuits https://nptel.ac.in/courses/108105132

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1							1		2	1	2	
CO2	3	2	1							1		2	1	2	
CO3	3		1							1		2	1	2	
CO4	3		2							1		2	1	2	
CO5	3		1							1		2	1	2	

High-3, Medium-2, Low-1

Elements of Mechanical Engineering		Semester	I / II
Course Code	**1BMET105/205**	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
Examination type (SEE)	Theory		

Course Outcomes

At the end of the course, the student will be able to:

1. Analyse the properties of steam, various engineering materials along with their classifications and applications.
2. Illustrate the basic concepts of thermodynamics, internal combustion engines and electric/hybrid vehicles.
3. Demonstrate the working and operations of machine tools and metal joining techniques.
4. Outline the configuration, anatomy, and performance parameters of robots.
5. Apply the concepts of belt and gear drives to solve basic numerical problems related to velocity ratio in gear drives.
6. Discuss the role of computer systems in manufacturing, their contribution to automation, and the applications of 3D printing and AI in mechanical engineering.

Module-1

Engineering materials: Introduction, Classification, Ferrous and Non-Ferrous metals: Types, Properties and their applications.

Composite materials: Introduction, Constituents of a composite, Classification, Types of Matrix and Reinforcement materials, Advantages, Disadvantages and Applications of composite materials in Aerospace and Automobile industries.

Smart materials: Introduction, Types - Piezoelectric materials, MR fluids, Shape memory alloys and Advantages, Disadvantages and Applications.

Nano materials: Introduction, Types of nano materials, Advantages, Disadvantages and Applications.

Number of Hours: 8

Module-2

Concepts of Thermodynamics: Work, Energy, Heat, Modes of Heat transfer: Conduction, Convection and Radiation. Steam: Formation of steam, Properties of Steam, Numericals related to the properties of steam.

Introduction to Heat engines and Heat pumps.

Introduction to Internal Combustion engines: Working principle of Two stroke and Four stroke engines (SI & CI Engines), No Numericals.

Electric vehicles and Hybrid vehicles: Working principles, Electric and Hybrid vehicle components, Brief introduction to energy storage in Electric vehicles.

Number of Hours: 8

Module-3

Machine Tools:

Lathe: Working principle, Specifications, Operations performed – Turning, Facing, Taper turning by swivelling the compound rest, Thread cutting and Knurling.

Drilling Machine: Working principle, Specifications, Operations performed – Drilling, Reaming, Boring, Counterboring, Countersinking, Tapping.

Milling machine: Working principle, Specifications, Operations performed – Plane milling, End milling, Slot milling, Angular milling.

(Sketches of machine tools not required. Sketches to be used only for explaining the operations).

Joining Processes: Introduction, Temporary and Permanent joining methods: Working principle of Soldering, Brazing and Electric Arc welding, Advantages, Limitations and Applications.

Number of Hours: 8

Module-4

Belt drives: Introduction, Open and Cross belt drives. (No derivations and numericals), Flat belts and V belts.

Gear Drives: Types of Gears, Velocity ratio, Gear Trains - Simple and Compound gear trains and Numericals.

Robotics: Introduction, Generation of Robots, Asimov's laws of Robots, Robot anatomy - Links and Joints, Types of Robots, Configurations of Robots, Robot motion - Degrees of Freedom, Robot sensors: Tactile, Force, Proximity and Vision sensors, Definition of Work volume, Accuracy, Precision, Repeatability and Payload.

Number of Hours: 8

Module-5

Computer Numerical Control (CNC): Introduction, Definition of NC and CNC Components of CNC. Definition of CAD, CAM, CAE and CIM.

Automation: Definition, Types of Automation, Reasons for Automation.

Additive manufacturing: Introduction, Basic principles (Steps in additive manufacturing), Additive manufacturing processes – Photopolymerization technique, Material extrusion technique and Powder based fusion technique, Automotive and Aerospace applications.

Applications of AI in Mechanical Engineering: Automobile industry, manufacturing industry and Mechanical design.

Number of Hours: 8

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. K R Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 2018.
2. S K Hajra Choudhury and Nirjhar Roy, Elements of Workshop Technology (Vol. I and II), Media Promoters and Publishers Pvt. Ltd., 2016.
3. Ganeshan. V, Internal Combustion Engines, Tata McGraw Hill, 4th Edition, 2012.
4. Rajput R.K, Thermal Engineering, Laxmi Publications (Pvt) Ltd., New Delhi. 6th Edition, 2007.
5. Mikell P. Grover, Automation Production Systems and Computer Integrated Manufacturing, PHI, 2004.
6. Husain Iqbal, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 3rd Edition,

2021.
7. Ian Gibson, David. W. Rosen, Brent Stucker, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Springer, 2nd Edition, 2014.
8. Mikell P. Groover and Emory W. Zimmers, CAD/CAM. Zimmer & Groover CAD/CAM, 2007.

Reference books / Manuals:

1. Serope Kalpakjian and Steven R Schmid, Manufacturing Engineering and Technology, Fourth Edition, Pearson Education, Asia, 2000.
2. Radha Krishna & S. Subramanian, CAD/CAM/CIM, New Age International Publishers, 2009
3. F.L.Matthews and R.D.Rawlings, Composite materials: Engineering and Science, Woodhead Publishing Ltd. & CRC Press, 2003.
4. Mikell P.Groover and Mitchel Weiss and Roger N.Nagel Nicholas G.Odrey, Industrial Robotics technology, programming and applications, Tata McGraw Hill Edition, 2008

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/112104526
- https://nptel.ac.in/courses/112104616
- https://nptel.ac.in/courses/112104769
- https://venturebeat.com/ai/how-ai-is-impacting-the-automotive-world/
- https://www.vlcsolutions.com/blog/artificial-intelligence-in-manufacturing/
- https://skill-lync.com/blogs/technical-blogs/design-applications-of-machine-learning-and-ai-in-mechanical-engineering
- https://caeassistant.com/blog/ai-in-mechanical-engineering-video/
- https://www.neuralconcept.com/post/how-is-ai-used-in-mechanical-engineering
- https://www.youtube.com/watch?v=MKiiXubKaGM
- https://www.youtube.com/watch?v=_canCYWZPsc
- https://www.youtube.com/watch?v=lQ-MYnyxh7M

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Simulation and Virtual Labs
- Partial Delivery of course by Industry experts
- ICT-Enabled Teaching
- Video demonstration

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50).

Continuous Internal Evaluation (CIE) (Marks)				
Test 1	**Test 2**	**Assignment**	**Group discussion**	**Total**
20	**20**	**05**	**05**	**50**

Semester End Examination (SEE):

QUESTION PAPER PATTERN (SEE)										
Q. No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
UNIT	1		2		3		4		5	
1. Two full questions (each of 20 Marks) are to be set from each unit.										
2. Student shall answer five full questions selecting one full question from each unit.										

MAPPING OF COs WITH POs												
COs/POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1	1	1	2	2	1	1	1	1	3
CO2	3	2	2	1	1	2	2	1	1	1	1	3
CO3	2	1	1	1	2	2	2	1	1	1	1	3
CO4	3	1	2	1	2	2	2	1	1	1	1	3
CO5	3	2	2	1	1	2	2	1	1	1	1	3
Strength of correlation: Strongly related-3, Moderately related-2, Weakly related-1, Not related-0												
Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Computer Science & Engineering
Scheme and Syllabus 2025 – 26

Course Title	**PROGRAMMING IN C**						
Course Code	**1BITT105/205**						
Category	**Programming Specific Course (PSC)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	03	00	**00**	00	**03**	42	**03**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES

1. To introduce the fundamental principles of C programming and its basic constructs.
2. To enable students to apply control structures, arrays, and related concepts for problem-solving.
3. To develop skills in writing modular programs using functions for tackling computational challenges.
4. To provide an understanding of user-defined data types such as structures, unions, and enumerations for modelling real-world scenarios.
5. To cultivate the ability to analyse problems and select appropriate data types and constructs to design efficient C programs.

UNIT-1 (08 hrs)
Introduction to Computing: Computer languages, Creating and Running Programs, System Development. **Overview of C:** A Brief History of C, C Is a Middle-Level Language, C Is a Structured Language, C Is a Programmer's Language, Compilers Vs. Interpreters, The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C's Memory Map. **Expressions:** The Basic Data Types, Modifying the Basic Types, Identifier Names, Variables, The Four C Scopes, Type Qualifiers, Storage Class Specifiers, Variable Initializations, Constants, Operators, Expressions. **Textbook 2: Chapter 1: 1.3, 1.4, 1.5; Textbook 1: Chapter 1, 2**
UNIT-2 (08 hrs)
Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf(). **Statements:** True and False in C, Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements. **Textbook 1: Chapter 8, 3**
UNIT-3 (08 hrs)
Arrays and Strings: Single-Dimension Arrays, Generating a Pointer to an Array, Passing Single-Dimension Arrays to Functions, Strings, Two-Dimensional Arrays, Multidimensional Arrays, Array Initialization, Variable - Length Arrays.

Pointers: What Are Pointers?, Pointer Variables, The Pointer Operators, Pointer Expressions, Pointers and Arrays, Multiple Indirection, Initializing Pointers. **Textbook 1: Chapter 4, 5**
UNIT-4 (08 hrs)
Functions: The General Form of a Function, Understanding the Scope of a Function, Function Arguments, argc and argv—Arguments to main(), The return Statement, What Does main() Return?, Recursion, Function Prototypes, Declaring Variable Length Parameter Declarations, The inline Keyword. **Pointers (Contd…):** Pointers to Functions, C's Dynamic Allocation Functions **Textbook 1: Chapter 5, Chapter 6**
UNIT-5 (08 hrs)
Structures, Unions, Enumerations, and typedef: Structures, Arrays of Structures, Passing Structure to Functions, Structure Pointers, Arrays and Structures within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef. **Textbook 1: Chapter 7**

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to,

CO1: Demonstrate fundamental concepts and language constructs of C programming.
CO2: Make use of control structures and arrays to solve basic computational problems.
CO3: Develop modular programs using user-defined functions for complex computational problems.
CO4: Construct user defined datatypes using structures, unions and enumerations to model simple real-world scenarios.
CO5: Choose suitable datatypes and language constructs to solve a given computational or real-world problem

TEXT BOOKS

1. Schildt, Herbert. "C the complete reference", 4th Edition, Mc GrawHill.

2. Hassan Afyouni, Behrouz A. Forouzan. “A Structured Programming Approach in C”, 4th Edition, Cengage.

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, 2nd Edition, Prentice Hall of India.
2. Reema Thareja, Programming in C, 3rd Edition, Oxford University Press, 2023

ONLINE RESOURCES

1. elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2. Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview]

3. C for Everyone: Programming Fundamentals [https://www.coursera.org/learn/c-for-everyone]
4. Computer Programming Virtual Lab [https://cse02-iiith.vlabs.ac.in/exp/pointers/]
5. C Programming: The ultimate way to learn the fundamentals of the C language
6. [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-clanguage-e187584209.html]
7. C Programming: The Complete Reference [https://viden.io/knowledge/programming-in-clanguage/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]
8. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01384323703937433634517_shared/overview
9. C programming Tutorial: https://www.geeksforgeeks.org/c/c-programming-language/.

MAPPING of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	-	-	-	-	-	-	-
CO2	2	2	2	1	3	-	-	-	-	-	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	-
CO4	2	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-

Strength of correlation: Low-1, Medium- 2, High-3

Course Title	**MECHANICS AND MATERIALS LABORATORY**						
Course Code	**1BCVL106**						
Category	**Practical**						
Scheme & Credits	No. of Hours per week					Total Teaching hours	Credits
	L	T	P	SS	Total		
	0	**0**	**2**	**0**	**02**	**12**	**01**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. Marks: 100**		**Duration of SEE: 02 hours**		

Course Learning Objectives:

To make students analyze the problems involving forces, moments with their applications, understand the concept of equilibrium and material properties along with their applications and develop the student's ability to explore design and conduct the experiments with creativity, critical thinking, and inquiry-based learning.

PART- A

CONVENTIONAL EXPERIMENTS

1. Verification of Lami's Theorem.
2. Equilibrium of concurrent forces.
3. Parallel force system - Simply supported beam.
4. Verification of Varignon's theorem.
5. Specific Gravity of
   a) Fine aggregates.
   b) Coarse aggregates.
   c) Cement.
   d) Soil.
6. Sieve analysis of soil - Graphical representation of the Gradation curve.
7. Visual identification of building materials:

   Bricks, Stones, Tiles, M-Sand, Bitumen, Fly-Ash, GGBS, Steel Bars of Various Sizes.

PART – B

TYPICAL OPEN-ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Support reactions.
2. Field tests on cement.
3. Particle size distribution (Well graded, Uniformly graded and Gap graded).

Teaching & Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

1. Active Learning Techniques
2. Problem-Based Learning (PBL)
3. Team-Based Learning (TBL)
4. Hands-On Experiments and Simulations

Course Outcomes: The students will be able to	
CO1	Analyse force systems and verify Lami's theorem.
CO2	Analyse force systems and verify Varignon's theorem.
CO3	Analyze the forces for equilibrium and simply supported beam.
CO4	Identify and understand the properties of various construction materials.
CO5	Classify the soil sample and represent it with the gradation curve.

Text Books:	
1	M. L. Gambhir: Concrete Manual: Dhanpat Rai & sons New – Delhi, ISBN-135551234001965.
2	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674
3	Ramamrutham.S, Engineering Mechanics, Dhanpat Rai Books, 2013, ISBN: 9789352164271.
4	Soil Mechanics and foundation Engineering by B C Punmia, Ashok kumar jain, Arun kumar jain, 18th edition, 2023, Laxmi Publications New Delhi.

Reference Books:	
1	Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
2	Rattan S.S., Strength of Materials, Third edition, 2017, McGraw Hill Education; New Delhi. ISBN-13978-9385965517.
3	Bansal R K, Strength of Materials, Laxmi Publications. 2023, 4th Edition, ISBN:978-8131808146.
4	IS 4031 (Part 11):1988 – Specific gravity test for hydraulic cement.
5	IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete.

6	IS 2386(Part 3):1963 Methods of test for aggregates for concrete: Part 3 Specific gravity, density, voids, absorption and bulking.
7	IS 2720 (Part 3/Sec 1):1980 – Determination of specific gravity of soil.

Web links and Video Lectures (e-Resources):	
1	https://www.nptel.ac.in/courses/122104015/
2	https://nptel.ac.in/courses/112103109/
3	http://vlab.co.in/

Process of Assessment (both CIE and SEE):

Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
    a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.
    b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.
4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying 50% weightage (i.e., 50 marks each).

The CIE Theory component will be 25 marks and CIE Practical component will be 25 marks.

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The laboratory test (duration 03 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous assessment:

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator-1 (CO/PO Mapping)					
Performance Indicator-2 (CO/PO Mapping)					
…					
Performance Indicator-n (CO/PO Mapping)					

Rubrics for SEE / CIE Test:

	Superior	Good	Fair	Needs Improvement	Unacceptable
Performance Indicator-1 (CO/PO Mapping)					
Performance Indicator-2 (CO/PO Mapping)					
…					
Performance Indicator-n (CO/PO Mapping)					

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 35% of 50 marks**, i.e., **18 marks**.

- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 40 out of 100 marks**.

Rubrics suggested for Practical continuous assessment				
Performance Indicators	**Excellent**	**Very Good**	**Good**	**Satisfactory**
Fundamental Knowledge (4) (PO1)	The student has well depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge (2)	Student has not understood the concepts clearly (1)
Design of Experiment (5) (PO2 & PO3)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (4)	Student is capable of discussing single design with its merits and de-merits (3)	Student is capable of explaining the design (1-2)
Implementation (8) (PO3 & PO8)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation. (3-4)	Student is capable of implementing the design. (1-2)
Result &Analysis (5) (PO4)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases. (4)	Student will be able to run the code for few cases and analyze the output. (3)	Student will be able to run the program but not able to analyze the output. (1-2)

Demonstration (8) (PO9)	The lab record is well- organized, with clear sections (e.g., Introduction, Method, Results, Conclusion). Transitions between sections are smooth. (7-8)	The lab record is organized, with clear sections, but some sections are not well-defined. (5-6)	The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	The lab record is poorly organized, with missing or unclear sections. (1-2)

Note: Can add Engineering & IT tool usage based on the nature of the course

CO-PO Mapping											
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	1						1		1
CO2	3	1	1						1		1
CO3	3	1	1						1		1
CO4	3	1	1						1		1
CO5	3	1	1						1		1

Dr. Ambedkar Institute of Technology,
Bengaluru-56

Department of Computer Science & Engineering 2025 -2026

Course Title	**C PROGRAMMING LAB**						
Course Code	**1BITL106**						
Category	**Programming Specific Course Lab (PSCL)**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	00	**02**	00	**02**	24	**02**
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVES

1. To introduce the fundamentals of C programming for solving computational problems.
2. To develop the ability to use C language constructs and derived data types for real-world problem-solving.
3. To enhance problem-solving, program design, and implementation skills through practical experiments.
4. To cultivate professional skills in preparing structured documentation that includes design, implementation, results, and inferences.

Note:
1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks.
b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks.
4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students.

PART – A CONVENTIONAL EXPERIMENTS

Note: Students must write the algorithm & flowchart for PART-A questions in the Record book

1. A robot needs to find how far it must travel between two points on a 2D plane. Develop a C program to calculate the straight-line distance between the given coordinates.
2. Develop a C program that takes a student's marks as input and displays their grade based on the following criteria:

90 and above: Grade A
75 to 89: Grade B
60 to 74: Grade C
50 to 59: Grade D
Below 50: Grade F
Choose a suitable control structure to implement this logic efficiently.
3. Develop a C program that takes a unique identification input like PAN Number, AADHAR_Number, APAAR_Id, Driving License, Passport and checks it against a set of stored KYC records. Based on the input, display whether the individual is verified or not. Use an appropriate control structure to handle multiple possible ID matches. Assume all Unique identification are of integer type.
4. A math app needs to determine the type of roots for a quadratic equation based on user input. Develop a C program to calculate and display the roots based on the given coefficients.
5. A sensor in a robotic arm needs to calculate the angle of rotation in real-time, but the hardware doesn't support built-in trigonometric functions. Develop a C program to approximate the value of sin(x) using a series expansion method for improved performance.
6. Develop a C program that accepts a course description string and a keyword from the user. Search whether the keyword exists within the course description using appropriate string functions. If found, display:
"Keyword '<keyword>' found in the course description." Otherwise, display: "Keyword '<keyword>' not found in the course description."
7. Develop a C program that takes marks for three subjects as input. Use a function to check if the student has passed (minimum 40 marks in each subject). Display the average and whether the student passed or failed.
8. In an ATM system, two account balances need to be swapped temporarily for validation. Develop a C program that accepts two balances and uses a function with pointers to swap them. Display the balances before and after swapping.

PART – B

TYPICAL OPEN-ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined, and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. A college library has a digital bookshelf system where each book is assigned a unique Book ID. The bookshelf is organized in ascending order of Book IDs. Develop a C Program to quickly find whether a book with a specific Book ID is available in the shelf.
2. A sports teacher has recorded the scores of students in a 100-meter race. To prepare the result sheet, the teacher wants the scores arranged in descending order (from highest to lowest). Develop a C program to sort the scores.
3. A small warehouse tracks how many units of different products are shipped from multiple branches. Another dataset shows how much revenue each product generates per unit. Develop

a C program which combines these datasets to calculate the total revenue generated by each branch.
4. A basic mobile contact manager stores first and last names separately. For displaying full names in the contact list, you need to join them manually. Additionally, the system must check the length of each full name to ensure it fits the screen. Perform these operations by developing a C program without using built-in string functions.
5. A currency exchange booth allows users to convert between two currencies. Before confirming the exchange, the system simulates a swap of the values to preview the result without actually changing the original data. In other cases, it updates the actual values. Develop a C program that implements both behaviours using Call by Value and Call by reference.
6. A local library needs to store and display details of its books, including title, author, and year of publication. Design a structure that can hold these details and develop a C program to display a list of all books entered.

TEACHING LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

COURSE OUTCOMES: On completion of the course, student should be able to,

Course outcome

At the end of the course, the student will be able to:

CO1: Develop programs in C to solve simple computational problems.

CO2: Make use of C language derived datatypes to solve simple real-world problems.

CO3: Build a document consisting of experiment setup, design, implementation and results with inferences.

Textbook:

1. Hassan Afyouni, Behrouz A. Forouzan. “A Structured Programming Approach in C”, 4th Edition, Cengage.

Reference books:

1. Schildt, Herbert. "C the complete reference", 4th Edition, Mc GrawHill.

2. Brian W. Kernighan and Dennis M. Ritchie, The ‘C’ Programming Language, 2nd edition, Prentice Hall of India.

Web links and Video Lectures (e-Resources):

1. Introduction to Programming in C [https://onlinecourses.nptel.ac.in/noc23_cs02/preview]

2. C for Everyone: Programming Fundamentals [https://www.coursera.org/learn/c-for-everyone]

3. Computer Programming Virtual Lab [https://cse02-iiith.vlabs.ac.in/exp/pointers/]

4. C Programming: The ultimate way to learn the fundamentals of the C language

[https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-clanguage-e187584209.html]

5. C Programming: The Complete Reference [https://viden.io/knowledge/programming-in-clanguage/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]

MAPPING of COs with POs

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1	3	-	-	-	-	-	-	-
CO2	2	2	2	1	3	-	-	-	-	-	-	-
CO3	3	3	2	2	3	-	-	-	-	-	-	-
CO4	2	2	2	2	3	-	-	-	-	-	-	-
CO5	3	3	2	2	3	-	-	-	-	-	-	-
Strength of correlation: Low-1, Medium- 2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Syllabus - CBCS – for AY 2025 -2026- First Year Syllabus

Course Title	**BASIC ELECTRICAL ENGINEERING LABORATORY**						
Course Code	**1BEEL206**						
Category	**PROGRAM-SPECIFIC COURSE LAB**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	**00**	**02**	**00**	**02**	**26**	**01**
CIE Marks**: 50**	SEE Marks**: 50**		Total Max. marks **= 100**		Duration of SEE**: 03** Hours		

COURSE OBJECTIVE:

1. To verify fundamental electrical laws and principles through practical experiments on DC and AC circuits.
2. To measure electrical parameters such as resistance, inductance, impedance, power, and power factor using standard instruments.
3. To develop skills in three-phase power measurement and analysis of star- and delta-connected loads.
4. To practice safe wiring methods, load control, and earth resistance measurement.
5. To identify, analyze, and troubleshoot faults in simple electrical circuits using appropriate techniques.

PART - A
(1) Verification of Ohm's law and Kirchhoff's laws. (2) Measurement of low range resistance using voltmeter-ammeter method. Verification of resistance value using multimeter/LCR meter. (3) Measurement of earth's resistance by 3-electrode method. (4) Measurement of resistance, inductance, impedance and power factor using voltmeter, ammeter and wattmeter in single-phase AC circuits. (5) Measurement of three-phase power of an inductive load by 2-wattmeter method, when the load is (a) star connected and (b) delta connected. Calculation of resistance, reactance, impedance and power factor. (6) Wiring an appropriate electric circuit, understanding the basic principle used for 2-way and 3-way control of load.
PART - B
(1) Creation of short circuit to determine the time taken by a fuse of different length. Documenting the test data and the conclusions. (2) Trouble shooting experiments in simple DC circuits. The trouble may be due to loose connection, faulty component leading to open circuits or short circuits. Detection of fault and the reasons for that and conclusion. (3) Measurement of voltage between line and neutral, ground and line, ground and neutral in respect of heathy and unhealthy 3-pin socket. Conclusions arrived for the faulty wiring. Allowable ground voltage. (4) A 12 V battery is available. It is required to obtain 3 V from the battery to charge a mobile. Create a circuit to obtain the required voltage. Specify all the ratings of the components used. (5) Only three ammeters and standard resistance are available in the laboratory. Using the same measure the single phase power consumed by an inductive load. (6) Only three voltmeters and standard resistance are available in the laboratory. Using the same measure the single phase power consumed by an inductive load.

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Conduct standard electrical experiments to verify theoretical principles.

CO2: Measure key electrical parameters such as resistance, inductance, impedance, power, and power factor with standard methods.

CO3: Design and perform experiments to solve practical open-ended electrical problems.

CO4: Analyse experimental data from non-routine method to arrive at a solution.

TEXT BOOKS

1. **Manual prepared for the conventional experiments by EEE Departments.**

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2											3		
CO 2	3	2			2								3	2	
CO 3	3	3	2		2				2				3	3	2
CO 4	2	3		3	2								2	3	

Strength of correlation: Low-1, Medium- 2, High-3

Fundamentals of Electronics and Communication Engineering LAB	
Course Code: **1BECL206**	CIE Marks:**50**
Teaching Hours/Week (L:T:P: S): **0:0:2:0**	SEE Marks:**50**
Credits: **1**	Exam Hours:**100**

Course objectives:

- To gain hands on experience in designing and testing of rectifier circuits.
- To analyze the characteristics of Bipolar Junction Transistors and Field Effect Transistors.
- To inspect the working of different modes of Op-Amp.
- To learn the fundamentals of Basic and Universal gates.

Sl. No	Experiments
	NOTE: 1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 100. 2. Both PART-A and PART-B are considered for CIE and SEE. 3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B. a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 70 marks out of the maximum 100 marks. b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 30 marks. 4. For continuous internal evaluation, during the semester, classwork, the typical open-ended questions shall be from PART-B, and any other similar questions to enhance the skill of the students
	PART – A **CORE/BASIC HARDWARE EXPERIMENTS**
1	Design and Testing of Half-Wave and Full-Wave Rectifiers With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency
2	Design and Testing of Bridge Rectifier With and Without Filter for Determining Ripple Factor, Voltage Regulation, and Efficiency
3	Analysis of Input and Output Characteristics of a Bipolar Junction Transistor in Common Emitter Configuration

4	Study of Transfer and Drain Characteristics of a MOSFET in Common Source Configuration
5	Investigation of Op-Amp in Inverting and Non-Inverting Modes with Gain Measurement
6	Study of Truth Tables for OR, AND, NOT, NAND, and NOR Gates Using Basic and Universal Gates
	PART – B OPEN ENDED HARDWARE EXPERIMENTS
1	Design and Testing of Clipping and Clamping Circuits to obtain desired Transfer Characteristics
2	Design and test a single stage bipolar junction transistor amplifier to obtain desired gain and bandwidth requirements.
3	Testing of Op-Amp as voltage follower and a weighted summer with waveform analysis.
4	Design and Testing of Integrator and Differentiator Circuits using Op-Amp with Waveform Analysis
5	Amplitude Modulation using Discrete Components for Given Specifications.
6	Realization of Half/ Full Adder and Subtractor using Logic Gates.

Course outcomes (Course Skill Set):

After studying this course, students will be able to:

CO1: Apply the operating principles of diodes, transistors, and MOSFETs to construct and test basic analog circuits.

CO2: Implement operational amplifier configurations such as inverting, non-inverting, integrator, and differentiator for analog signal processing applications.

CO3: Analyze the functionality of logic gates and combinational circuits including adders, subtractors, and code converters using digital ICs.

CO4: Investigate amplitude modulation to explore fundamental analog communication techniques.

CO5: Develop solutions to open-ended electronic design problems by selecting appropriate components, constructing circuits, and interpreting results to meet defined objectives.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3							1	2	2				2	

CO2	**3**	**3**						**1**	**2**	**2**				**2**	
CO3	**3**	**3**			**2**			**1**	**2**	**2**				**2**	
CO4	**3**	**3**						**1**	**2**	**2**				**2**	**2**
CO5	**3**	**3**						**1**	**2**	**2**				**2**	**2**

High-3, Medium-2, Low-1

Elements of Mechanical Engineering Lab		Semester	I / II
Course Code	1BMEL206	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	24 Hours (12-week session)	Total Marks	100
Credits	1	Exam Hours	3
Examination type (SEE)	**Practical**		

Course Outcomes

At the end of the course, the student will be able to:

1. Perform various operations using lathe and welding machine.
2. Calibrate various measuring devices to achieve accuracy of measurement.
3. Demonstrate angular measurement of a given specimen using appropriate device.
4. Determine the properties and characteristics of fuels and oils.
5. Determine the hardness of materials using hardness testing machine.

Note:

1. The laboratory syllabus consists of PART-A and PART-B. While PART-A has 6 conventional experiments, PART-B has 6 typical open-ended experiments. The maximum marks for the laboratory course are 50.
2. Both PART-A and PART-B are considered for CIE and SEE.
3. Students have answer 1(one) question from PART-A and 1(one) question from PART-B.
   a. The questions set for SEE shall be from among the experiments under PART-A. It is evaluated for 35 marks out of the maximum 50 marks.
   b. The open-ended question set for SEE shall be any other open-ended question and not selected from the experiments under PART-A. It shall be evaluated for 20 marks.

PART – A

CONVENTIONAL EXPERIMENTS

1. Performing facing, plain turning and step turning operations by using a lathe.
2. Performing facing, plain turning and knurling operations by using a lathe.
3. Preparation of welded joints using the arc welding process.
4. Calibration of vernier caliper and micrometer using slip gauges.
5. Determination of the angle of a specimen using a sine bar.
6. Determination of the hardness of materials using hardness testing machine.

PART – B

TYPICAL OPEN-ENDED EXPERIMENTS

Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.

1. Comparative study of flash point and fire point of various fuels / oils using the open cup method
2. Comparative study of flash point and fire point of various fuels / oils using the closed cup method
3. Comparative study on viscosity of different base fuels.
4. Investigation of the effect of additives on the viscosity of base fuels.
5. Selection and justification of appropriate joining techniques for given applications
6. Fabrication of a sheet metal part with simple geometry and soldering.

Suggested Learning Resources: (Textbook / Reference Book/ Manuals):

Textbooks:

1. Amitabh Ghosh and Amit Kumar Mallik, Manufacturing Science, Affiliated East West Press (p) Ltd, New Delhi, 2002
2. Hajara and Choudhary, Workshop Technology Vol. I (2008) & II (2010), Median Promoters & publishers, Bombay.
3. Khanna O. P, Workshop Practice, Vol. I, Dhanpat Rai & Co., 2000.
4. Engineering Metrology, R.K. Jain, Khanna Publishers, Delhi, 2009.

Reference books / Manuals:

1. Serope Kalpakjian and Steven R Schmid, Manufacturing Engineering and Technology, Fourth Edition, Pearson Education, Asia, 2000.
2. P.N. Rao, Manufacturing technology--Foundry, Forming and Welding, Tata McGraw Hill Education, 2001.
3. I.C. Gupta, Engineering Metrology, Dhanpat Rai Publications, New Delhi, 2018.
4. Ganeshan. V, Internal Combustion Engines, Tata McGraw Hill, 4th Edition, 2012**.**

Web links and Video Lectures (e-Resources):

- https://openoregon.pressbooks.pub/manufacturingprocesses45/chapter/chapter-unit-1-the-engine-lathe/
- https://www.millerwelds.com/resources/article-library/the-fundamentals-of-welding-process-equipment-and-applications
- https://www.youtube.com/watch?v=sbbwJ5p6irc
- https://www.youtube.com/watch?v=TlhGTSDfQxc

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Simulation and Virtual Labs
- Video demonstration

Assessment Structure:

The assessment for each course is equally divided between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each component carrying **50% weightage** (i.e., 50 marks each).

The CIE marks awarded shall be based on the continuous evaluation of the laboratory report using a defined set of rubrics. Each experiment report can be evaluated for 30 marks. The laboratory test (duration 02 hours) at the end of the last week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 20 marks. For both CIE and SEE, the student is required to conduct one experiment each from both Part A and Part B.

Rubrics for CIE – Continuous Assessment: 30 marks					
Performance Indicators	**Excellent**	**Good**	**Satisfactory**	**Needs Improvement**	**Poor**
Technical Skills & Procedure (PO1 & PO5) (10)	Performs operations flawlessly, correct sequence, excellent tool use. (9-10)	Minor errors, generally correct sequence and tool use. (7-8)	Performs task with some errors; needs occasional help. (5-6)	Many errors, requires frequent guidance. (3-4)	Cannot perform task without continuous supervision. (0-2)
Safety Compliance (PO6) (5)	Strictly follows all safety protocols, proper PPE usage at all times. **(5)**	Follows safety rules, occasional minor lapses. **(4)**	Mostly safe, some reminders needed. **(3)**	Frequent safety violations. **(2)**	Unsafe behavior, ignores safety rules. **(0-1)**
Interaction with the Group (PO8) (5)	Naturally leads, encourages, and includes all group members. Facilitates communication and ensures tasks are distributed fairly. Respects all opinions. **(5)**	Cooperates well with group members. Communicates clearly, shares the workload, and is a reliable and positive team member. **(4)**	Works alongside others but with limited communication or collaboration. Tends to work in isolation or contributes unevenly to the group effort. **(3)**	Fails to cooperate with the group. Is dismissive of others' ideas or causes friction and disagreement within the team. **(2)**	Refuses to work with the group or actively disrupts the group's ability to complete the experiment. **(1)**
Lab Report (PO9) (10)	Report is exceptionally well-organized, detailed, and insightful. All data and analysis are accurate. Submitted on time. **(9-10)**	Report is complete, well-organized, and accurate. All required sections are present and data is correctly reported. Submitted on time. **(7-8)**	Report has minor errors in data or analysis, or is missing some minor components. Organization could be clearer. **(5-6)**	Report is incomplete, contains significant errors, is poorly organized, or is submitted late without a valid reason. **(3-4)**	Fails to submit a report, or the submitted work is of completely unacceptable quality and lacks critical information. **(0-2)**

Rubrics for SEE / CIE Test:
(CIE test -To be conducted for 50 marks and the marks obtained shall be reduced to 20)
(SEE-To be conducted for 50 marks)

Performance Indicators	Excellent	Good	Satisfactory	Needs Improvement	Poor
Execution (PO3 & PO5) (8)/ (40)	Executes operations accurately with correct parameters; smooth, safe handling of equipment. **(7-8) / (33-40)**	Minor execution errors; mostly correct handling of tools/ machines. **(5-6) / (25-32)**	Acceptable performanc e with some parameter or handling errors. **(3-4) / (17-24)**	Multiple execution errors; needs frequent correction. **(2) / (9-16)**	Unable to perform operation independently. **(0-1)/ (0-8)**
Result and Discussion (PO4) (7)/ (40)	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. **(7-8) / (33-40)**	Accurate results; some useful discussion. **5-6) / (25-32)**	Results mostly correct; discussion basic. **(3-4) / (17-24)**	Results incomplete or partially wrong; weak discussion. **(2) / (9-16)**	Presents accurate results; clearly compares with standards; insightful discussion of deviations and causes. **(0-1)/ (0-8)**
Viva Voce (PO9) (5)/ (20)	Answers all questions confidently, showing deep conceptual and practical understanding. **(5) / (17-20)**	Answers most correctly; minor conceptual gaps. **(4) / (13-16)**	Answers some but lacks depth. **(3) / (9-12)**	Gives vague or incomplete answers. **(2) / (5-8)**	Unable to answer. **(1) / (0-4)**

- To qualify and become eligible to appear for SEE, in the **CIE component**, a student must secure **a minimum of 50% of 50 marks**, i.e., **25 marks**.
- To pass the **SEE component**, a student must secure **a minimum of 40% of 50 marks**, i.e., 20 **marks**.
- A student is deemed to have **successfully completed the course** if the **combined total of CIE and SEE is at least 45 out of 100 marks**.

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Humanities and Social Sciences
Scheme and Syllabus 2025 – 26

Course Title	**Communication Skills**							
Course Code	1BENGL106/1BENGL206							
Category	AEC							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	01	00	01	00	02	30	-	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**			

COURSE LEARNING OBJECTIVES:

This course aims to develop learners' communication skills by strengthening their verbal, non-verbal, and digital communication competence. It enhances proficiency in grammar, phonetics, and vocabulary for effective academic and professional expression. The course trains students in writing, speaking, and interpersonal skills essential for employability, including job applications, interviews, and presentations. It also fosters digital literacy, ethical use of online resources, and academic integrity through guided practice and self-study.

Unit	**Syllabus content**	**No. of hours**	
		Theory	**LAB**
I	**Communication Skills:** the process of communication – sender, message, channel, receiver, and feedback**. Barriers to communication:** physical, psychological, linguistic, cultural, and organizational barriers**.** **Non-verbal communication:** body language, gestures, and expressions. Paralanguage, proxemics, and chronemics**.** **Grammar:** parts of speech – noun, pronoun, verb, adjective, adverb, preposition, conjunction, and interjection**.** **Phonetics:** pronunciation, phonemes – vowels and consonants, word stress, sentence stress, and intonation patterns**.** **Self-study: "**The Chimney Sweeper" by William Blake & Martin Luther King Jr.'s "I Have a Dream" Speech. **(RBT Levels: L1)**	03	03
II	**INTERPERSONAL SKILLS** **Speaking Skills:** Introducing oneself (formal and informal contexts), extempore speaking, formal presentations – techniques and structure, group discussion – purpose, techniques, evaluation parameters, debates – format, rules, key features, giving technical presentations – use of visuals, clarity, confidence, and audience engagement**.** **Writing Skills:** Biography writing (of self/others), short story writing (creative expression), paragraph writing – descriptive, argumentative, expository, and narrative, and blog writing. **Grammar:** Common errors in English usage (subject–verb agreement, articles, prepositions, tenses), Wh–questions (who, what, when, where, why, how), Yes/No questions (non–Wh questions), and question tags. **Vocabulary:** Idioms and phrases – meaning and usage in sentences**.** **Self-study:** Reading the Interview of an Achiever **(RBT Levels: L1)**	03	03

III	**ENGLISH FOR EMPLOYABILITY** **Writing**: Formal letter writing (enquiry, order, and complaint). **Grammar**: Tenses, active and passive voice, reported speech. **Email Etiquettes**: Structure, writing, and responding to emails. **Self-Study:** Informal letter writing. (RBT Levels: L1)	03	03
IV	**ENGLISH IN DIGITAL WORLD** **Writing**: Framing of search terms/keywords in search engines, commands for search on open AIs, tools to support synchronous communication such as webinar platforms, and asynchronous communication such as forums and social media. Online communication – types, pros and cons of online communication. Acceptable online roles and behaviours – netiquettes, etiquettes of social media. Problems and opportunities in handling digital resources – tools to check grammar. **Writing**: Citing information accurately from source material, plagiarism – infringement, importance of academic integrity. **Self-Study**: Exploring and analyzing a blog or social media post for effective use of netiquette and online communication. Practicing the use of grammar and plagiarism-check tools to edit and refine a short write-up or academic paragraph. **(RBT Levels: L1)**	03	03
V	**APPLYING FOR JOBS** **Speaking**: Interview skills, mock interview, telephone interviews, non-verbal communication cues, statement of purpose, company profile, and completing comprehension exercises. **Writing**: Job applications and resumes. **Grammar**: Conditional clauses and modal verbs. **Self-Study**: Listening – TED Talks; Reading – Reading a job interview. **(RBT Levels: L1)**	03	03

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	**Apply the process and principles of communication with correct grammar, phonetics, and intonation**
CO2	**Demonstrate interpersonal skills through speaking, writing, and group activities for effective collaboration.**
CO3	**Write formal letters, emails, and documents with proper structure, etiquette, and accuracy.**
CO4	**Use digital communication tools responsibly, following netiquettes and academic integrity.**
CO5	**Prepare job applications, resumes, and perform effectively in interviews with confidence and professionalism.**

TEACHING–LEARNING PROCESS: Chalk and Talk, Group discussion, power point presentation, animations, videos.

TEXTBOOKS

1. **Meenakshi Raman & Sangeeta Sharma**, *Technical Communication: Principles and Practice*, Oxford University Press.
2. **Krishna Mohan & Meera Banerji**, *Developing Communication Skills*, Macmillan.
3. **M.Ashraf Rizvi**, *Effective Technical Communication*, McGraw-Hill.

4. **Andrea J. Rutherford**, *Basic Communication Skills for Technology*, Pearson.

REFERENCE BOOKS

1. Nira Konar – *Communication Skills for Professionals*, PHI Learning.
2. John Seely – *The Oxford Guide to Writing and Speaking*, Oxford University Press.
3. Lesikar, Flatley & Rentz – *Business Communication: Making Connections in a Digital World*, McGraw-Hill.

SCHEME FOR EXAMINATIONS

Question Paper Pattern:

CIE- Objective type (Max. marks: 25 marks)

SEE- Objective type (Max. marks: 50 marks)

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1									1	3		2
CO2										3		2
CO3										3		2
CO4									1	3		2
CO5									1	3		2
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Humanities and Social Sciences
Scheme and Syllabus 2025 - 26

Course Title	Indian Constitution & Engineering Ethics							
Course Code	1BICT107/1BICT207							
Category	AEC (NCMC)							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	01	00	00	00	01	15	-	PP/NP
CIE Marks: 100	**SEE Marks: 00**		**Total Max. marks=100**		**Duration of SEE: 00 Hours**			

COURSE LEARNING OBJECTIVES

This course aims to build an understanding of ethics and values and their significance in shaping professional conduct. It introduces the scope and challenges of engineering ethics while addressing issues such as conflicts of interest, responsibility, trust, and reliability. Students will also gain awareness of safety, risk management, and Intellectual Property Rights, enabling them to handle ethical dilemmas in professional practice.

Unit	Syllabus content	No. of hours Theory
I	**Introduction to Indian Constitution**: The necessity of the Constitution; the societies before and after the adoption of the Constitution; introduction to the Indian Constitution; the making of the Constitution; the role of the Constituent Assembly; the Preamble of the Indian Constitution and key concepts of the Preamble; salient features of the Indian Constitution. **Self-study:** Role of Dr. B.R. Ambedkar in framing the Indian Constitution **(RBT Levels: L1)**	3
II	**FRs, FDs and DPSPs**: Fundamental Rights and their restrictions and limitations in different complex situations; Directive Principles of State Policy (DPSPs) and their present relevance in our society with examples; Fundamental Duties and their scope and significance in nation-building. **Self-study:** Fundamental Duties in practice – preparing a short report on how citizens fulfill or neglect duties such as protecting the environment or preserving heritage. **(RBT Levels: L1)**	3
III	**Union Executive**: Parliamentary system; Union Executive – President, Prime Minister, Union Cabinet; Parliament – Lok Sabha and Rajya Sabha; Parliamentary Committees; important parliamentary terminologies; Supreme Court of India; judicial reviews and judicial activism. **Self-Study:** Judicial Activism in India – landmark cases such as Vishaka v. State of Rajasthan or Kesavananda Bharati v. State of Kerala. **(RBT Levels: L1)**	3

IV	**State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections and Electoral Process, Amendments to the Constitution (how and why), Important Constitutional Amendments till today, and Emergency Provisions **Self-Study:** Reading and reflecting on the **42nd Constitutional Amendment Act, 1976**, often called the "Mini Constitution," to understand its impact on the balance of power and Emergency provisions. **(RBT Levels: L1)**	3
V	**Professional Ethics:** Ethics and Values, Types of Ethics, Scope and Aims of Professional and Engineering Ethics, Positive and Negative Faces of Engineering Ethics, Clash of Ethics, Conflicts of Interest, Impediments to Responsibility, Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety, and Liability in Engineering. **Self-Study:** Case Study Analysis of real-world engineering ethical dilemmas (e.g., Bhopal Gas Tragedy, Challenger Disaster, or Volkswagen Emission Scandal) and reflection on the role of ethics, safety, and responsibility**.** **(RBT Levels: L1)**	3

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1	Apply ethical principles and values in professional and personal contexts**.**
CO2	Recognize ethical dilemmas, conflicts of interest, and their implications in engineering practice.
CO3	Demonstrate awareness of professional responsibility, trust, and reliability in engineering.
CO4	Analyze ethical issues related to risks, safety, and liability in engineering projects.
CO5	Understand the relevance of Intellectual Property Rights and ethical decision-making in engineering.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1 D.D. Basu – *Introduction to the Constitution of India* (LexisNexis).
2 J.C. Johari – *Indian Government and Politics* (Sterling Publishers).
3 R. Subramanian – *Professional Ethics* (Oxford University Press)

REFERENCE BOOKS

1. Subhash Kashyap – *Our Constitution: An Introduction to India's Constitution and Constitutional Law* (National Book Trust).
2. P.M. Bakshi – *The Constitution of India* (Universal Law Publishing).
3. Govindarajan M., Natarajan S., Senthil Kumar V.S. – *Professional Ethics and Human Values* (PHI Learning).

CO-PO MAPPING

	PO1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1						3						
CO2						3						
CO3						3						
CO4						3						
CO5						3		3				
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Humanities and Social Sciences
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Course Title	Samskrutika Kannada							
Course Code	1BKST108/1BKST208							
Category	HSMS							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	01	00	00	00	01	15	-	01
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**			**Duration of SEE: 02 Hours**		

COURSE LEARNING OBJECTIVES

ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ಭಾಷಾ ಅಭಿರುಚಿಯನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದರ ಜೊತೆಗೆ ಸಾಹಿತ್ಯ , ವ್ಯಾಕರಣಾಂಶ, ವಿಷಯಗಳನ್ನು ತಿಳಿಸಲಾಗುವುದು. ಪಠ್ಯ ವಿಷಯದ ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಧರ್ಮದ ಆಚರಣೆ, ಕರ್ನಾಟಕ ಏಕೀಕರಣದ ಬಗೆಗೆ ತಿಳಿಸಲಾಗುವುದು ಮತ್ತು ಆಧುನಿಕ ಪೂರ್ವ ಕಾವ್ಯ , ಆಧುನಿಕ ಕಾವ್ಯ, ತಿಳಿಸಲಾಗುವುದು ಮತ್ತು ಸಮಾಜಕ್ಕೆ ಕೊಡುಗೆಯನ್ನು ನೀಡಿದ ಮಹಾನ್ ವ್ಯಕ್ತಿಗಳ ಬಗೆಗೆ ಮತ್ತು ಮಾನವೀಯ ಮೌಲ್ಯಗಳ ಬಗೆಗೆ ತಿಳಿಸಲಾಗುವುದು. ಹಾಗು ಗಣಕಯಂತ್ರ ಮತ್ತು ಪಾರಿಭಾಷಿಕ ಪದಗಳ ಬಗೆಗೆ ಬೋಧಿಸಲಾಗುವುದು.

Unit	Syllabus content	No. of hours
		Theory
I	**ಲೇಖನಗಳು** ಕನ್ನಡ ನಾಡು,ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು ೧. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ : ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ.ವೆಂಕಟಸುಬ್ಬಯ್ಯ ೨. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ವಿತಾವಿಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನ * ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ : ಅಕ್ಷರ, ಪದ, ವಾಕ್ಯರಚನೆಯ ಬಗೆಗೆ ಪರಿಚಯ **(RBT Levels: L1)**	03
II	**ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)** ೧. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ , ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ. ೨. ಕೀರ್ತನೆಗಳು : ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸ ತಲ್ಲಣಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೆ – ಕನಕದಾಸ ೩. ತತ್ವಪದಗಳು : ಶಿವಯೋಗಿ – ಬಾಲಲೀಲಾ ಮಹಾಂತ ಶಿವಯೋಗಿ ೪. ಜನಪದ ಗೀತೆ : ಬಡವರಿಗೆ ಸಾವ ಕೊಡಬೇಡ ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ : ಪ್ರಬಂಧ ರಚನೆ, ಪತ್ರಲೇಖನದ ಬಗೆಗೆ ಕುರಿತು ತಿಳಿಸುವುದು **(RBT Levels: L1)**	03
III	**ಕಾವ್ಯಭಾಗ (ಆಧುನಿಕ)** ೧. ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗ : ಡಿ.ವಿ.ಜಿ ೨. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು ೩.ಚೋಮನ ಮಕ್ಕಳ ಹಾಡು : ಸಿದ್ಧಲಿಂಗಯ್ಯ ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ : ಭಾಷಾ ಅಭಿರುಚಿ ಬೆಳೆಸುವುದರ ಬಗೆಗೆ ಕುರಿತು ತಿಳಿಸುವುದು **(RBT Levels: L1)**	03

IV	**ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ, ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ** ೧. ಡಾ.ಸರ್.ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ – ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ : ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ ೨. ಕನ್ನಡ – ಕಂಪ್ಯೂಟರ್ ಶಬ್ದಕೋಶ * ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ : ಸಂವಹನ ಮಾಧ್ಯಮದ ಬಗೆಗೆ ಕುರಿತು ತಿಳಿಸುವುದು **(RBT Levels: L1)**	03
V	**ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ** ೧. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ ೨. ತಾಂತ್ರಿಕ ಪದಕೋಶ : ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು * (ವಿತಾವಿಯ ಆಡಳಿತ ಕನ್ನಡ ಪುಸ್ತಕದಿಂದ ಆಯ್ದ ಲೇಖನಗಳು – ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ : ಒಗಟು, ಗಾದೆ, ಮತ್ತಿತರ ವ್ಯಾಕರಣಾಂಶದ ಬಗೆಗೆ ಕುರಿತು ತಿಳಿಸುವುದು **(RBT Levels: L1)**	03

COURSE OUTCOMES: ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ಭಾಷಾ ಅಭಿರುಚಿಯನ್ನು ಬೆಳೆಸಿಕೊಳ್ಳುವುದರ ಜೊತೆಗೆ ಸಾಹಿತ್ಯ , ಕನ್ನಡ ಭಾಷೆಯ ಅಡಿಪಾಯ ಮತ್ತು ವ್ಯಾಕರಣಾಂಶ, ವಿಷಯಗಳನ್ನು ತಿಳಿಯುವರು.

CO1	**ಕನ್ನಡ ನಾಡು,ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿ :** ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಧರ್ಮದ ಆಚರಣೆ, ಕರ್ನಾಟಕ ಏಕೀಕರಣದ ಬಗೆಗೆ ಅಭ್ಯಸಿಸುವರು.
CO2	**ಆಧುನಿಕ ಪೂರ್ವ ಕಾವ್ಯ ಭಾಗ :** ವಚನಗಳು, ಕೀರ್ತನೆಗಳು, ತತ್ವಪದಗಳು ಮತ್ತು ಜನಪದ ಗೀತೆಯ ಬಗೆಗೆ ತಿಳಿಯುವರು
CO3	**ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ :** ಬಡವರ ಮೇಲಿನ ಶೀಮಂತರ ದಬ್ಬಾಳಿಕೆ ಮತ್ತು ಯುವ ಪೀಳಿಗೆಯನ್ನು ಹುರಿದುಂಬಿಸುವ ಪ್ರಯತ್ನ ಹಾಗು ಸಾಮಾನ್ಯ ಜನರ ಮಾನಸಿಕ ತೊಳಲಾಟದ ಬಗೆಗೆ ತಿಳಿಯುವರು
CO4	**ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ :** ಸಮಾಜಕ್ಕೆ ಕೊಡುಗೆಯನ್ನು ನೀಡಿದ ಮಹಾನ್ ವ್ಯಕ್ತಿಗಳ ಬಗೆಗೆ ಮತ್ತು ಗಣಕಯಂತ್ರ ಮತ್ತು ಪಾರಿಭಾಷಿಕ ಪದಗಳ ಬಗೆಗೆ ತಿಳಿಯುವರು.
CO5	**ತಂತ್ರಜ್ಞಾನ ಮಾಹಿತಿ :** ಮಾನವೀಯ ಮೌಲ್ಯಗಳ ಬಗೆಗೆ ಮತ್ತು ತಾಂತ್ರಿಕ ಹಾಗೂ ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳ ಬಗೆಗೆ ತಿಳಿಯುವರು

TEACHING–LEARNING PROCESS: Chalk and Talk, Workbook, Group discussions

TEXTBOOKS

1. ಪಠ್ಯದ ಹೆಸರು : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ (ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ)
2. ಡಾ.ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ–ವಿಶ್ರಾಂತ ಕುಲಪತಿಗಳು, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ , ಹಂಪಿ,
3. ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ – ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು
4. ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ – ಶೈಕ್ಷಣಿಕ ಸಲಹೆಗಾರರು

REFERENCE BOOKS

1. ಕನ್ನಡ ಮನಸು – ಡಾ.ಹೆಚ್.ಜೆ ಲಕ್ಕಪ್ಪಗೌಡ
2. ಆಡಳಿತ ಕನ್ನಡ–ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ – ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ – ಶೈಕ್ಷಣಿಕ ಸಲಹೆಗಾರರು
3. ಕನ್ನಡ ವ್ಯಾಕರಣ ಮತ್ತು ರಚನೆ – ಎನ್.ಗೋಪಾಲಕೃಷ್ಣ ಉಡುಪ
4. ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ

SCHEME FOR EXAMINATIONS

Question Paper Pattern:
CIE- Objective type (Max. marks: 25 marks)
SEE- Objective type (Max. marks: 50 marks

CO-PO MAPPING

	PO1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1										3		
CO2										3		
CO3										3		
CO4										3		
CO5										3		
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Humanities and Social Sciences
Scheme and Syllabus 2025 - 26

Course Title	**NON KANNADA – BALAKE KANNADA (Non Kannada & Non Karnataka Students)**							
Course Code	1BKBT108/1BKBT208							
Category	**HSMS**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	01	00	00	00	01	15	-	01
CIE Marks: 50	**SEE Marks: 50 (ORAL)**		**Total Max. marks=100**		**Duration of SEE: 02 Hours**			

COURSE LEARNING OBJECTIVES

ಕನ್ನಡೇತರ ಮತ್ತು ಹೊರನಾಡು ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಭಾಷೆಯ ಅಡಿಯಪಾಯವನ್ನು ಜೊತೆಗೆ ಕನ್ನಡ ವ್ಯಾಕರಣಾಂಶದ ಪರಿಚಯ ನೀಡುವುದರ ಮೂಲಕ ಮೌಖಿಕ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೆಚ್ಚಿಸಲು ಉತ್ತೇಜನ ನೀಡಲಾಗುವುದು. ಹಾಗು ಅಕ್ಷರದಿಂದ ಪದ, ಪದದಿಂದ ವಾಕ್ಯ ವಿರುದ್ಧಪದಗಳು, ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು, ಲಿಂಗಪರಿಚಯ. ನಾಮಪದಗಳು. ಏಕವಚನ, ಬಹುವಚನ ರಚಿಸಲು ತಿಳಿಸಿಕೊಡಲಾಗುವುದು. ಹಾಗು ಪ್ರತ್ಯೇಕವಾಗಿ ಕಾರ್ಯ ಪುಸ್ತಕವನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನೀಡಲಾಗುವುದು. ಇದರಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಭಾಷಾ ಬೆಳವಣಿಗೆಗೆ ಸಹಾಯಕವಾಗುವ ಅಂಶವನ್ನು ರಚಿಸಿ ನೀಡಲಾಗುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳ ಸಂವಹನ ಮಾಧ್ಯಮದ ಸಾಮರ್ಥ್ಯ ಹೆಚ್ಚಿಸಲು ಮತ್ತು ಓದುವ ಮತ್ತು ಬರೆಯುವ ಕೌಶಲ ಹೆಚ್ಚಿಸಿಕೊಳ್ಳಲು ಸಹಾಯವಾಗುತ್ತದೆ.

Unit	**Syllabus content**	**No. of hours**
		Theory
I	**ಲೇಖನಗಳು** Introduction, Necessity of learning a local language. ಕನ್ನಡ ವರ್ಣಮಾಲೆ , ಕಾಗುಣಿತ, ಕನ್ನಡ ಒತ್ತಕ್ಷರ, ಕನ್ನಡ ಅಂಕಿಗಳು , **(RBT Levels: L1)**	03
II	**ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ**: Plural Opposite words Gender, nouns ವಿರುದ್ಧಪದಗಳು, ಲಿಂಗಪರಿಚಯ. ನಾಮಪದಗಳು. **(RBT Levels: L1)**	03
III	**ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ** : Ordinal numerals and markers ಸಂಖ್ಯಾ ಗುಣವಾಚಕಗಳು, ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು, ಏಕವಚನ, ಬಹುವಚನ. **(RBT Levels: L1)**	03
IV	**ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ** : Imperative words and sentences , ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು. ,ಅಕ್ಷರದಿಂದ ಪದ, ಪದದಿಂದ ವಾಕ್ಯ ರಚನೆ **(RBT Levels: L1)**	03
V	**ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ** : Kannada Vocabulary List & Kannada Words in Conversation: ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು ಆಶುಭಾಷಣ ವಿಷಯ, ಸಂವಹನ ಮಾಧ್ಯಮ , ಮೌಖಿಕ ಚಟುವಟಿಕೆ **(RBT Levels: L1)**	03

COURSE OUTCOMES: ಕನ್ನಡೇತರ ಮತ್ತು ಹೊರನಾಡು ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಭಾಷೆಯ ಅಡಿಯಪಾಯವನ್ನು ಜೊತೆಗೆ ಕನ್ನಡ ವ್ಯಾಕರಣಾಂಶದ ಬಗೆಗೆ ತಿಳಿಯುವರು.

CO1	**ಭಾಷೆಯ ಅಡಿಪಾಯ** : ಕನ್ನಡ ಭಾಷಾ ಅಕ್ಷರದ ಅಡಿಪಾಯದ ಬಗೆಗೆ ತಿಳಿಯುವರು
CO2	**ವ್ಯಾಕರಣಾಂಶ ಪರಿಚಯ** : ವ್ಯಾಕರಣಾಂಶದಲ್ಲಿ ಬರುವ ವಿರುದ್ಧಪದಗಳು, ಲಿಂಗಪರಿಚಯ. ನಾಮಪದಗಳ ಬಗೆಗೆ ತಿಳಿಯುವರು
CO3	**ವ್ಯಾಕರಣಾಂಶ ಪರಿಚಯ** : ವ್ಯಾಕರಣಾಂಶದಲ್ಲಿ ಬರುವ ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು , ಏಕವಚನ, ಬಹುವಚನದ ಬಗೆಗೆ ತಿಳಿಯುವರು (RBT Levels: L1)
CO4	**ರಚನಾ ಕೌಶಲ್ಯ** : ವಿದ್ಯಾರ್ಥಿಗಳು ಬರವಣಿಗೆ ಸಾಮರ್ಥ್ಯವನ್ನು ಹೆಚ್ಚಿಸಿಕೊಳ್ಳುವುದರಿಂದ ರಚನಾ ಕೌಶಲ್ಯದ ಬಗೆಗೆ ತಿಳಿಯುವರು.
CO5	**ಮೌಖಿಕ ಚಟುವಟಿಕೆ** : ವಿದ್ಯಾರ್ಥಿಗಳು ಮೌಖಿಕ ಚಟುವಟಿಕೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವುದರಿಂದ ಭಾಷಾ ಸಾಮರ್ಥ್ಯದ ಬಗೆಗೆ ಹೆಚ್ಚು ಆತ್ಮವಿಶ್ವಾಸ ಮೂಡಿಸಿಕೊಳ್ಳುವರು.

TEACHING–LEARNING PROCESS: Chalk and Talk, Workbook, Group discussions

TEXTBOOKS

1. ಪಠ್ಯದ ಹೆಸರು : ಬಳಕೆ ಕನ್ನಡ ಕನ್ನಡೇತರ ಮತ್ತು ಹೊರನಾಡು ಕನ್ನಡ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ
2. ಡಾ.ಪಿ.ಪಾಂಡುರಂಗ ಬಾಬು – ಪ್ರಾಧ್ಯಾಪಕರು, ಕನ್ನಡ ಭಾಷಾಧ್ಯಯನ ವಿಭಾಗ, ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಹಂಪಿ
3. ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ – ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು
4. ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ – ಶೈಕ್ಷಣಿಕ ಸಲಹೆಗಾರರು

REFERENCE BOOKS

1 ಕನ್ನಡ ಕಲಿ – ಲಿಂಗದೇವರು ಹಳೆಮನೆ

2. ವ್ಯವಹಾರಿಕ ಕನ್ನಡ–ಡಾ.ಎಲ್.ತಿಮ್ಮೇಶ –ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು ಮತ್ತು ಮುಖ್ಯಸ್ಥರು
   ಪ್ರೊ.ವಿ.ಕೇಶವಮೂರ್ತಿ – ಶೈಕ್ಷಣಿಕ ಸಲಹೆಗಾರರು
3. ಕನ್ನಡ ವ್ಯಾಕರಣ ಮತ್ತು ರಚನೆ – ಎನ್.ಗೋಪಾಲಕೃಷ್ಣ ಉಡುಪ
4. ಕನ್ನಡ ಕಾರ್ಯಪುಸ್ತಕ

SCHEME FOR EXAMINATIONS

Question Paper Pattern:
CIE- Objective type (Max. marks: 25 marks)
SEE- Objective type (Max. marks: 50 marks)

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										3		
CO2										3		
CO3										3		
CO4										3		
CO5										3		
Strength of correlation: Low-1, Medium-2, High-3												

Dr. Ambedkar Institute of Technology, Bengaluru-560056
Department of Humanities and Social Sciences
Scheme and Syllabus 2025 - 26

Course Title	**Soft Skills**							
Course Code	1BSST110/1BSST210							
Category	**AEC (NCMC)**							
Scheme and Credits	Theory/Practical/Integrated					Total teaching hours	Lab slots	Credits
	L	T	P	SDA	Total			
	01	00	00	00	01	01	-	PP/NP
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 00 Hours**			

COURSE LEARNING OBJECTIVES

This course aims to develop students' interpersonal, emotional, and professional competencies for personal and workplace effectiveness. It enhances communication, active listening, empathy, emotional intelligence, and stress management skills. Students are trained to set goals, manage time, adapt to change, demonstrate creativity, and resolve conflicts efficiently. The course also fosters teamwork, collaboration, critical thinking, and professional habits for personal growth and organizational success.

Unit	Syllabus content	No. of hours
		Theory
I	**Social Skills** Communication: Principles of clear and effective exchange of ideas in professional and social contexts. Persuasion: Techniques to influence and convince through logical, emotional, and ethical appeals. Self-Awareness: Identifying personal strengths, weaknesses, opportunities, and challenges (SWOC analysis). Active Listening: Paraphrasing, questioning techniques, and demonstrating attentiveness. **Self-study:** SWOC Journal: Maintain a weekly self-reflection journal identifying personal strengths, weaknesses, opportunities, and challenges, with strategies for improvement. **(RBT Levels: L1)**	03
II	**Emotional Skills I** Emotional Intelligence (EI): Recognizing and managing emotions, empathy, relationship management, and conflict resolution. Stress Management: Identifying stress triggers, relaxation techniques, work-life balance strategies, and mindfulness practices. Time Management: Prioritization (Eisenhower Matrix), setting SMART goals, avoiding procrastination, and effective scheduling. Adaptability & Resilience: Handling change, bouncing back from setbacks, and developing a growth mindset. **Self-study:** Case study on real-life examples of leaders demonstrating emotional intelligence; Reflection journal on personal stress triggers and coping strategies. **(RBT Levels: L1)**	03

III	**Emotional Skills II** Ambition & Goal Setting: Defining personal and professional aspirations, creating SMART goals, and aligning actions with long-term vision. Sympathy & Empathy: Understanding emotional perspectives, differentiating between the two, and applying them in workplace and social interactions. Creativity & Innovation: Generating original ideas, problem-solving, and applying creative thinking techniques (mind-mapping, SCAMPER). **Self-Study:** Reading case studies of successful innovators and leaders who applied empathy and creativity in their professional journeys; Writing a personal goal-setting action plan aligned with SMART goals. **(RBT Levels: L1)**	03
IV	**Professional Skills I** Problem Solving: Identifying root causes, analyzing options, and implementing solutions using methods like 5 Whys and Fishbone Diagram. Discipline: Building consistency, accountability, and professional habits. Time Management: Prioritizing tasks (Eisenhower Matrix), scheduling, and avoiding procrastination. **Self-Study:** Case study analysis of workplace problem-solving scenarios; preparing a weekly time management plan and reflecting on its effectiveness. **(RBT Levels: L1)**	03
V	**Professional Skills II** Collaboration & Teamwork: Working effectively in diverse teams, fostering trust, and achieving shared goals. Negotiation & Conflict Resolution: Strategies to resolve differences and reach win–win outcomes. Critical Thinking: Analyzing, evaluating, and synthesizing information to make well-reasoned decisions. **Self-Study:** Case study analysis on teamwork and leadership in real-world projects; reading articles on successful conflict resolution strategies; practicing critical thinking through puzzles, problem scenarios, and reflective journals. **(RBT Levels: L1)**	03

COURSE OUTCOMES: On completion of the course, students are able to:

CO1	Demonstrate effective communication, persuasion, and active listening in social and professional contexts.
CO2	Apply emotional intelligence, stress management, adaptability, and resilience to handle personal and professional challenges**.**
CO3	Set personal and professional goals, practice empathy, and foster creativity and innovation.
CO4	Work collaboratively in teams, resolve conflicts, and demonstrate negotiation and critical thinking skills.
CO5	Apply professional discipline, time management, and accountability to achieve workplace efficiency and growth.

TEACHING–LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos.

TEXTBOOKS

1. Barun K. Mitra – *Personality Development and Soft Skills*, Oxford University Press.
2. D. K. Sharma – *Soft Skills: An Integrated Approach to Maximise Personality*, Wiley India.

REFERENCE BOOKS

1. John Seely – *The Oxford Guide to Writing and Speaking*, Oxford University Press.

2. Lesikar, Flatley & Rentz – *Business Communication: Making Connections in a Digital World*, McGraw-Hill.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1										3		
CO2												3
CO3												3
CO4												3
CO5									3			
Strength of correlation: Low-1, Medium-2, High-3												

Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Electrical and Electronics Engineering
Scheme and Syllabus 2025-26

Course Title	**INNOVATION AND DESIGN THINKING LAB**						
Course Code	**1BIDL108/208**						
Category	**ABILITY ENHANCEMENT COURSE/SKILL DEVELOPMENT COURSE**						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	00	**00**	**02**	**00**	**02**	**26**	**01**
CIE Marks**: 50**	SEE Marks**: 50**		Total Max. marks **= 100**		Duration of SEE**: 03** Hours		

COURSE OBJECTIVE:

1. To explain the concept of design thinking for product and service development.
2. To explain the fundamental concept of innovation and design thinking.
3. To discuss the methods of implementing design thinking in the real world.

Week 1, 2 & 3: Orientation and Team Formation
Week -1&2: Introduction to Social Entrepreneurship, Innovation and Design Thinking Group discussion on What is Innovation vs Invention. Why Design Thinking is important. Brief about 5 stages: Empathize – Define – Ideate – Prototype – Test. Week -3: Innovation warm-up activities, forming interdisciplinary teams, Instructions about Next week activities
Week 4–5: Empathy and Field Exploration
Week-4&5: Field (any public places of student's interest Eg- Village, Government Office, Industry. R&D institute, NGO etc) visits, stakeholder interviews and interaction. Recording all interaction through handwritten in activity book prescribed by the University.
Week 6, 7 and 8: Problem Definition
Week-6: Documentation, categorization and Group discussion on interactions and problems/challenges. Week-7&8: Problem framing using "How Might We" approach, Identification of social problems and user insights through affinity Clustering and Problem Tree. Mention of clearly defined challenge statements.
Week 9, 10 &11: Ideation Sprint
Week-9&10: Presentation by teams on Defined Problems, Brainstorming interactions and Mind Mapping. Week-10: Idea Filtering - Shortlist of creative, eco -friendly and feasible ideas. Selection of one Suitable IDEA for next process, Designing/Structuring of Prototype model.
Week 12, 13 &14: Rapid Prototyping using Atal Idea Lab/Makers Space
Week-12&13: Building low-fidelity and working models using tools like Arduino, 3D printers,: Digital fabrication, electronics kits and recycled materials Week-14: User testing, Feedback collection, Iteration - Observation Notes, Feedback Forms (Designing a business model for impact and scalability, if possible) Preparation of Draft of social venture plan
Week 15 &16: Final Demo and Social Pitch
Innovation showcase, Poster display, Project pitching to jury Presentation of the project with impact with assessment, prototype, and sustainability plan

COURSE OUTCOMES: On completion of the course, student should be able to:

CO1: Empathize with community problems and define meaningful challenges.
CO2: Apply design thinking principles and multidisciplinary skills to develop user-centric solutions.
CO3: Build and test basic prototypes using tools available in the Atal Idea/Tinkering Lab or Makers

Space.
CO4: Pitch socially relevant ideas with scalable models.
CO5. Collaborate effectively in diverse teams.

TEXT BOOKS

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson "Engineering Design", Cengage learning (International edition), 2nd Edition, 2013.
2. Roger Martin "The Design of Business: Why Design Thinking is the Next Competitive Advantage" ,Harvard Business Press, 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), Design Thinking: Understand – Improve Apply, Springer, 2011.
4. Idris Mootee "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons),2013

REFERENCE BOOKS

1. Yousef Haik and Tamer M.Shahin "Engineering Design Process" Second Edition , Cengage Learning, 2011.
2. Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author), "Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover" 20 Sep 2013.

ONLINE RESOURCES

1. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3. www.bizfilings.com › Home › Marketing › Product Development
4. https://www.mindtools.com/brainstm.html
5. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en

SCHEME FOR EXAMINATIONS

Examination type (SEE): Practical/Presentation/Seminar

MAPPING of COs with POs and PSOs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		3				2	2						3		2
CO 2	2		3	2			2						2	3	2
CO 3			2		3								2	3	
CO 4						2	2			3	2			2	3
CO 5									3	2				2	3

Strength of correlation: Low-1, Medium- 2, High-3

Continuous Internal Evaluation (CIE) –
CIE Parameters (50 Marks)

Sl. No.	CIE Component/Week	Marks	Description	
1	Orientation Activities & Communication Skills	5	Participation in Week 1–3 orientation, communication and teamwork skill-building exercises.	

2	Empathy & Field Exploration Documentation	10	Quality and completeness of field visit reflections, stakeholder interviews, and activity book.	
3	Problem Definition and Framing	10	Clarity of challenge statements, use of "How Might We", Affinity Mapping, Problem Trees.	
4	Ideation & Mind Mapping	5	Participation in brainstorming, mind mapping, idea filtering sessions.	
5	Prototype Development & Iteration	10	Quality and creativity of prototype/model, user testing, feedback collection, iterations.	
6	Final Presentation & Pitch	5	Project pitching, poster presentation, storytelling and scalability model.	
7	Teamwork, Journal, and Engagement	5	Peer and mentor evaluation of participation, teamwork, journal updates.	
8	Total CIE marks	50	Final CIE marks to be considered	

*Minimum to Qualify for SEE: 20 out of 50 in CIE

Semester End Examination (SEE) –
SEE to be conducted in batches where the students will exhibit their projects along with the presentation and Viva -voce. – 100 Marks
"SEE shall be conducted by one Internal and one External Examiner"

Sl. No.	Evaluation Parameter	Marks	Details	
1	Prototype / Solution Demonstration	30	Working functionality, creativity, use of lab tools, relevance to the problem.	
2	Final Presentation / Social Pitch	20	Clarity, storytelling, problem-solution fit, communication, visual aids.	
3	Business Model or Sustainability Plan	10	Feasibility, cost-effectiveness, scalability, and alignment with SDGs.	
4	Viva Voce	20	Individual understanding, contribution, tools used, learning outcomes.	
5	Documentation Report / Portfolio	20	Project report, reflection, team activity log, stakeholder input summaries.	

Submission Requirements:

• Handwritten activity book with CIE marks and Final project report (Typed or Handwritten).

• Final presentation ppt/pdf (hard and soft copy).

• Prototype or working model [physical or conceptual (shall be drawn/sketched clearly on card sheet paper)].

• Peer/team feedback and reflection entries (if applicable).

	SUBJECT TITLE: CAREER DEVELOPMENT SKILLS – I		
	1BCDN109	**Mandatory Course (CGPC)**	**No of lecture hours per week: 02**
	Evaluation Method: CIE + Assignment +Group Activity (Max: 50 Marks)		**Total No. of lecture hours: 26**

Course objectives:

1. **The lessons under this unit are designed to enable the students to plan their career on correct measures and motivate them to set their goals on prior basis.**
2. **This unit aims to develop the personality skills of the students and teach them to lead a corporate discipline nurture. It also helps them to get groomed with professional ethics.**
3. **This unit complies with the overcoming ability of students dealt in stress and it also teaches the punctuality and time managing.**
4. **This lesson will help students make inferences and predictions about spoken, writing & listening discourse.**
5. **To prepare for Verbal Ability, stick to the rule of – concepts first and practice later. Study English grammar to understand the concepts. Then practice several sample questions of different kinds to gain confidence, speed and accuracy.**

Unit No.	Syllabus content	No. of hours
		Theory
1	**Self-awareness and Self-confidence:** Knowing your own self, Knowing others, Working well with others, Knowing personal attitudes, Developing the right attitude for work, Being proactive & positive. **Goal Settings:** Importance of goal, Creating SMART goals, Action plan to meet goals, Tips for effective execution of goals **Career Planning:** Qualities of an Engineer, available opportunities for Engineering graduates, Avenues and Skills.—(**GA)- Role play on self-introduction, strengths and weakness 2) Improve my GPA to 3.5, Make new friends on Campus**	**6 hours**
2	**Building Personality and Discipline:** Personality Building, Types of Personality, Ways of developing personality, 3 types of discipline, Advantages of being disciplined **Mindful Grooming and Cleanliness:** Expectations from the industry, Building personal presence, Corporate grooming, Types and Impact of Grooming, Tips on Personal Grooming..—(**GA)- Understanding on Dress Etiquettes (Debate-Role Play)** **Attitude and Behavior:** Types & Structures of Attitudes, Personal & Positive Attitudes	**6 hours**

3	**Emotional intelligence Quotient:** Types of emotional quotient, Signs of emotional intelligence, Characteristics of emotional intelligence, Ways to increase EQ **Time Management:** Importance of time, Time Management Matrix, Tips for managing time effectively, Prioritizing. **Stress Management:** Causes, Types & Symptoms of stress **Writing Skills:** Importance of Writing Skills, Dos & DON'T's of Writing Skills, Ways to improve writing skills, Tips for writing skills. **Reading Skills:** Dos & Don'ts of good reading, Improve your reading skills.--(**GA)- Read and Respond- Passage: -5 Questions (1 mark each):**	**6 hours**
4	**Listening Skills:** Hearing & Listening, Barriers to Listening, Active Listening Skills & Importance of listening **Speaking Skills:** Basics of Speaking skills, 7 C's for Better Speaking, Types of Speaking & Elements of public speaking.-(**GA)- Presentation on a particular topic on writing skills, Escape the Classroom, The Survival Challenge**	**4 hours**
5	**Leadership skills and motivation:** Attributes of a leader, Leadership Styles, Key Characteristics-—(**GA) Quiz, Word Relay (The Verbal Challenge** **Common mistakes in English, Classic Indianisms, Course of action, Cause and effect.**	**4 hours**

Course Outcomes:

CO1: The students will be able to learn about the overview of their goals and also gets to know diversities in the field of their career planning.

CO2: The student will develop and improve their personal and professional effectiveness. By the end of this unit, students will have deployed themselves about the corporate culture.

CO3: At the completion of this unit, students will develop the self-confidence and emerge as the confident person.

CO4: After the completion of this unit students will understand the stress, time and emotional management. Also, they will learn about the overcoming the fear and uncomfortable situations such as public speaking.

CO5: After the completion of this unit, students will gain knowledge about the assertiveness of Listening, Reading, Writing & Interpersonal segments.

REFERENCE BOOKS.

1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI
2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education
3. The Emotionally Intelligent Workplace by DANIEL GOLEMAN.
4. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI.
5. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA
6. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

Note: Required reference links to each unit will be provided in PH

Second Semester BE (Common to all branches)

	SUBJECT TITLE: CAREER DEVELOPMENT SKILLS – II		
	Subject Code: 1BCDN209	**Mandatory Course (CGPC)**	**No of lecture hours per week: 02**
	Evaluation Method: CIE + Assignment +Group Activity (Max: 50 Marks)		**Total No. of lecture hours: 26**

Course objectives:

1. **The main goal of this unit is to help students to overcome the fear of speaking in both personal and professional culture and it also focuses on the presenting the topics with confidence.**
2. **This unit teaches the students on how to be effective team player & contribute to the organizational growth. It also depicts the easier decision making and problem-solving techniques & enables students to think creatively there by moulding them to be future leaders**
3. **This unit makes the students understand about the English usage properly with the right set of course and action. This unit aims at teaching the Verbal Ability and It gives them the insight about grammar rules & concepts.**
4. **This unit begins with the Quantitative Aptitude and Logical Aptitude content as it is a crucial round to clear in order to proceed for further rounds of interviews. This will help students to strengthen the general aptitude.**
5. **This unit aims to teach students understand their interpretation skills in relation to patterns, diagrammatic tests, abstract reasoning test.**

Unit No.	Syllabus content	No. of hours Theory
1	**Team building:** Importance of Team Building, Benefits of Team Building, Key Roles in Team building, Helpful Team Behavior-–—**(GA) The Human Maze,Projects Releases performed as a team (Act /Play)** **Decision making and Problem Solving:** Decision making styles, Types of Decision making, Steps of Decision making, Decision Making skills, Problem Solving, Steps of Problem solving. **Small talk and Debate**	**6 hours**
2	Workplace etiquette, Business Communication, **sales and negotiation**—**(GA)** and Customer service (Customer Experience of selling a product, Owner of a company selling he/her firm to a buyer)	**6 hours**
3	**Grammar Brush up:** Parts of Speech **Verbal Ability – II Grammar based Exercise:** Sentence correction, Sentence Completion, Spotting errors---**(PH)- Nuances of Vowels, Sentence Structure, Grammar Organization**	**4 hours**
4	**Number System:** Number system, Power cycle, Remainder cycle, Factors, Multiples, HCF and LCM, Trailing Zeroes **Algebra:** Different types of Algebraic expressions, Different types of Algebraic equations-**(PH) – Usage of Zeroes, Comparison of LCM, HCF**	**6 hours**

5	**Coding and Decoding:** Different types of Problems on Coding and Decoding, Forward Coding, Reverse Coding, Mirror Coding. **Statement and assumptions, Statement and Conclusions- Different types of questions and answering methodology.** **Alphanumeric Problems and Number series:** Different types of Problems**--(PH)**	**4 hours**

Course Outcomes:

CO1: The students would have learnt about the way of quality communication with the co-workers and it will also help to build a strong social relationship with outside society. And students will also learn to deliver the presentation in a more powerful and persuasive way.

CO2: After the completion of this unit, student would have learnt how to work in teams & be effective leader. And students will learn about the synchronization with the workmate and also gives them an opportunity to unlock their individual potentials by taking the right decisions.

CO3: At this unit, students would have learnt the mistakes in the usage of English vocabulary during their common talks.

CO4: After the completion of this unit student will know about the basic concepts of general quantitative aptitude.

CO5: The problems on Alphanumeric & numbers will be learnt after the completion of this unit. And also it also covers the Analytical reasoning concept of Coding and Decoding.

REFERENCE BOOKS.

1.Soft skills an integrated approach to maximize personality by SANGEETHA SHARMA, GAJENDRA SINGH CHAUHAN, and Wiley Publishing.
2. Quantitative aptitude for competitive exams by S.Chand, Dr. R.S. Aggarwal
3. Quantitative aptitude for CAT by Arun Sharma, Tata McGrew Hill
4. Rapid Quantitative Aptitude by Er. Deepak Agarwal and Mr. D.P Gupta
5. Numerical Ability and Quantitative aptitude for Competitive examinations by P.K.Mittal.
6. Verbal Ability and Reading comprehension by Arun Sharma and Meenakshi Upadhyay, Tata McGrew Hill Education

Note: Required reference links to each unit will be provided in PH